



[www.nicsanat.com](http://www.nicsanat.com)

021-87700210



# RX

Customised to your machine

Model: 3G3RX

200 V Class Three-Phase Input 0.4 to 55 kW

400 V Class Three-Phase Input 0.4 to 132 kW



[www.nicsanat.com](http://www.nicsanat.com)

021-87700210

## USER'S MANUAL



# OMRON

---

# Introduction

---

Thank you for choosing the general-purpose Inverter RX Series. This User's Manual (hereinafter called "this manual") describes the parameter setting methods required for installation/wiring and operation of the RX model, as well as troubleshooting and inspection methods.

- This manual should be delivered to the actual end user of the product.
- After reading this manual, keep it handy for future reference.
- This manual describes the specifications and functions of the product as well as the relations between them. You should assume that anything not described in this manual is not possible with the product.

- Intended readers

This manual is intended for:

Those with knowledge of the workings of electricity (qualified electric engineers or the equivalent), and also in charge of:

- Introducing the control equipment
- Designing the control system
- Installing and/or connecting the control equipment
- Field management

---

# Read and Understand this Manual

---

Please read and understand this manual before using the product. Please consult your OMRON representative if you have any questions or comments.

## Warranty and Limitations of Liability

### WARRANTY

OMRON's exclusive warranty is that the products are free from defects in materials and workmanship for a period of one year (or other period if specified) from date of sale by OMRON.

OMRON MAKES NO WARRANTY OR REPRESENTATION, EXPRESS OR IMPLIED, REGARDING NON-INFRINGEMENT, MERCHANTABILITY, OR FITNESS FOR PARTICULAR PURPOSE OF THE PRODUCTS. ANY BUYER OR USER ACKNOWLEDGES THAT THE BUYER OR USER ALONE HAS DETERMINED THAT THE PRODUCTS WILL SUITABLY MEET THE REQUIREMENTS OF THEIR INTENDED USE. OMRON DISCLAIMS ALL OTHER WARRANTIES, EXPRESS OR IMPLIED.

### LIMITATIONS OF LIABILITY

OMRON SHALL NOT BE RESPONSIBLE FOR SPECIAL, INDIRECT, OR CONSEQUENTIAL DAMAGES, LOSS OF PROFITS OR COMMERCIAL LOSS IN ANY WAY CONNECTED WITH THE PRODUCTS, WHETHER SUCH CLAIM IS BASED ON CONTRACT, WARRANTY, NEGLIGENCE, OR STRICT LIABILITY.

In no event shall the responsibility of OMRON for any act exceed the individual price of the product on which liability is asserted.

IN NO EVENT SHALL OMRON BE RESPONSIBLE FOR WARRANTY, REPAIR, OR OTHER CLAIMS REGARDING THE PRODUCTS UNLESS OMRON'S ANALYSIS CONFIRMS THAT THE PRODUCTS WERE PROPERLY HANDLED, STORED, INSTALLED, AND MAINTAINED AND NOT SUBJECT TO CONTAMINATION, ABUSE, MISUSE, OR INAPPROPRIATE MODIFICATION OR REPAIR.

## Application Considerations

### SUITABILITY FOR USE

OMRON shall not be responsible for conformity with any standards, codes, or regulations that apply to the combination of products in the customer's application or use of the products.

At the customer's request, OMRON will provide applicable third party certification documents identifying ratings and limitations of use that apply to the products. This information by itself is not sufficient for a complete determination of the suitability of the products in combination with the end product, machine, system, or other application or use.

The following are some examples of applications for which particular attention must be given. This is not intended to be an exhaustive list of all possible uses of the products, nor is it intended to imply that the uses listed may be suitable for the products:

- Outdoor use, uses involving potential chemical contamination or electrical interference, or conditions or uses not described in this manual.
- Nuclear energy control systems, combustion systems, railroad systems, aviation systems, medical equipment, amusement machines, vehicles, safety equipment, and installations subject to separate industry or government regulations.
- Systems, machines, and equipment that could present a risk to life or property.

Please know and observe all prohibitions of use applicable to the products.

**NEVER USE THE PRODUCTS FOR AN APPLICATION INVOLVING SERIOUS RISK TO LIFE OR PROPERTY WITHOUT ENSURING THAT THE SYSTEM AS A WHOLE HAS BEEN DESIGNED TO ADDRESS THE RISKS, AND THAT THE OMRON PRODUCTS ARE PROPERLY RATED AND INSTALLED FOR THE INTENDED USE WITHIN THE OVERALL EQUIPMENT OR SYSTEM.**

### PROGRAMMABLE PRODUCTS

OMRON shall not be responsible for the user's programming of a programmable product, or any consequence thereof.

## Disclaimers

### CHANGE IN SPECIFICATIONS

Product specifications and accessories may be changed at any time based on improvements and other reasons.

It is our practice to change model numbers when published ratings or features are changed, or when significant construction changes are made. However, some specifications of the products may be changed without any notice. When in doubt, special model numbers may be assigned to fix or establish key specifications for your application on your request. Please consult with your OMRON representative at any time to confirm actual specifications of purchased products.

### DIMENSIONS AND WEIGHTS

Dimensions and weights are nominal and are not to be used for manufacturing purposes, even when tolerances are shown.

### PERFORMANCE DATA

Performance data given in this manual is provided as a guide for the user in determining suitability and does not constitute a warranty. It may represent the result of OMRON's test conditions, and the users must correlate it to actual application requirements. Actual performance is subject to the OMRON Warranty and Limitations of Liability.

### ERRORS AND OMISSIONS

The information in this manual has been carefully checked and is believed to be accurate; however, no responsibility is assumed for clerical, typographical, or proofreading errors, or omissions.

# Safety Precautions

## ■ Indications and Meanings of Safety Information

In this user's manual, the following precautions and signal words are used to provide information to ensure the safe use of the RX Inverter.

The information provided here is vital to safety. Strictly observe the precautions provided.

## ■ Meanings of Signal Words

|                                                                                                  |                                                                                                                                                                                    |
|--------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  <b>DANGER</b>  | Indicates an imminently hazardous situation which, if not avoided, is likely to result in serious injury or may result in death. Additionally there may be severe property damage. |
|  <b>CAUTION</b> | Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury or in property damage.                                                   |

## ■ Alert Symbols in this Document

|  <b>DANGER</b> |                                                                                                                                                                                                                                                                          |
|-------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|              | Turn off the power supply and implement wiring correctly. Not doing so may result in a serious injury due to an electric shock.                                                                                                                                          |
|              | Wiring work must be carried out only by qualified personnel. Not doing so may result in a serious injury due to an electric shock.                                                                                                                                       |
|              | Do not change wiring and slide switches (SW1), put on or take off Digital Operator and optional devices, replace cooling fans while the input power is being supplied. Doing so may result in a serious injury due to an electric shock.                                 |
|              | Be sure to ground the unit. Not doing so may result in a serious injury due to an electric shock or fire.<br>(200-V class: type-D grounding, 400-V class: type-C grounding)                                                                                              |
|              | Do not remove the terminal block cover during the power supply and 10 minutes after the power shutoff.<br>Doing so may result in a serious injury due to an electric shock.                                                                                              |
|              | Do not operate the Digital Operator or switches with wet hands. Doing so may result in a serious injury due to an electric shock.                                                                                                                                        |
|              | Inspection of the Inverter must be conducted after the power supply has been turned off. Not doing so may result in a serious injury due to an electric shock.<br>The main power supply is not necessarily shut off even if the emergency shutoff function is activated. |

|  <b>CAUTION</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|--------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                 | Do not connect resistors to the terminals (PD/+1, P/+, N/-) directly. Doing so might result in a small-scale fire, heat generation or damage to the unit.                                                                                                                                                                                                                                                                                                               |
|                 | Install a stop motion device to ensure safety. Not doing so might result in a minor injury. (A holding brake is not a stop motion device designed to ensure safety.)                                                                                                                                                                                                                                                                                                    |
|                 | Be sure to use a specified type of braking resistor/regenerative braking unit. In case of a braking resistor, install a thermal relay that monitors the temperature of the resistor. Not doing so might result in a moderate burn due to the heat generated in the braking resistor/regenerative braking unit. Configure a sequence that enables the Inverter power to turn off when unusual overheating is detected in the braking resistor/regenerative braking unit. |
|                 | The Inverter has high voltage parts inside which, if short-circuited, might cause damage to itself or other property. Place covers on the openings or take other precautions to make sure that no metal objects such as cutting bits or lead wire scraps go inside when installing and wiring.                                                                                                                                                                          |
|                 | Do not touch the Inverter fins, braking resistors and the motor, which become too hot during the power supply and for some time after the power shutoff. Doing so may result in a burn.                                                                                                                                                                                                                                                                                 |
|                | Take safety precautions such as setting up a molded-case circuit breaker (MCCB) that matches the Inverter capacity on the power supply side. Not doing so might result in damage to property due to the short circuit of the load.                                                                                                                                                                                                                                      |
|               | Do not dismantle, repair or modify this product. Doing so may result in an injury.                                                                                                                                                                                                                                                                                                                                                                                      |



# Precautions for Safe Use

## ■ Installation and Storage

Do not store or use the product in the following places.

- Locations subject to direct sunlight.
- Locations subject to ambient temperature exceeding the specifications.
- Locations subject to relative humidity exceeding the specifications.
- Locations subject to condensation due to severe temperature fluctuations.
- Locations subject to corrosive or flammable gases.
- Locations subject to exposure to combustibles.
- Locations subject to dust (especially iron dust) or salts.
- Locations subject to exposure to water, oil, or chemicals.
- Locations subject to shock or vibration.

## ■ Transporting, Installation, and Wiring

- Do not drop or apply strong impact on the product. Doing so may result in damaged parts or malfunction.
- Do not hold by the front cover and terminal block cover, but hold by the fins during transportation.
- Do not connect an AC power supply voltage to the control input/output terminals. Doing so may result in damage to the product.
- Be sure to tighten the screws on the terminal block securely.  
Wiring work must be done after installing the unit body.
- Do not connect any load other than a three-phase inductive motor to the U, V, and W output terminals.
- Take sufficient shielding measures when using the product in the following locations. Not doing so may result in damage to the product.
  - Locations subject to static electricity or other forms of noise.
  - Locations subject to strong magnetic fields.
  - Locations close to power lines.

## ■ Operation and Adjustment

- Be sure to confirm the permissible range of motors and machines before operation because the inverter speed can be changed easily from low to high.
- Provide a separate holding brake if necessary.
- If the Drive Programming stops during multi-function output, the output status is held. Take safety precautions such as stopping peripheral devices.
- If the clock command is used in Drive Programming, an unexpected operation may occur due to weak battery. Take measures such as detecting a weak battery by a check that the clock data returns to the initial setting and stopping the inverter or programs. When the LCD Digital Operator is removed or disconnected, Drive Programming is in a waiting status by the clock command.

## ■ Maintenance and Inspection

- Be sure to confirm safety before conducting maintenance, inspection or parts replacement.
- The capacitor service life is influenced by the ambient temperature. Refer to "Smoothing Capacitor Life Curve" described in the manual. When a capacitor reaches the end of its service life and does not work as the product, you need to replace the capacitor.
- When disposing of LCD digital operators and wasted batteries, follow the applicable ordinances of your local government. When disposing of the battery, insulate it using tape.



The following display must be indicated when products using lithium primary batteries (with more than 6 ppb of perchlorate) are transport to or through the State of California, USA.

Perchlorate Material - special handling may apply.  
See [www.dtsc.ca.gov/hazardouswaste/perchlorate](http://www.dtsc.ca.gov/hazardouswaste/perchlorate)

The 3G3AX-OP05 has the lithium primary battery (with more than 6 ppb of perchlorate).  
Label or mark the above display on the exterior of all outer shipping packages of your products when exporting your products which the 3G3AX-OP05 are installed to the State of California, USA.

- Do not short + and –, charge, disassemble, heat, put into the fire, or apply strong impact on the battery. The battery may leak, explode, produce heat or fire. Never use the battery which was applied strong impact due to such as fall on the floor, it may leak.
- UL standards establish that the battery shall be replaced by an expert engineer. The expert engineer must be in charge of the replacement and also replace the battery according to the method described in this manual.
- When the display of LCD Digital Operator can not be recognized due to the service life, replace the LCD Digital Operator.

---

# Precautions for Correct Use

---

## ■ Installation

- Mount the product vertically on a wall with the product's longer sides upright.  
The material of the wall has to be noninflammable such as a metal plate.

## ■ Main Circuit Power Supply

- Confirm that the rated input voltage of the Inverter is the same as AC power supply voltage.

## ■ Error Retry Function

- Do not come close to the machine when using the error retry function because the machine may abruptly start when stopped by an alarm.
- Be sure to confirm the RUN signal is turned off before resetting the alarm because the machine may abruptly start.

## ■ Non-Stop Function at Momentary Power Interruption

- Do not come close to the machine when selecting restart in the non-stop function at momentary power interruption selection (b050) because the machine may abruptly start after the power is turned on.

## ■ Operation Stop Command

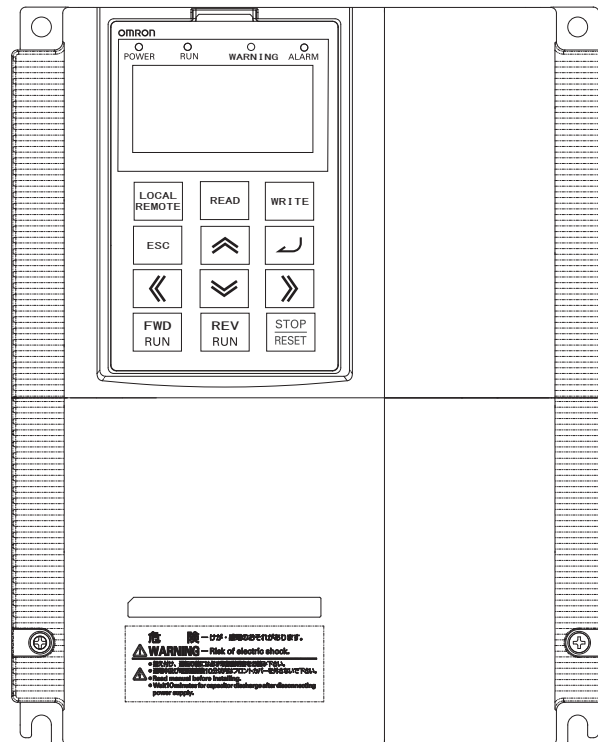
- Provide a separate emergency stop switch because the STOP key on the Digital Operator is valid only when function settings are performed.
- When checking a signal during the power supply and the voltage is erroneously applied to the control input terminals, the motor may start abruptly. Be sure to confirm safety before checking a signal.

## ■ Product Disposal

- Comply with the local ordinance and regulations when disposing of the product.

### Warning Labels

Warning labels are located on the Inverter as shown in the following illustration.  
Be sure to follow the instructions.



### Warning Description

**危険** — けが・感電のおそれがあります。

**WARNING** — Risk of electric shock.

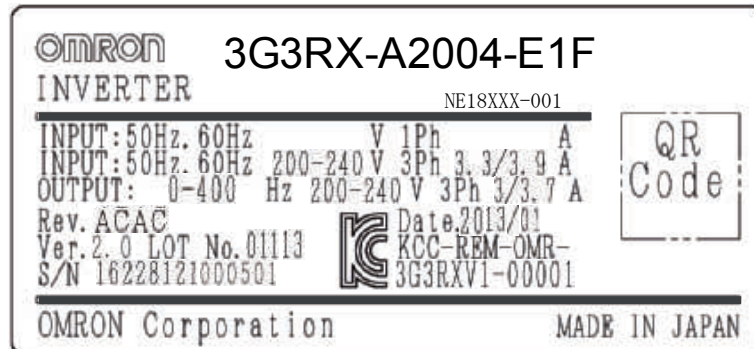
- 据え付け、運転の前には必ず取扱説明書をお読み下さい。
- 通電中及び電源遮断後10分以内はフロントカバーを外さないで下さい。
- Read manual before installing.
- Wait 10 minutes for capacitor discharge after disconnecting power supply.

# Checking Before Unpacking

## ■Checking the Product

On delivery, be sure to check that the delivered product is the Inverter RX model that you ordered. Should you find any problems with the product, immediately contact your nearest local sales representative or OMRON sales office.

## ●Checking the Nameplate



## ●Checking the Model

3 G 3 R X - A 2 0 5 5 - E F

F: Built-in filter

E: Europe standard

Max. applicable motor capacity

|     |         |     |         |
|-----|---------|-----|---------|
| 004 | 0.4 kW  | 185 | 18.5 kW |
| 007 | 0.75 kW | 220 | 22 kW   |
| 015 | 1.5 kW  | 300 | 30 kW   |
| 022 | 2.2 kW  | 370 | 37 kW   |
| 037 | 3.7 kW  | 450 | 45 kW   |
| 040 | 4.0 kW  | 550 | 55 kW   |
| 055 | 5.5 kW  | 750 | 75 kW   |
| 075 | 7.5 kW  | 900 | 90 kW   |
| 110 | 11 kW   | 11K | 110 kW  |
| 150 | 15 kW   | 13K | 132 kW  |

Voltage class

|   |                                |
|---|--------------------------------|
| 2 | 3-phase 200 V AC (200-V class) |
| 4 | 3-phase 400 V AC (400-V class) |

Enclosure rating

|   |                                                           |
|---|-----------------------------------------------------------|
| A | Panel-mounting (IP20 min.) or closed wall-mounting models |
| B | IP00                                                      |

## ■Checking the Accessories

Note that this manual is the only accessory included with the RX model. Mounting screws and other necessary parts must be provided by the user.

---

# Revision History

---

■ A manual revision code appears as a suffix to the catalog number located at the lower left of the front and back covers.

**Cat. No. I560-E2-05**

↑ Revision code

| Revision code | Revision date | Description   |
|---------------|---------------|---------------|
| 01            | April 2009    | First version |
| 04            | February 2012 | Major changes |
| 05            | December 2012 | Minor changes |

# About This Manual

This User's Manual is compiled chapter by chapter for user's convenience as follows. Understanding the following configuration ensures more effective use of the product.

|                                      | Overview                                                                                                                                            |
|--------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
| Chapter 1 Overview                   | Describes features and names of parts.                                                                                                              |
| Chapter 2 Design                     | Provides external dimensions, installation dimensions, peripheral device design/selection instructions, and other information necessary for design. |
| Chapter 3 Operation                  | Describes names of parts, the Inverter's operations, including how to use the keys on the Digital Operator, and the monitor function.               |
| Chapter 4 Functions                  | Describes the functions of the Inverter.                                                                                                            |
| Chapter 5 Maintenance Operations     | Describes the causes and their countermeasures if the Inverter fails, including the solutions to possible troubles (troubleshooting).               |
| Chapter 6 Inspection and Maintenance | Describes items for periodical inspection and/or maintenance for the Inverter.                                                                      |
| Chapter 7 Specifications             | Provides Inverter specifications, as well as the specifications and dimensions of peripheral devices.                                               |
| Appendix                             | Describes the summarized parameter settings as a reference for users who have used this Inverter and understood the functions.                      |





|                                                                  |       |
|------------------------------------------------------------------|-------|
| Introduction.....                                                | 1     |
| Read and Understand this Manual .....                            | 2     |
| Safety Precautions .....                                         | 5     |
| Precautions for Safe Use.....                                    | 7     |
| Precautions for Correct Use .....                                | 9     |
| Checking Before Unpacking .....                                  | 11    |
| Revision History.....                                            | 12    |
| About This Manual.....                                           | 13    |
| <b>Chapter 1 Overview</b>                                        |       |
| 1-1    Functions .....                                           | 1-1   |
| 1-2    Appearance and Names of Parts.....                        | 1-4   |
| <b>Chapter 2 Design</b>                                          |       |
| 2-1    Installation.....                                         | 2-1   |
| 2-2    Wiring.....                                               | 2-5   |
| <b>Chapter 3 Operation</b>                                       |       |
| 3-1    Operation Method .....                                    | 3-3   |
| 3-2    LCD Display.....                                          | 3-4   |
| 3-3    Test Run Procedure.....                                   | 3-5   |
| 3-4    Operation .....                                           | 3-6   |
| 3-5    Read/Write function and operation .....                   | 3-13  |
| 3-6    Test Run Operation .....                                  | 3-14  |
| 3-7    Part Names and Descriptions of the Digital Operator ..... | 3-17  |
| 3-8    Parameter Transition .....                                | 3-19  |
| 3-9    Parameter List .....                                      | 3-21  |
| <b>Chapter 4 Functions</b>                                       |       |
| 4-1    Monitor Mode.....                                         | 4-1   |
| 4-2    Function Mode .....                                       | 4-8   |
| 4-3    Functions When PG Option Board (3G3AX-PG01) Is Used.....  | 4-123 |
| 4-4    Communication Function .....                              | 4-145 |
| <b>Chapter 5 Maintenance Operations</b>                          |       |
| 5-1    Protective Functions and Troubleshooting .....            | 5-1   |
| 5-2    Warning Function.....                                     | 5-10  |
| <b>Chapter 6 Inspection and Maintenance</b>                      |       |
| 6-1    Inspection and Maintenance.....                           | 6-1   |

# Contents

---

## Chapter 7 Specifications

|     |                                  |      |
|-----|----------------------------------|------|
| 7-1 | Standard Specification List..... | 7-1  |
| 7-2 | Dimensional Drawing .....        | 7-7  |
| 7-3 | Options .....                    | 7-15 |

## Chapter App Appendix

|            |                                    |        |
|------------|------------------------------------|--------|
| Appendix-1 | Parameter List .....               | App-1  |
| Appendix-2 | Product Life Curve .....           | App-47 |
| Appendix-3 | Life Alarm Output.....             | App-48 |
| Appendix-4 | EC Declaration of Conformity ..... | App-49 |

|            |         |
|------------|---------|
| Index..... | Index-1 |
|------------|---------|

# Chapter 1

## Overview

|     |                                     |     |
|-----|-------------------------------------|-----|
| 1-1 | Functions .....                     | 1-1 |
| 1-2 | Appearance and Names of Parts ..... | 1-4 |

# 1-1 Functions

## RX Inverter Models

| Rated voltage    | Enclosure rating | Max. applicable motor capacity | Model       |
|------------------|------------------|--------------------------------|-------------|
| 3-phase 200 V AC | IP20             | 0.4 kW                         | 3G3RX-A2004 |
|                  |                  | 0.75 kW                        | 3G3RX-A2007 |
|                  |                  | 1.5 kW                         | 3G3RX-A2015 |
|                  |                  | 2.2 kW                         | 3G3RX-A2022 |
|                  |                  | 3.7 kW                         | 3G3RX-A2037 |
|                  |                  | 5.5 kW                         | 3G3RX-A2055 |
|                  |                  | 7.5 kW                         | 3G3RX-A2075 |
|                  |                  | 11 kW                          | 3G3RX-A2110 |
|                  |                  | 15 kW                          | 3G3RX-A2150 |
|                  |                  | 18.5 kW                        | 3G3RX-A2185 |
|                  |                  | 22 kW                          | 3G3RX-A2220 |
|                  |                  | 30 kW                          | 3G3RX-A2300 |
|                  |                  | 37 kW                          | 3G3RX-A2370 |
|                  |                  | 45 kW                          | 3G3RX-A2450 |
|                  |                  | 55 kW                          | 3G3RX-A2550 |
| 3-phase 400 V AC | IP20             | 0.4 kW                         | 3G3RX-A4004 |
|                  |                  | 0.75 kW                        | 3G3RX-A4007 |
|                  |                  | 1.5 kW                         | 3G3RX-A4015 |
|                  |                  | 2.2 kW                         | 3G3RX-A4022 |
|                  |                  | 4.0 kW                         | 3G3RX-A4040 |
|                  |                  | 5.5 kW                         | 3G3RX-A4055 |
|                  |                  | 7.5 kW                         | 3G3RX-A4075 |
|                  |                  | 11 kW                          | 3G3RX-A4110 |
|                  |                  | 15 kW                          | 3G3RX-A4150 |
|                  |                  | 18.5 kW                        | 3G3RX-A4185 |
|                  |                  | 22 kW                          | 3G3RX-A4220 |
|                  |                  | 30 kW                          | 3G3RX-A4300 |
|                  |                  | 37 kW                          | 3G3RX-A4370 |
|                  |                  | 45 kW                          | 3G3RX-A4450 |
|                  |                  | 55 kW                          | 3G3RX-A4550 |
|                  | IP00             | 75 kW                          | 3G3RX-B4750 |
|                  |                  | 90 kW                          | 3G3RX-B4900 |
|                  |                  | 110 kW                         | 3G3RX-B411K |
|                  |                  | 132 kW                         | 3G3RX-B413K |

## International Standards Models (EC Directives and UL/cUL Standards)

The RX Inverter meets the EC Directives and UL/cUL standard requirements for worldwide use.

| Classification   |                       | Applicable standard |
|------------------|-----------------------|---------------------|
| EC Directives    | EMC Directive         | EN61800-3: 2004     |
|                  | Low-voltage Directive | EN61800-5-1: 2007   |
| UL/cUL Standards |                       | UL508C              |

## Human Environment-friendly, High-performance, General-purpose Inverters Suitable for Various Advanced Applications

### ■ High Performance

#### High Starting Torque

With the vector control and auto-tuning functions, the RX Series has achieved high starting torque in excess of 200% at 0.3 Hz.

#### Trip Suppression

This Inverter features two trip suppression functions: "Overcurrent trip suppression function" to suppress overcurrent trip during acceleration, and "Overvoltage suppression function during deceleration" to suppress overvoltage trip during deceleration. Therefore, the RX Series provides tough operational capabilities regardless of the severe time setting of acceleration and deceleration.

### ■ Various Applications

#### Sensor-less Vector Control at 0 Hz

The RX Series provides sensor-less vector control, which is useful for up/down applications. It can provide a high torque of 150%, even at a speed reference of 0 Hz (150% torque is available when the Inverter capacity is increased by one rank). This function contributes to simplification of control programs and extension of the service life of the brake.

#### Emergency Shutoff Function

By switching the dedicated switch (SW1) this function enables you to change the multi-function input (input 3) to the emergency shutoff input. You can directly turn off a motor control power module without operating the software. This function simplifies construction of safety applications.

#### Built-in Braking Circuit (up to 22 kW)

The Inverter models with 22 kW or lower capacity incorporate a braking transistor, enabling space-saving configuration for applications that need rapid acceleration and stop.

#### Restart Speed Search Function

For a free-running motor (e.g. a fan motor), this function checks the direction of rotation and frequency, enabling smooth restart of the motor.

#### High-torque Multi-operation

The RX Series enables balanced torque control for the whole system, in proportion to multiple motor loads.

#### Deceleration Stop During Power Failure

During a power failure or momentary power interruption, the RX Series can decelerate and stop a motor by using the motor braking energy.

[www.nicsanat.com](http://www.nicsanat.com)

021-87700210



## ■ Human Environment-friendly Features

### More Simplified Parameter Settings and View

- Only parameters that have been changed from the default settings can be viewed.
- With the user setting function, only 12 parameters for frequent use can be viewed.

### Compliance With Safety Standards

The RX Series meets the requirements of the CE and UL/cUL and complies with various standards.

### The RoHS Directive

The standard model meets the requirements of the RoHS Directive.

### Easily Meets the Requirements Specified by the Ministry of Land, Infrastructure and Transport of Japan

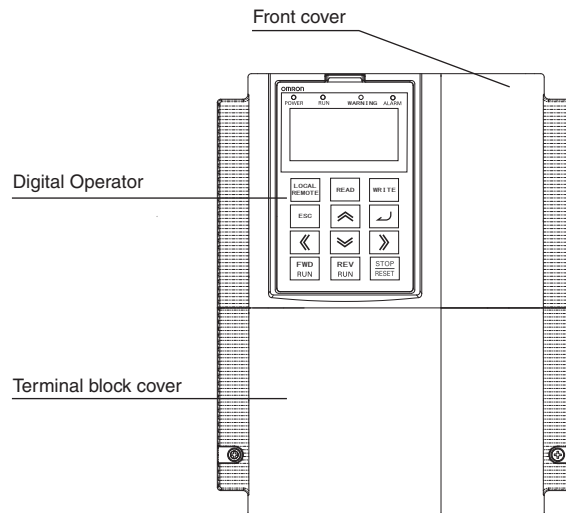
The RX Series incorporates a zero-phase reactor (radio noise filter) as a standard specification. When an optional DC reactor is added, the RX Series meets the requirements specified by the Ministry of Land, Infrastructure and Transport of Japan.

# 1-2 Appearance and Names of Parts

1

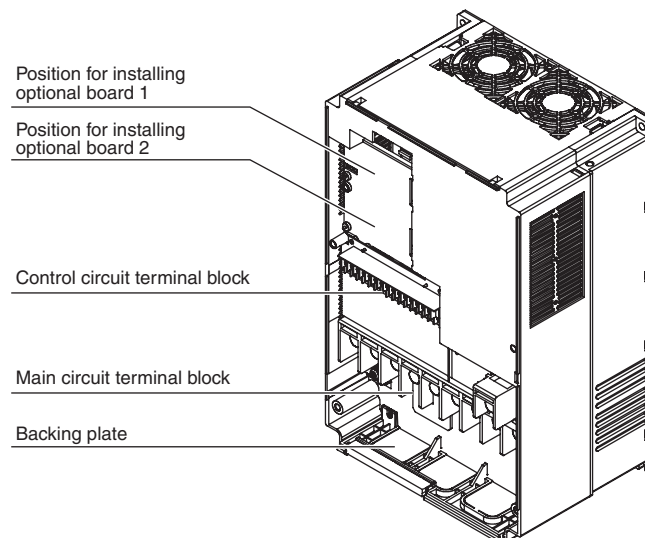
Overview

When the product is unpacked, it appears as below. (Example of 3G3RX-A2150/A4150 to A2220/A4220)



Open the terminal block cover and you can connect cables to the main circuit terminal block, as well as the control circuit terminal block.

Also, open the front cover and you can mount the optional board.







# Chapter 2

## Design

|     |                    |     |
|-----|--------------------|-----|
| 2-1 | Installation ..... | 2-1 |
| 2-2 | Wiring .....       | 2-5 |

## 2-1 Installation

### DANGER

|                                                                                   |                                                                                                                                                                                                                                          |
|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | Turn off the power supply and implement wiring correctly. Not doing so may result in a serious injury due to an electric shock.                                                                                                          |
|  | Wiring work must be carried out only by qualified personnel. Not doing so may result in a serious injury due to an electric shock.                                                                                                       |
|  | Do not change wiring and slide switches (SW1), put on or take off Digital Operator and optional devices, replace cooling fans while the input power is being supplied. Doing so may result in a serious injury due to an electric shock. |
|  | Be sure to ground the unit. Not doing so may result in a serious injury due to an electric shock or fire. (200-V class: type-D grounding, 400-V class: type-C grounding)                                                                 |

### CAUTION

|                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | Do not connect resistors to the terminals (PD/+1, P/+, N/-) directly. Doing so might result in a small-scale fire, heat generation or damage to the unit.                                                                                                                                                                                                                                                                                                               |
|  | Install a stop motion device to ensure safety. Not doing so might result in a minor injury. (A holding brake is not a stop motion device designed to ensure safety.)                                                                                                                                                                                                                                                                                                    |
|  | Be sure to use a specified type of braking resistor/regenerative braking unit. In case of a braking resistor, install a thermal relay that monitors the temperature of the resistor. Not doing so might result in a moderate burn due to the heat generated in the braking resistor/regenerative braking unit. Configure a sequence that enables the Inverter power to turn off when unusual overheating is detected in the braking resistor/regenerative braking unit. |
|  | The Inverter has high voltage parts inside which, if short-circuited, might cause damage to itself or other property. Place covers on the openings or take other precautions to make sure that no metal objects such as cutting bits or lead wire scraps go inside when installing and wiring.                                                                                                                                                                          |

## Safety Information

### ■ Installation and Storage

Do not store or use the product in the following places.

- Locations subject to direct sunlight.
- Locations subject to ambient temperature exceeding the specifications.
- Locations subject to relative humidity exceeding the specifications.
- Locations subject to condensation due to severe temperature fluctuations.
- Locations subject to corrosive or flammable gases.
- Locations subject to exposure to combustibles.
- Locations subject to dust (especially iron dust) or salts.
- Locations subject to exposure to water, oil, or chemicals.
- Locations subject to shock or vibration.

### ■ Transporting, Installation, and Wiring

- Do not drop or apply strong impact on the product. Doing so may result in damaged parts or malfunction.
  - Do not hold by the front cover and terminal block cover, but hold by the fins during transportation.
  - Do not connect an AC power supply voltage to the control input/output terminals. Doing so may result in damage to the product.
  - Be sure to tighten the screws on the terminal block securely.
- Wiring work must be done after installing the unit body.
- Do not connect any load other than a three-phase inductive motor to the U, V, and W output terminals.
  - Take sufficient shielding measures when using the product in the following locations. Not doing so may result in damage to the product.

Locations subject to static electricity or other forms of noise.

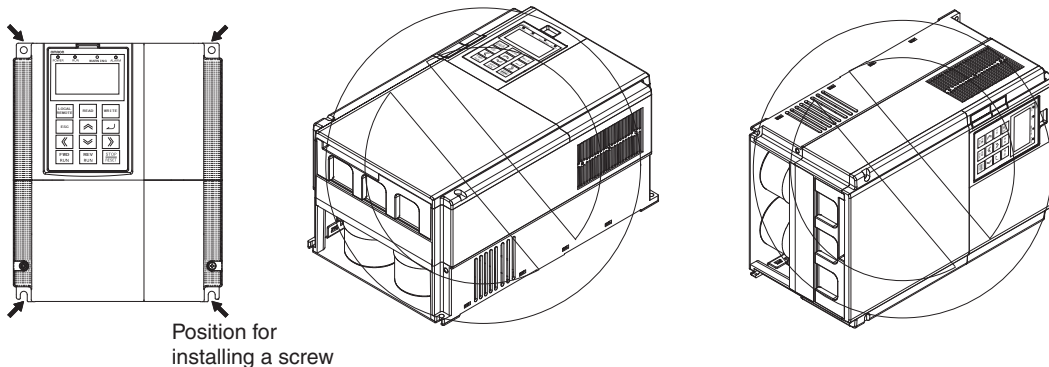
Locations subject to strong magnetic fields.

Locations close to power lines.

## Precautions for Use

### ■ Installation

- Install the Inverter vertically on the wall.
- Install the Inverter on a nonflammable wall surface material, like metal.

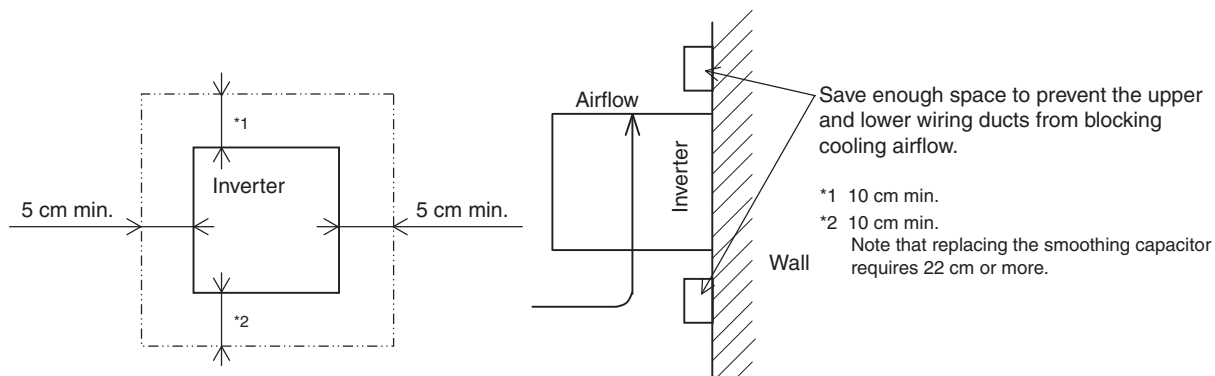


### ■ Main Circuit Power Supply

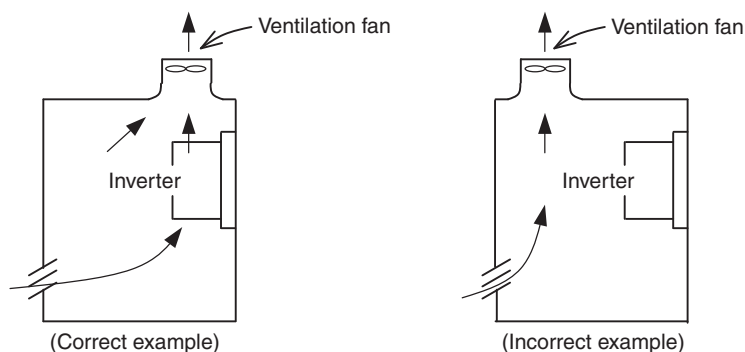
- Confirm that the rated input voltage of the Inverter matches the AC power supply voltage.

## ■ Installation Environment

- Increased ambient temperatures will shorten the life of the Inverter.
- Keep the Inverter away from heating elements (such as a braking resistor, DC reactor, etc.).  
If the Inverter is installed in an enclosure, keep the ambient temperature within the range of the specifications, taking dimensions and ventilation into consideration.



- When several RX models are installed in an enclosure and a ventilation fan is mounted in the enclosure, be careful about the layout of the Inverters and the air intake apertures. Depending on the internal layout of the panel, the Inverter's cooling effect may deteriorate, resulting in an increase in ambient temperature. Also, use thorough caution in making sure that the Inverter's ambient temperature is within the allowable operating temperature range.



- Before installing the Inverter, place a cover over all the ventilation openings to shield them from foreign objects. After completing the installation process, be sure to remove the covers from the Inverter before operation.

- Below is the heat radiation according to the Inverter capacity.

| Inverter capacity (kw)         | 0.4  | 0.75 | 1.5  | 2.2  | 3.7  | 5.5  | 7.5  | 11   | 15   | 18.5 |
|--------------------------------|------|------|------|------|------|------|------|------|------|------|
| Load with 70% loss (W)         | 64   | 76   | 102  | 127  | 179  | 242  | 312  | 435  | 575  | 698  |
| Load with 100% loss (W)        | 70   | 88   | 125  | 160  | 235  | 325  | 425  | 600  | 800  | 975  |
| Efficiency at rated output (%) | 85.1 | 89.5 | 92.3 | 93.2 | 94.0 | 94.4 | 94.6 | 94.8 | 94.9 | 95.0 |

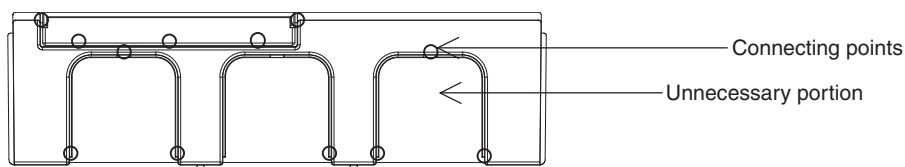
| Inverter capacity (kw)         | 22   | 30   | 37   | 45   | 55   | 75   | 90   | 110  | 132  |
|--------------------------------|------|------|------|------|------|------|------|------|------|
| Load with 70% loss (W)         | 820  | 1100 | 1345 | 1625 | 1975 | 2675 | 3375 | 3900 | 4670 |
| Load with 100% loss (W)        | 1150 | 1550 | 1900 | 2300 | 2800 | 3800 | 4800 | 5550 | 6650 |
| Efficiency at rated output (%) | 95.0 | 95.0 | 95.1 | 95.1 | 95.1 | 95.2 | 95.2 | 95.2 | 95.2 |

- To raise the carrier frequency, reduce the output current (or derate the rated current).

## Backing Plate

### ■ Inverter with 22 kW or Lower Capacity

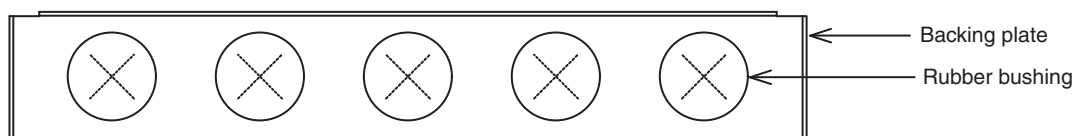
When running cables, cut the points between the backing plate and unnecessary portions with nippers or a wire cutter, and remove.



### ■ Inverter with 30 kW or Higher Capacity

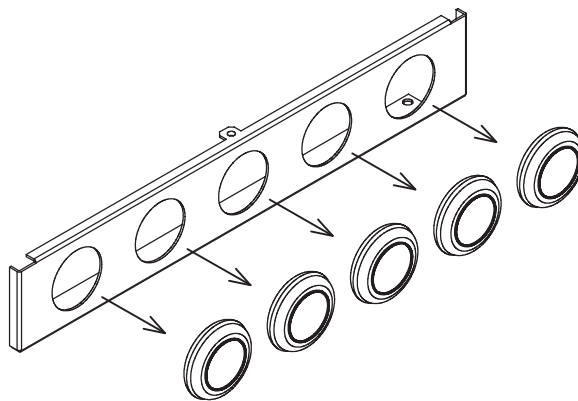
#### For Connection Without Cable Conduit

Make a cut in the rubber bushing of the backing plate with nippers or a wire cutter, and insert a cable.



#### For Connection With Cable Conduit

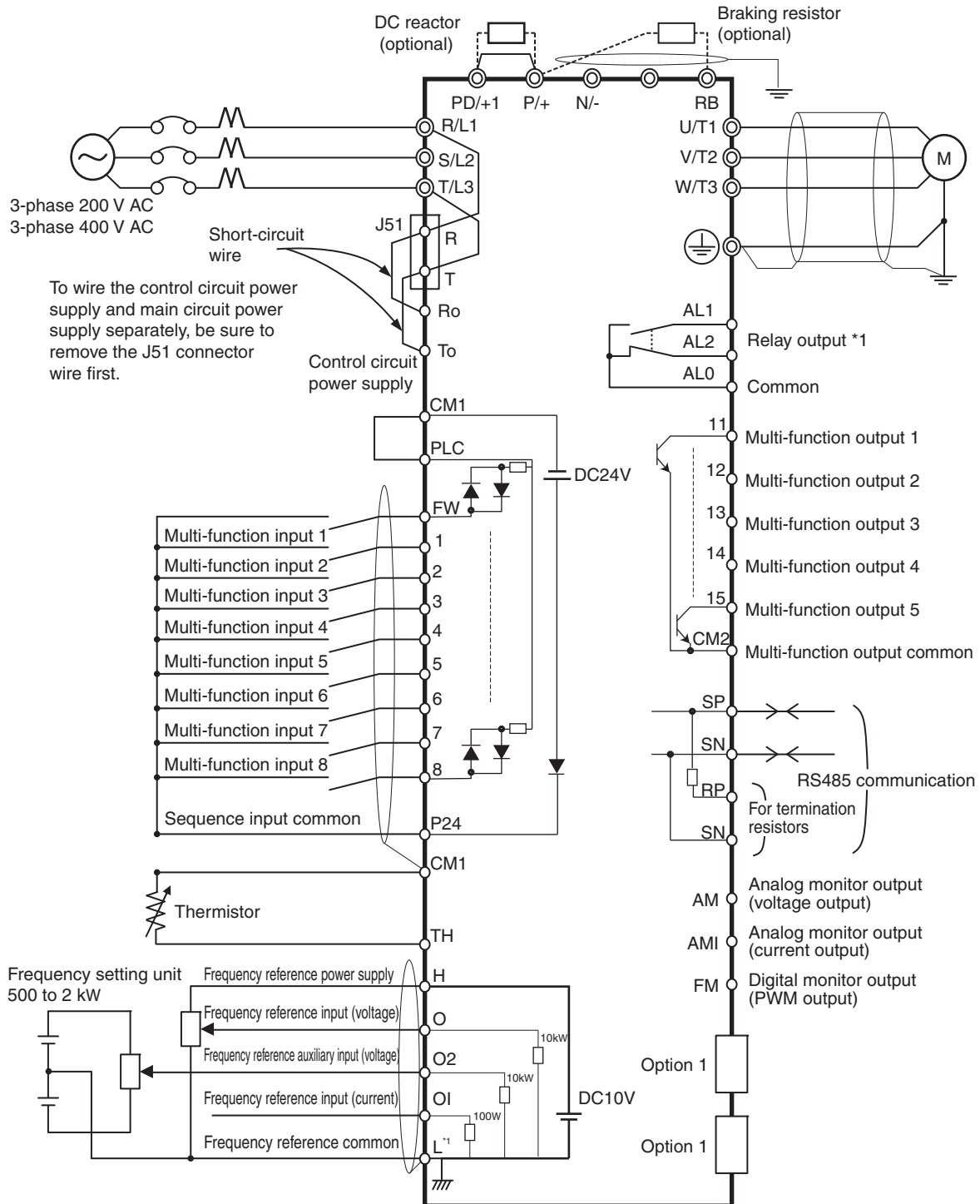
Remove the rubber bushing from the conduit connecting portions, and connect the cable conduit.



\* Do not remove the rubber bushing unless you connect a cable conduit. Otherwise, the cable sheath may be damaged by the inner edge of the backing plate, resulting in short-circuit or ground fault.

## 2-2 Wiring

### Standard Connection Diagram



\*1 L is the common reference for analog input and also for analog output.

## ■ Main Circuit Terminals

| Terminal symbol                                                                        | Terminal name                                 | Description                                                                                                                     |
|----------------------------------------------------------------------------------------|-----------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------|
| R/L1, S/L2, T/L3                                                                       | Main power supply input terminal              | Connect the input power supply.                                                                                                 |
| U/T1, V/T2, W/T3                                                                       | Inverter output terminal                      | Connect to the 3-phase motor.                                                                                                   |
| PD/+1, P/+                                                                             | External DC reactor terminal                  | Remove the short-circuit bar between terminals "PD/+1" and "P/+", and connect the optional power factor improvement DC reactor. |
| P/+, RB                                                                                | Braking resistor connection terminals         | Connect optional external braking resistors. (The RB terminal is provided for the Inverters with 22 kW or lower capacity.)      |
| P/+, N/-                                                                               | Regenerative braking unit connection terminal | Connect optional regenerative braking units.                                                                                    |
| G<br> | Ground terminal                               | Inverter case ground terminal. Connect this terminal to the ground.<br>type-D (200-V class), type-C (400-V class)               |

## ■ Control Circuit Terminal

|                                     | Terminal symbol | Terminal name                                 | Description                                                                                                                                                                                                                       | Specifications                                                                     |
|-------------------------------------|-----------------|-----------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|
| Analog<br>Frequency reference input | H               | Frequency reference power supply output       | +10 V DC power supply for the O terminal.                                                                                                                                                                                         | Allowable load current: 20 mA max.                                                 |
|                                     | O               | Frequency reference input (Voltage)           | With a 0 to 10 V DC voltage input, the frequency reaches the maximum at 10 V. Set at A014 if the maximum frequency needs to be achieved at lower than 10 V.                                                                       | Input impedance 10 k $\Omega$<br>Allowable input voltage range: -0.3 to +12 V DC   |
|                                     | O2              | Auxiliary frequency reference input (Voltage) | With a 0 to $\pm 10$ V DC voltage input, the O2 signal is added to the frequency reference signal of the O or OI terminal. By changing the setting, the frequency reference can be input even with the O2 terminal independently. | Input impedance 10 k $\Omega$<br>Allowable input voltage range: 0 to $\pm 12$ V DC |
|                                     | OI              | Frequency reference input (Current)           | With a 4 to 20 mA DC current input, the maximum frequency is set at 20 mA. The OI signal is only active when the AT terminal is ON. Allocate the AT function to the multi-function input terminal.                                | Input impedance 100 $\Omega$<br>Allowable max. current: 24 mA                      |
|                                     | L               | Frequency reference common                    | Common terminal for the frequency setting signals (O, O2 and OI) and the analog output terminals (AM and AMI). Do not connect this terminal to the ground.                                                                        |                                                                                    |

Continued to the next page

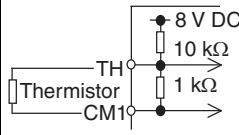
|                   |                | Terminal symbol | Terminal name                          | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Specifications                                            |
|-------------------|----------------|-----------------|----------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------|
| Analog            | Monitor output | AM              | Multi-function analog output (Voltage) | This terminal outputs a signal selected from the "0 to 10 V DC Voltage Output" monitor items: Output frequency, Output current, Output torque (with/without sign), Output voltage, Input power, Electronic thermal load rate, LAD frequency, Motor temperature, and Fin temperature.                                                                                                                                                                                        | Allowable max. current: 2 mA                              |
|                   |                | AMI             | Multi-function analog output (Current) | This terminal outputs a signal selected from the "4 to 20 mA DC Current Output" monitor items: Output frequency, Output current, Output torque (without sign), Output voltage, Input power, Electronic thermal load rate, LAD frequency, Motor temperature, and Fin temperature.                                                                                                                                                                                            | Allowable load impedance: 250 Ω max.                      |
| Digital (contact) | Monitor output | FM              | Multi-function digital output          | This terminal outputs a signal selected from the "0 to 10 V DC Voltage Output (PWM)" monitor items: Output frequency, Output current, Output torque (without sign), Output voltage, Input power, Electronic thermal load rate, LAD frequency, Motor temperature, Fin temperature, Digital output frequency, and Digital current monitor.<br>"Digital output frequency", and "Digital current monitor" output a digital pulse at 0/10 V DC pulse voltage and 50% duty ratio. | Allowable max. current: 1.2 mA<br>Max. frequency: 3.6 kHz |
|                   | Power supply   | P24             | Internal 24 V DC                       | 24 V DC power supply for contact input signal.<br>When the source logic is selected, this terminal functions as the contact input common terminal.                                                                                                                                                                                                                                                                                                                          | Allowable max. output current: 100 mA                     |
|                   |                | CM1             | Input common                           | Common terminal for the interface power supply P24 terminal, thermistor input TH terminal and digital monitor FM terminal.<br>When the sink logic is selected, this terminal functions as the contact input common terminal. Do not connect this terminal to the ground.                                                                                                                                                                                                    |                                                           |

Continued to the next page



|                   |                                     | Terminal symbol      | Terminal name                        | Description                                                                                                                                                                                                                                     | Specifications                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                  |
|-------------------|-------------------------------------|----------------------|--------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Digital (contact) | Contact input                       | RUN command          | FW                                   | Forward rotation command terminal                                                                                                                                                                                                               | When the FW signal is ON, the motor runs forward. When it is OFF, the motor decelerates and stops.                                                                                                                                                                                                                                                                         | [Contact input ON condition]<br>Voltage between each input terminal and the PLC terminal :18 V DC or more                                                                                                                                        |
|                   |                                     | Function / Selection | 1<br>2<br>3<br>4<br>5<br>6<br>7<br>8 | Multi-function input                                                                                                                                                                                                                            | Select 8 functions from among the 61 functions and allocate them to terminals 1 to 8.<br><br>Note: Only terminals 1 and 3 can be used for the emergency shutoff function. For details, refer to "Emergency Shutoff Function" (page 2-9).                                                                                                                                   | Input impedance between each input terminal and the PLC terminal: 4.7 kΩ<br><br>Allowable max. voltage:<br>Voltage between each input terminal and the PLC terminal: 27 V DC<br><br>Load current at 27 V DC power supply voltage: Approx. 5.6 mA |
|                   |                                     |                      | PLC                                  | Multi-function input common                                                                                                                                                                                                                     | The sink and source logic for contact input can be switched by connecting a short-circuit bar on the control terminal block.<br>Short-circuiting P24 and PLC ⇒ Sink logic, Short-circuiting PLC and CM1 ⇒ Source logic<br>To activate contact input via an external power supply, remove the short-circuit bar and connect PLC terminal to the external interface circuit. |                                                                                                                                                                                                                                                  |
|                   | Open collector output               | Status / Factor      | 11<br>12<br>13<br>14<br>15           | Multi-function output                                                                                                                                                                                                                           | Select 5 functions from among 45, and allocate them to terminals 11 through 15.<br>If an alarm code is selected in C062, terminals 11 to 13, or terminals 11 to 14 always output an alarm factor code (e.g. Inverter trip). The signal between each terminal and CM2 always corresponds to the sink or source logic.                                                       | Between each terminal and CM2<br>Voltage drop 4 V max. at power-on<br><br>Max. allowable voltage: 27 V DC                                                                                                                                        |
|                   |                                     |                      | CM2                                  | Multi-function output common                                                                                                                                                                                                                    | Common terminals for multi-function output terminals 11 to 15.                                                                                                                                                                                                                                                                                                             | Max. allowable current: 50 mA                                                                                                                                                                                                                    |
| Digital (contact) | Relay output<br>Status, alarm, etc. | AL2<br>AL1           | Relay output                         | Select the desired functions from among 45 functions, and allocate them. SPDT contact output.<br>By factory default, the relay output (AL2, AL1) contact selection (C036) is set at NC contact between AL2-AL0, and NO contact between AL1-AL0. | Contact max. capacity<br>AL2-AL0<br>250 V AC, 2 A (Resistance)<br>0.2 A (Induction)<br>AL1-AL0<br>250 V AC, 1 A (Resistance)<br>0.2 A (Induction)<br>Contact min. capacity<br>100 V AC, 10 mA<br>5 V DC, 100 mA                                                                                                                                                            |                                                                                                                                                                                                                                                  |
|                   |                                     | AL0                  | Relay output common                  |                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                  |

Continued to the next page

|                                  | Terminal symbol | Terminal name                      | Description                                                                                                                                                                                                                                                                                                                                                                                | Specifications                                                                                                                                               |
|----------------------------------|-----------------|------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Analog<br>Analog input<br>Sensor | TH              | External thermistor input Terminal | <p>Connect an external thermistor to this terminal, to trip the Inverter when a temperature error occurs.</p> <p>The CM1 terminal functions as the common terminal.</p> <p>[Recommended thermistor characteristics]</p> <p>Allowable rated power: 100 mW min.</p> <p>Impedance at temperature error: 3 kΩ</p> <p>Temperature error detection level is adjustable between 0 and 9999 Ω.</p> | <p>Allowable input voltage range<br/>0 to 8 V DC<br/>[Input circuit]</p>  |

### Slide Switch (SW1) Settings

The built-in slide switch is used to enable or disable the emergency shutoff function. (Factory Default: Disabled)

\* For the location of the slide switch, refer to (page 2-11).

### Emergency Shutoff Function (Factory Default: Disabled)

• This function is intended to turn off the Inverter output (stop switching the main element) via only the multi-function input terminal of the hardware circuit without going through the CPU software.

\* This function stops switching of the main element. The circuit is not electrically turned off. While the power supply is ON, do not touch the Inverter terminals and power cable (e.g. motor cable). Doing so may result in electric shock, injury or ground fault.

• When this function is enabled, the multi-function input terminals 1 and 3 are exclusively used for this function. No other function can be allocated to these terminals. If another function has been allocated, it will automatically be disabled, and terminals 1 and 3 are changed to the emergency shutoff terminals.

Function of multi-function input terminal 1

Reset signal (RS) / NO contact (Fixed)

This signal is used to reset the Inverter, and to reset the emergency shutoff trip [ E37.\* ].

Function of multi-function input terminal 3

Emergency shutoff signal (EMR) / NC contact (Fixed)

This signal is used to turn off the Inverter output without using the built-in CPU.

With this signal input, the Inverter activates an emergency shutoff trip [ E37. \* ].

\* If multi-function input terminal 3 has not been connected or disconnected, or if the signal logic is not matched, the Inverter activates an emergency shutoff trip [E37. \*]. After checking the cable connection and the signal logic, input the reset signal (RS).

Emergency shutoff trip [ E37. \* ] can be reset only by the reset signal (RS) via multi-function input terminal 1. (It cannot be reset with the Digital Operator.)

• To enable this function, set the slide switch SW1 lever in the Inverter to [ON].

(With the factory default setting, slide switch SW1 is [OFF]. [This function is disabled.] )

\* Before operating slide switch SW1, make sure that the input power supply is OFF.

| Slide switch SW1 setting and status of multi-function input terminals 1 and 3   |                                                                                                                           |         |                                                                   |         |                                           |                    |                                                                      |         |
|---------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------|---------|-------------------------------------------------------------------|---------|-------------------------------------------|--------------------|----------------------------------------------------------------------|---------|
| Slide switch (SW1) setting                                                      | Multi-function input terminal 1                                                                                           |         |                                                                   |         | Multi-function input terminal 3           |                    |                                                                      |         |
|                                                                                 | Multi-function input 1 selection [ C001 ]                                                                                 |         | Multi-function input 1 operation selection [ C011 ] <sup>*1</sup> |         | Multi-function input 3 selection [ C003 ] |                    | Multi-function input 3 operation selection [ C013 ] <sup>*1 *2</sup> |         |
| SW1 OFF<br>Emergency shutoff:<br>Disabled<br>(factory default)                  | [Can be selected randomly] <sup>*4</sup>                                                                                  |         | [Can be selected randomly] <sup>*4</sup>                          |         | [Can be selected randomly] <sup>*4</sup>  |                    | [Can be selected randomly] <sup>*4</sup>                             |         |
|                                                                                 | Factory default                                                                                                           | 01 (RV) | Factory default                                                   | 00 (NO) | Factory default                           | 12 (EXT)           | Factory default                                                      | 00 (NO) |
| SW1 ON<br>Emergency shutoff:<br>Enabled <sup>*5</sup>                           | Automatic allocation to multi-function input terminals 1 and 3, and the input terminal with 18 (RS) setting <sup>*3</sup> |         |                                                                   |         |                                           |                    |                                                                      |         |
|                                                                                 | Fixed function (Cannot be changed)                                                                                        | 18 (RS) | Fixed function (Cannot be changed)                                | 00 (NO) | Fixed function (Cannot be changed)        | 64 (EMR)           | Fixed function (Cannot be changed)                                   | 01 (NC) |
| Turning SW1 on, and then off<br>Emergency shutoff:<br>Disabled <sup>*3 *5</sup> | [Can be selected randomly] <sup>*4</sup>                                                                                  |         | [Can be selected randomly] <sup>*4</sup>                          |         | [Can be selected randomly] <sup>*4</sup>  |                    | [Can be selected randomly] <sup>*4</sup>                             |         |
|                                                                                 | Holds setting while SW1 is ON.                                                                                            | 18 (RS) | Holds setting while SW1 is ON.                                    | 00 (NO) | Emergency shutoff function: Reset         | no (no allocation) | Holds setting while SW1 is ON.                                       | 01 (NC) |

\*1. With the terminal with input terminal selection [18 (RS)], NO/NC selection is fixed to [00 (NO)].

\*2. When [C003] is [64 (EMR)], [C013] is fixed to [01 (NC)].

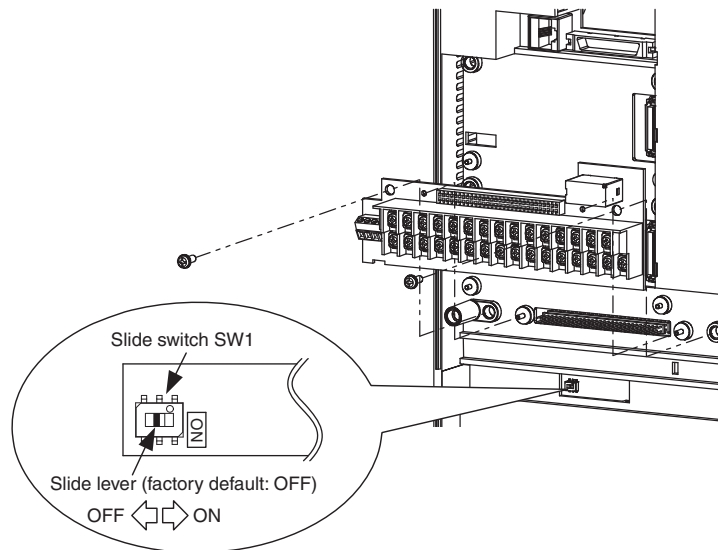
\*3. If [18 (RS)] has been allocated to a multi-function input terminal (except for 3) other than terminal 1 before switch SW1 is set to "ON", the input terminal selection for the relevant terminal will be automatically changed to "no (no allocation)" by setting SW1 to "ON". This is done in order to prevent duplicated allocation of this function. Then, even if SW1 is reset to [OFF], the initial allocation cannot be restored. The User should Re-allocate the terminal function.

Example) When the multi-function input terminal 2 [C002] is [18 (RS)], setting SW1 to [ON] changes the [C002] setting to [no (no allocation)]. [18 (RS)] will be allocated to the multi-function input terminal 1 [C001].

Then, even if SW1 is reset to [OFF], the multi-function input terminal 2 [C002] setting is [no (no allocation)], and the multi-function input terminal 1 [C001] setting is [18 (RS)].

\*4. Input terminal selection [64 (EMR)] cannot be selected with the Digital Operator. When slide switch SW1 is set to [ON], this function will be automatically allocated.

- \*5. Once slide switch SW1 is set to [ON], allocation of multi-function input terminals 1 and 3 will not be restored, even if SW1 is reset to [OFF] afterward. Re-allocate the terminal function.



## Wiring the Main Circuit Terminals

### ■ Main Power Supply Input Terminals (R/L1, S/L2, T/L3)

- Use an earth leakage breaker for circuit (wiring) protection between the power supply and the main power supply terminals (R/L1, S/L2, T/L3).
- An earth leakage breaker may malfunction due to the effect of high frequency. Use an earth leakage breaker with a large high-frequency sensitivity current rating.
- If the Inverter protection function is activated, a malfunction or accident may have occurred to your system. Connect a magnetic contactor to turn off the Inverter power supply.
- Do not start or stop the Inverter by switching ON/OFF the magnetic contactor connected on the Inverter power supply input (primary) side and output (secondary) side.  
To start or stop the Inverter via an external signal, use the operation command (FW or RV) on the control circuit terminal block.
- This Inverter uses a 3-phase power supply. A single-phase power supply cannot be used.
- Do not use this Inverter with a phase loss power input. Doing so may damage the Inverter.  
By factory default, the phase loss input protection is disabled. If a phase of power supply input is interrupted, the Inverter reverts to the following status:

R/L1-phase or T/L3-phase is interrupted: The Inverter does not operate.

S/L2-phase is interrupted: The Inverter reverts to single-phase operation, causing a trip (due to undervoltage, overcurrent, etc.) or damage to the Inverter.

Even if the power input is under a phase loss condition, the internal capacitor is charged with voltage, causing an electric shock or injury.

When changing the cable connections, refer to the instructions on page 2-1.

- In the following cases, the internal converter module may be damaged. Use caution to avoid them:  
Imbalance of power supply voltage is 3% or more.  
Power supply capacity is ten times or more than the Inverter capacity, and also 500 kVA or more.  
Rapid change in power supply voltage.

Example) When several Inverters are connected with a short bus.  
When the phase advance capacitor is turned on/off.

- Do not turn power on/off more than once every 3 minutes.  
Doing so may damage the Inverter.

### ■ Inverter Output Terminals (U/T1, V/T2, W/T3)

- For connection of the output terminal, use the applicable cable or a cable with a larger diameter. Otherwise, the output voltage between the Inverter and the motor may drop. Particularly during low-frequency output, a voltage drop occurs with the cable, resulting in motor torque reduction.
- Do not mount a phase advance capacitor or surge absorber. These devices cause the Inverter to trip, or may cause damage to the capacitor or surge absorber.
- If the cable length exceeds 20 m (particularly, with 400-V class), a surge voltage may be generated at the motor terminal due to stray capacitance or inductance of the cable, causing the motor to burn out.
- To connect several motors, provide a thermal relay for each.
- The RC value of each thermal relay should be 1.1 times of the motor rated current. The relay may trip easily depending on the cable length. In this case, connect an AC reactor to the Inverter output.

### ■ DC Reactor Connection Terminal (PD/+1, P/+)

- This terminal is used to connect the optional DC reactor for power factor improvement. By factory default, a short-circuit bar has been connected between the terminals PD/+1 and P/+. Before connecting the DC reactor, remove this short-circuit bar.
- The length of the DC reactor connection cable should be 5 m or less.

If the DC reactor is not used, do not remove the short-circuit bar.

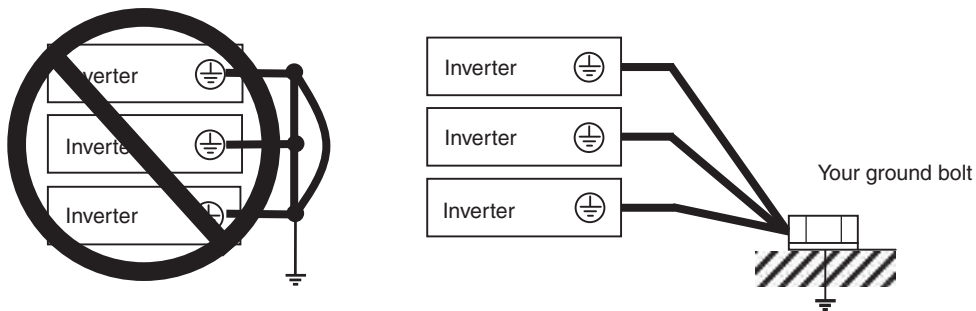
If you remove the short-circuit bar without connecting the DC reactor, no power is supplied to the Inverter main circuit, disabling operation.

### ■ External Braking Resistor Connection Terminal (P/+, RB)/Regenerative Braking Unit Connection Terminal (P/+, N/-)

- The Inverters with 22 kW or lower capacity incorporate a regenerative braking circuit. To improve braking capability, mount the optional external braking resistor to this terminal. Do not mount a resistor whose resistance is lower than the specified value. Doing so may damage the regenerative braking circuit.
- The Inverters with 30 kW or higher capacity do not incorporate a regenerative braking circuit. To improve braking capability, the optional regenerative braking unit and braking resistor are required. In this case, connect the regenerative braking unit terminals (+, -) to the Inverter terminals (P/+, N/-).
- The cable length should be 5 m or less. Twist the two wires.
- Do not connect any device other than the optional regenerative braking unit or external braking resistor to this terminal.

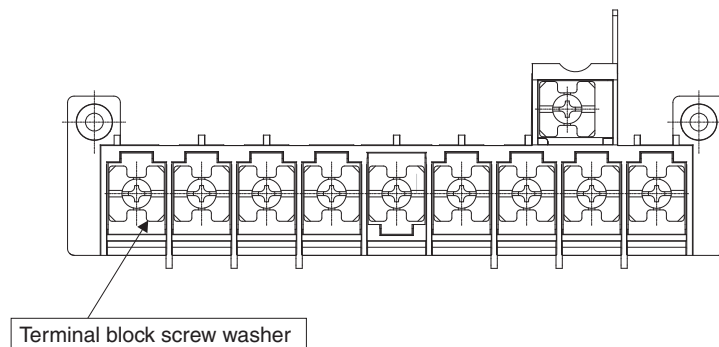
## ■ Ground Terminal (G ⊕)

- To prevent electric shock, be sure to ground the Inverter and the motor.
- According to the Electric Apparatus Engineering Regulations, the 200-V class Inverter should be connected to the grounding electrodes under type-D grounding conditions (conventional type 3 grounding: ground resistance 100  $\Omega$  or less), the 400-V class Inverter should be connected to the grounding electrodes under type-C grounding conditions (conventional special type 3 grounding: ground resistance 10  $\Omega$  or less).
- For the ground cable, use the applicable cable or a cable with a larger diameter. Make the cable length as short as possible.
- When several Inverters are connected, the ground cable must not be connected across several Inverters, and must not be looped. Otherwise, the Inverters may malfunction.



## ■ Installing Screws in the Main Circuit Terminal Block

- For the main circuit terminal blocks of 3G3RX-A2055/-A2075/-A4055/-A4075, be sure to install the terminal block screw washers with their grooved sides aligned vertically, as shown below. Not doing so may result in a contact failure or fire.  
(Intended terminals: R/L1, S/L2, T/L3, PD/+1, P/+, N/-, U/T1, V/T2, W/T3, RB)



## ■ Arrangement of Main Circuit Terminals

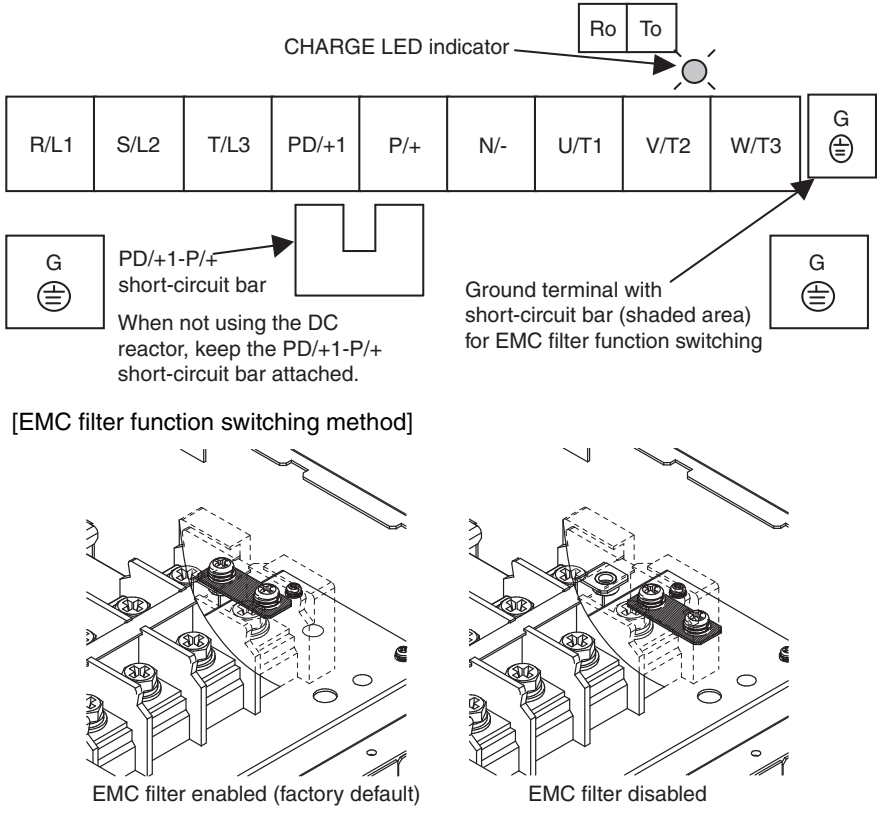
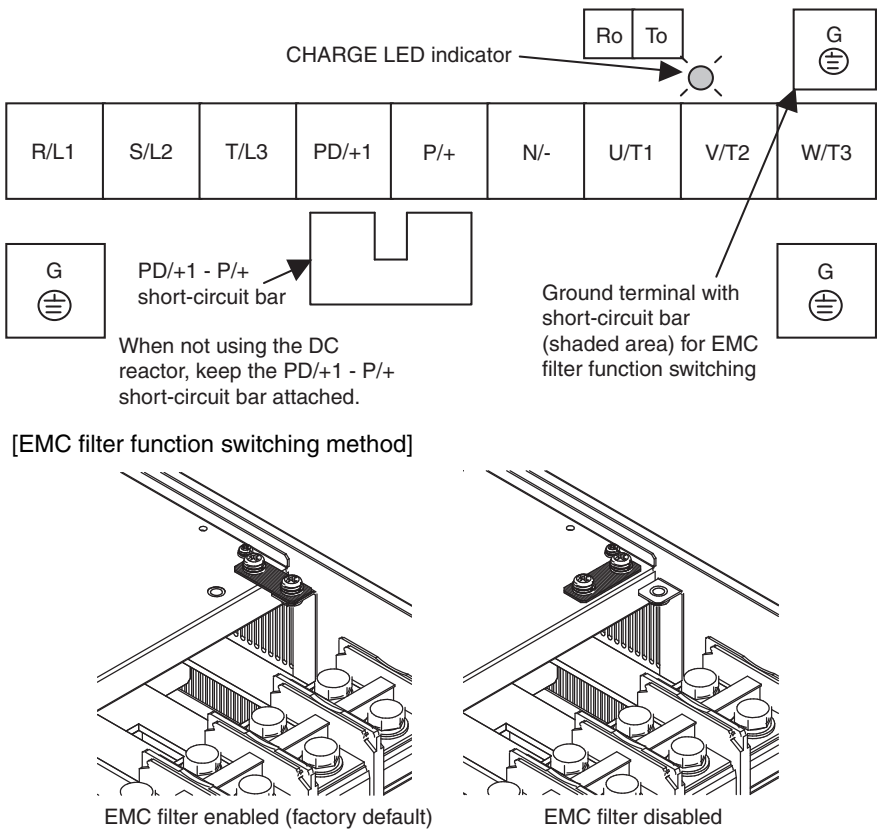
The terminal arrangement on the Inverter main circuit terminal block is shown below.

| Terminal arrangement                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                         | Applicable model                                                                                                                                                                                      |                         |                          |                     |                    |            |                                      |            |                    |                                                                                                               |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|--------------------------|---------------------|--------------------|------------|--------------------------------------|------------|--------------------|---------------------------------------------------------------------------------------------------------------|
| <p>CHARGE LED indicator</p> <p>PD/+1 - P/+ short-circuit bar</p> <p>When not using the DC reactor, keep the PD/+1 - P/+ short-circuit bar attached.</p> <p>[EMC filter function switching method]</p> <p>Dummy plug (green)</p> <p>Filter enable pin (J61)</p> <p>Short plug</p> <p>Filter disable pin (J62)</p> <table border="1"> <thead> <tr> <th></th><th>Filter enable pin (J61)</th><th>Filter disable pin (J62)</th></tr> </thead> <tbody> <tr> <td>EMC filter disabled</td><td>Dummy plug (green)</td><td>Short plug</td></tr> <tr> <td>EMC filter enabled (factory default)</td><td>Short plug</td><td>Dummy plug (green)</td></tr> </tbody> </table> |                         |                                                                                                                                                                                                       | Filter enable pin (J61) | Filter disable pin (J62) | EMC filter disabled | Dummy plug (green) | Short plug | EMC filter enabled (factory default) | Short plug | Dummy plug (green) | <p>3G3RX-A2004 to A2037<br/>3G3RX-A4004 to A4037</p> <p>Ro, To: M4<br/>Ground terminal: M4<br/>Others: M4</p> |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Filter enable pin (J61) | Filter disable pin (J62)                                                                                                                                                                              |                         |                          |                     |                    |            |                                      |            |                    |                                                                                                               |
| EMC filter disabled                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Dummy plug (green)      | Short plug                                                                                                                                                                                            |                         |                          |                     |                    |            |                                      |            |                    |                                                                                                               |
| EMC filter enabled (factory default)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Short plug              | Dummy plug (green)                                                                                                                                                                                    |                         |                          |                     |                    |            |                                      |            |                    |                                                                                                               |
| <p>CHARGE LED indicator</p> <p>PD/+1 - P/+ short-circuit bar</p> <p>When not using the DC reactor, keep the PD/+1 - P/+ short-circuit bar attached.</p> <p>[EMC filter function switching method]</p> <p>Ground terminal with short-circuit bar (shaded area) for EMC filter function switching</p> <p>EMC filter enabled (factory default)</p> <p>EMC filter disabled</p>                                                                                                                                                                                                                                                                                     |                         | <p>3G3RX-A2055, A2075<br/>3G3RX-A4055, A4075</p> <p>Ro, To: M4<br/>Ground terminal: M5<br/>Others: M5</p> <p>3G3RX-A2110<br/>3G3RX-A4110</p> <p>Ro, To: M4<br/>Ground terminal: M6<br/>Others: M5</p> |                         |                          |                     |                    |            |                                      |            |                    |                                                                                                               |



| Terminal arrangement                                                                                                                                                                                                                                                                                                              | Applicable model                                                                                                                                        |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>CHARGE LED indicator</p> <p>R/L1 S/L2 T/L3 PD/+1 P/+ N/- U/T1 V/T2 W/T3</p> <p>Ro To RB</p> <p>G</p> <p>Ground terminal with short-circuit bar (shaded area) for EMC filter function switching</p> <p>PD/+1 - P/+ short-circuit bar</p> <p>When not using the DC reactor, keep the PD/+1 - P/+ short-circuit bar attached.</p> | <p>3G3RX-A2150 to A2185<br/>3G3RX-A4150 to A4220</p> <p>Ro, To: M4<br/>Ground terminal: M6<br/>Others: M6</p>                                           |
| <p>[EMC filter function switching method]</p> <p>EMC filter enabled (factory default)</p> <p>EMC filter disabled</p>                                                                                                                                                                                                              | <p>3G3RX-A2220</p> <p>Ro, To: M4<br/>Ground terminal: M6<br/>Others: M8</p>                                                                             |
| <p>CHARGE LED indicator</p> <p>R/L1 S/L2 T/L3 PD/+1 P/+ N/- U/T1 V/T2 W/T3</p> <p>Ro To</p> <p>G</p> <p>Ground terminal with short-circuit bar (shaded area) for EMC filter function switching</p> <p>PD/+1 - P/+ short-circuit bar</p> <p>When not using the DC reactor, keep the PD/+1 - P/+ short-circuit bar attached.</p>    | <p>3G3RX-A2300</p> <p>Ro, To: M4<br/>Ground terminal: M6<br/>Others: M8</p> <p>3G3RX-A4300</p> <p>Ro, To: M4<br/>Ground terminal: M6<br/>Others: M6</p> |
| <p>[EMC filter function switching method]</p> <p>EMC filter enabled (factory default)</p> <p>EMC filter disabled</p>                                                                                                                                                                                                              | <p>3G3RX-A2370<br/>3G3RX-A4370</p> <p>Ro, To: M4<br/>Ground terminal: M8<br/>Others: M8</p>                                                             |



| Terminal arrangement                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Applicable model                                                                                           |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------|
| <p>CHARGE LED indicator </p>  <p>PD/+1-P/+ short-circuit bar</p> <p>When not using the DC reactor, keep the PD/+1-P/+ short-circuit bar attached.</p> <p>Ground terminal with short-circuit bar (shaded area) for EMC filter function switching</p> <p>[EMC filter function switching method]</p> <p>EMC filter enabled (factory default)</p> <p>EMC filter disabled</p>        | <p>3G3RX-A2450<br/>3G3RX-A4450<br/>3G3RX-A4550</p> <p>Ro,To: M4<br/>Ground terminal: M8<br/>Others: M8</p> |
| <p>CHARGE LED indicator </p>  <p>PD/+1 - P/+ short-circuit bar</p> <p>When not using the DC reactor, keep the PD/+1 - P/+ short-circuit bar attached.</p> <p>Ground terminal with short-circuit bar (shaded area) for EMC filter function switching</p> <p>[EMC filter function switching method]</p> <p>EMC filter enabled (factory default)</p> <p>EMC filter disabled</p> | <p>3G3RX-A2550</p> <p>Ro,To: M4<br/>Ground terminal: M8<br/>Others: M10</p>                                |

## ■ Recommended Cable Size, Wiring Device and Crimp Terminal

For Inverter wiring, crimp terminal and terminal screw tightening torque, refer to the table below.

| 2           | Design | Motor output (kW) | Applicable Inverter model | Power cable (mm <sup>2</sup> )<br>R, S, T, U, V, W, PD/+1, P/+, N/- | Ground cable (mm <sup>2</sup> ) | External braking resistor between PD/+1 and RB (mm <sup>2</sup> ) | Terminal screw size | Crimp terminal | Tightening torque N•m | Circuit breaker or fuse                       | Applicable device           |
|-------------|--------|-------------------|---------------------------|---------------------------------------------------------------------|---------------------------------|-------------------------------------------------------------------|---------------------|----------------|-----------------------|-----------------------------------------------|-----------------------------|
|             |        |                   |                           |                                                                     |                                 |                                                                   |                     |                |                       |                                               | Earth leakage breaker (ELB) |
| 200-V class |        | 0.4               | 3G3RX-A2004               | 1.25                                                                | 1.25                            | 1.25                                                              | M4                  | 1.25-4         | 1.2 (max.1.8)         | Fuse (Type J)                                 | 30 A                        |
|             |        | 0.75              | 3G3RX-A2007               | 1.25                                                                | 1.25                            | 1.25                                                              | M4                  | 1.25-4         | 1.2 (max.1.8)         |                                               | 30 A                        |
|             |        | 1.5               | 3G3RX-A2015               | 2                                                                   | 2                               | 2                                                                 | M4                  | 2-4            | 1.2 (max.1.8)         |                                               | 30 A                        |
|             |        | 2.2               | 3G3RX-A2022               | 2                                                                   | 2                               | 2                                                                 | M4                  | 2-4            | 1.2 (max.1.8)         |                                               | 30 A                        |
|             |        | 3.7               | 3G3RX-A2037               | 3.5                                                                 | 3.5                             | 3.5                                                               | M4                  | 3.5-4          | 1.2 (max.1.8)         |                                               | 30 A                        |
|             |        | 5.5               | 3G3RX-A2055               | 5.5                                                                 | 5.5                             | 5.5                                                               | M5                  | R5.5-5         | 2.4 (4.0 max.)        | Fuse (Type J) or Inverse time circuit breaker | 100 A                       |
|             |        | 7.5               | 3G3RX-A2075               | 8                                                                   | 8                               | 8                                                                 | M5                  | R8-5           | 2.4 (4.0 max.)        |                                               | 100 A                       |
|             |        | 11                | 3G3RX-A2110               | 14                                                                  | 14                              | 14                                                                | M6                  | R14-6          | 4.0 (4.4 max.)        |                                               | 100 A                       |
|             |        | 15                | 3G3RX-A2150               | 22                                                                  | 22                              | 22                                                                | M6                  | 22-6           | 4.5 (4.9 max.)        |                                               | 125 A                       |
|             |        | 18.5              | 3G3RX-A2185               | 30                                                                  | 22                              | 30                                                                | M6                  | 38-6           | 4.5 (4.9 max.)        |                                               | 125 A                       |
|             |        | 22                | 3G3RX-A2220               | 38                                                                  | 30                              | 38                                                                | M8                  | 38-8           | 8.1 (8.8 max.)        |                                               | 125 A                       |
|             |        | 30                | 3G3RX-A2300               | 60 (22 × 2)                                                         | 30                              | —                                                                 | M8                  | 60-8           | 8.1 (8.8 max.)        |                                               | 225 A                       |
|             |        | 37                | 3G3RX-A2370               | 100 (38 × 2)                                                        | 38                              | —                                                                 | M8 *1               | 100-8          | 8.1 (20.0 max.)       |                                               | 225 A                       |
|             |        | 45                | 3G3RX-A2450               | 100 (38 × 2)                                                        | 38                              | —                                                                 | M8 *1               | 100-8          | 8.1 (20.0 max.)       |                                               | 250 A                       |
|             |        | 55                | 3G3RX-A2550               | 150 (60 × 2)                                                        | 60                              | —                                                                 | M10                 | 150-10         | 19.6 (22.0 max.)      |                                               | 300 A                       |

|             | Motor output (kW) | Applicable Inverter model | Power cable (mm <sup>2</sup> )<br>R, S, T, U, V, W, PD/+1, P/+, N/- | Ground cable (mm <sup>2</sup> ) | External braking resistor between PD/+1 and RB (mm <sup>2</sup> ) | Terminal screw size | Crimp terminal | Tightening torque N•m | Circuit breaker or fuse      | Applicable device           |
|-------------|-------------------|---------------------------|---------------------------------------------------------------------|---------------------------------|-------------------------------------------------------------------|---------------------|----------------|-----------------------|------------------------------|-----------------------------|
|             |                   |                           |                                                                     |                                 |                                                                   |                     |                |                       |                              | Earth leakage breaker (ELB) |
| 400-V class | 0.4               | 3G3RX-A4004               | 1.25                                                                | 1.25                            | 1.25                                                              | M4                  | 1.25-4         | 1.2 (max.1.8)         | Fuse (Type J)                | 20 A                        |
|             | 0.75              | 3G3RX-A4007               | 1.25                                                                | 1.25                            | 1.25                                                              | M4                  | 1.25-4         | 1.2 (max.1.8)         |                              | 20 A                        |
|             | 1.5               | 3G3RX-A4015               | 2                                                                   | 2                               | 2                                                                 | M4                  | 2-4            | 1.2 (max.1.8)         |                              | 20 A                        |
|             | 2.2               | 3G3RX-A4022               | 2                                                                   | 2                               | 2                                                                 | M4                  | 2-4            | 1.2 (max.1.8)         |                              | 20 A                        |
|             | 4.0               | 3G3RX-A4040               | 2                                                                   | 2                               | 2                                                                 | M4                  | 2-4            | 1.2 (max.1.8)         |                              | 20 A                        |
|             | 5.5               | 3G3RX-A4055               | 3.5                                                                 | 3.5                             | 3.5                                                               | M5                  | R2-5           | 2.4 (4.0 max.)        | Inverse time circuit Breaker | 40 A                        |
|             | 7.5               | 3G3RX-A4075               | 3.5                                                                 | 3.5                             | 3.5                                                               | M5                  | 3.5-5          | 2.4 (4.0 max.)        |                              | 40 A                        |
|             | 11                | 3G3RX-A4110               | 5.5                                                                 | 5.5                             | 5.5                                                               | M6                  | R5.5-6         | 4.0 (4.4 max.)        |                              | 40 A                        |
|             | 15                | 3G3RX-A4150               | 8                                                                   | 8                               | 8                                                                 | M6                  | 8-6            | 4.5 (4.9 max.)        |                              | 75 A                        |
|             | 18.5              | 3G3RX-A4185               | 14                                                                  | 14                              | 14                                                                | M6                  | 14-6           | 4.5 (4.9 max.)        |                              | 75 A                        |
|             | 22                | 3G3RX-A4220               | 14                                                                  | 14                              | 14                                                                | M6                  | 14-6           | 4.5 (4.9 max.)        |                              | 75 A                        |
|             | 30                | 3G3RX-A4300               | 22                                                                  | 22                              | -                                                                 | M6                  | 22-6           | 4.5 (4.9 max.)        |                              | 100 A                       |
|             | 37                | 3G3RX-A4370               | 38                                                                  | 22                              | —                                                                 | M8 *1               | 38-8           | 8.1 (20.0 max.)       |                              | 100 A                       |
|             | 45                | 3G3RX-A4450               | 38                                                                  | 22                              | —                                                                 | M8 *1               | 38-8           | 8.1 (20.0 max.)       |                              | 150 A                       |
|             | 55                | 3G3RX-A4550               | 60                                                                  | 30                              | —                                                                 | M8 *1               | R60-8          | 8.1 (20.0 max.)       |                              | 150 A                       |
|             | 75                | 3G3RX-B4750               | 100 (38 x 2)                                                        | 38                              | —                                                                 | M10 *1              | 100-10         | 20.0 (22.0 max.)      |                              | 225 A                       |
|             | 90                | 3G3RX-B4900               | 100 (38 x 2)                                                        | 38                              | —                                                                 | M10 *1              | 100-10         | 20.0 (22.0 max.)      |                              | 225 A                       |
|             | 110               | 3G3RX-B411K               | 150 (38 x 2)                                                        | 60                              | —                                                                 | M10 *1              | 150-10         | 20.0 (35.0 max.)      |                              | 300 A                       |
|             | 132               | 3G3RX-B413K               | 80 x 2                                                              | 80                              | —                                                                 | M10 *1              | 80-10          | 20.0 (35.0 max.)      |                              | 350 A                       |

\*1. When the cable is connected without using the crimp terminal (bare wires), use the square washer included with the product.

Note: The cable size is based on the HIV cable (75°C heat resistance).

## ■ Connection for Separating Inverter Control Circuit Power Supply from Main Power Supply

If the Inverter protection circuit is activated to turn off the magnetic contactor of the Inverter input power supply, the power to the Inverter control circuit is also turned off, and the alarm signal cannot be kept on.

If the alarm signal must be kept on, use control circuit power supply terminals Ro and To.

Connect control circuit power supply terminals Ro and To to the primary circuit of the magnetic contactor according to the following procedure.

(Connection method)

Incoming electricity specifications

200-V class:

200 to 240 V (+10%, -15%)

50, 60 Hz  $\pm 5\%$

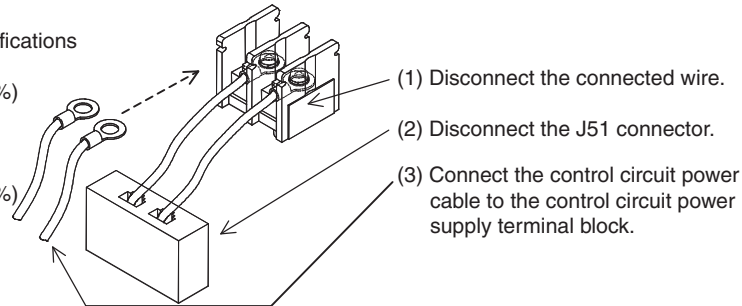
(282 to 339 V DC)

400-V class:

380 to 480 V (+10%, -15%)

50, 60 Hz  $\pm 5\%$

(537 to 678 V DC)

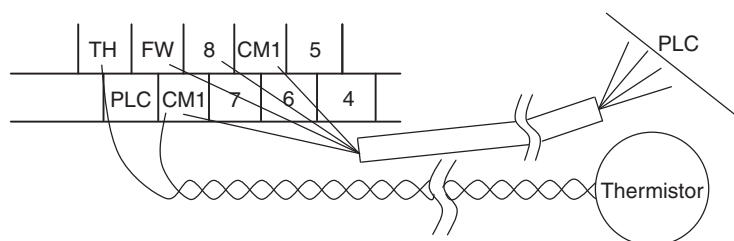


\* To separate the control circuit power supply (Ro, To) from the main circuit power supply (R/L1, S/L2, T/L3), observe the following instructions:

- For wiring between terminals Ro and To (terminal screw size: M4), use a cable of 1.25 mm<sup>2</sup> or more.
- Connect a 3 A fuse to the control circuit power supply cable.
- If the control circuit power supply (Ro, To) is turned on before the main circuit power supply (R/L1, S/L2, T/L3), ground fault detection at power-on is disabled.
- To use a DC power supply for the control circuit power supply (Ro, To), set the multi-function output terminal contact selection (C031 to C036) for the multi-function output terminals (11 to 15) and relay output terminals (AL2, AL1, AL0) to "00". If the multi-function output terminal contact selection is set to "01", the output signal may chatter when the DC power supply is turned off.
- Tightening torque for terminals Ro and To  
M4: 1.2 N•m (1.4 max.)

## Wiring Control Circuit Terminals

- Terminals L and CM1 are insulated from each other via the input and output signal common terminals.  
Do not short-circuit or ground these common terminals.  
Do not ground these common terminals via external equipment. (Check the external equipment ground conditions.)
- For wiring the control circuit terminals, use twisted shielded cables (recommended size: 0.75 mm<sup>2</sup>), and connect the shielded cable to each common terminal.
- The control circuit terminal connection cables should be 20 m or less.
- Separate the control circuit terminal connection cables from the main circuit cable (power cable) and the relay control circuit cable.
- For the connection of the TH (thermistor input) terminal, twist cables with the terminal CM1 individually, and separate them from other PLC common cables.  
Since a weak current flows through the thermistor, the thermistor connection cable must be separated from the main circuit cable (power cable). The thermistor connection cable should be 20 m or less.



- To use a relay for the multi-function output terminal, connect a surge-absorbing diode in parallel with the coil.
- Do not short-circuit the analog power supply terminals (between H and L) and/or the interface power supply terminals (between P24 and CM1).  
Doing so may result in failure of the Inverter.

### ■ Arrangement of the Control Circuit Terminal Block

|   |   |    |     |     |     |     |   |     |   |   |    |     |    |     |     |
|---|---|----|-----|-----|-----|-----|---|-----|---|---|----|-----|----|-----|-----|
|   | H | O2 | AM  | FM  | TH  | FW  | 8 | CM1 | 5 | 3 | 1  | 14  | 13 | 11  | AL1 |
| L | O | OI | AMI | P24 | PLC | CM1 | 7 | 6   | 4 | 2 | 15 | CM2 | 12 | AL0 | AL2 |

Terminal screw size M3    Tightening torque 0.7 N·m (0.8 max.)

### ■ Selecting the Input Control Logic

By factory default the terminal FW and the multi-function input terminal are set to source logic (PNP).

To change the input control logic to sink logic (NPN), remove the short-circuit bar between the terminals PLC and CM1 on the control circuit terminal block, and connect it between the terminals P24 and PLC.

## ■ Selecting the Sequence Input Method (Sink/Source Logic)

|              | When the Inverter's internal interface power supply is used | When external power supply is used<br>(Remove the short-circuit bar from the control terminal block.) |
|--------------|-------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|
| Sink logic   |                                                             |                                                                                                       |
| Source logic |                                                             |                                                                                                       |

## ■ Selecting the Sequence Output Method (Sink/Source Logic)

|            |  |              |  |
|------------|--|--------------|--|
| Sink logic |  | Source logic |  |
|------------|--|--------------|--|

## Wiring the Digital Operator

- The RX Series Inverter can be operated with the optional 3G3AX-OP01 or 3G3AX-OP05 as well as the standard Digital Operator.
- To use the Digital Operator apart from the Inverter body, place an order for the optional cable 3G3AX-CAJOP300-EE (3 m).
- The optional cable should be 3 m or less. Using a cable longer than 3 m may cause malfunction.

## Conforming to EC Directives

### ■Conforming Standards

- |                        |                    |
|------------------------|--------------------|
| •EMC directive         | EN 61800-3: 2004   |
| •Low-voltage directive | EN 61800-5-1: 2007 |

### ■Concept of Conformity

#### EMC Directive

OMRON products are the electrical devices incorporated and used in various machines or manufacturing equipment. For this reason, we make efforts to conform our products to their related EMC standards so that the machines or equipment which have incorporated our products should easily conform to the EMC standards. The RX models have conformed to the EMC directive EN 61800-3 by following the installation and wiring method as shown below. Your machines or equipment, however, vary in type, and in addition, EMC performance depends on the configuration, wiring, or location of the devices or control panels which incorporate the EC directive conforming products. This in turn does not allow us to confirm the condition and the conformity in which our products are used. Therefore, we appreciate confirmation of the final EMC conformity for the whole machine or equipment on your own.

#### Wiring the Power Supply

- Keep the ground cable as short as possible.
- Keep the cable between the Inverter and the noise filter as short as possible.

#### Connecting a Motor to the Inverter

- When connecting a motor to the Inverter, be sure to use shield braided cables.
- Keep the cables as short as possible.

#### Low-voltage Directive

The RX models have conformed to the EMC directive EN61800-5-1 by performing the machine installation and wiring as shown below.

- The RX models are an open type device. Be sure to install it inside the control panel.
- The power supply and voltage (SELV) with reinforced or double insulation should be used for wiring to the control circuit terminals.
- To satisfy requirements of the LVD (low-voltage) directive, the Inverter must be protected with a molded case circuit breaker (MCCB) in case a short-circuiting accident occurs. Be sure to install a molded case circuit breaker (MCCB) on the power supply side of the Inverter.
- Use one molded case circuit breaker (MCCB) per Inverter.
- Use the crimp-type terminal with an insulation sleeve to connect to the main circuit terminals.

## EMC Filters

### ■ Warnings and Instructions

- The 3G3RX frequency inverters meet the limits of EN61800-3, C1/C2/C3, for radiated interference, if the specified line filter is used and installation is performed according to our instructions, and internal line filter is disabled.
- The motor cable should be kept as short as possible in order to avoid electromagnetic emission as well as capacitive currents. The quick voltage changes of the OMRON inverter series cause capacitive currents through the motor cable stray capacitances.  
The cable length increases the capacitive current and electromagnetic emission.  
It is recommended that the motor cable length does not exceed 50m in any case, also depending on the inverter power range.  
It is recommended to install output AC-Reactors (motor chokes) if the cable length exceeds 50m.
- The EMC filters contain capacitors between the phases and the phases to ground as well as discharging resistors. After switching off the line voltage you should wait a minimum of 60 seconds before removing protective covers or touching terminals to avoid **electric shock!**
- The protective conductor connection between filter and drive is recommended without interruptions such as plug or contactors. If power plug or contactor become necessary they should be of the highest quality to provide negligible losses.
- The use of ground fault monitoring devices is not recommended. Should they be compulsory in certain applications for safety reasons, you should choose monitoring devices which are suited for DC-, AC- and HF- ground currents. Standard ground monitoring devices may fail due to the switching nature of the inverter control.
- The line filters have been developed for use in grounded systems.  
Use in ungrounded systems is not recommended.

If installed according to the following directions indicated in this section, the frequency inverter comply with the following standards:

Emissions: EN 61800-3 (EN 55011 group 1, Category C1/C2/C3 [Class B/A])

Immunity: EN61800-3, industrial environments

### ■ EMC compliant Installation of Drive Systems

#### Introduction

This document describes the electromagnetically compatible setup of your drive system with OMRON 3G3RX series inverters. (Electro Magnetic Compatibility = EMC). Read this information carefully and follow the instructions. If necessary, provide this information to third parties. HF interference results from rapid switching of electric currents and voltages. All AC, DC and servo drives very rapidly switch large currents and voltages in the process to supply connected electric motors. They become major sources of interference, generating both line-conducted and radiated interference. The additional use of line filters, also called interference suppression filters, and installation in a metal housing or a switch cabinet further improve the existing interference immunity. For the best possible damping of interference, special line filters have been developed which guarantee you easy assembly and installation along with the necessary electrical reliability. However, effective EMC countermeasures is only ensured if the suitable filter is selected for the particular drive and installed in accordance with these EMC recommendations.

#### Selection of line filter to reduce line-conducted interference

To reduce line-conducted interference, use the appropriate line filter for each frequency inverter. The below table show you a list of the available line filters for OMRON 3G3RX frequency inverter. The line filters up to 46A (200V class) or 58A (400V class) rated current are built in footprint style, they are fitted behind the respective frequency inverter, and thus require no additional surface space for installation. These filters are intended for installation in switch cabinets as standard. Vertical mounting next to the frequency inverter is also possible. The line filters from 64A (200V class) or 75A (400V class) rated current are built only in booktype style, and can be installed beside the frequency inverter.

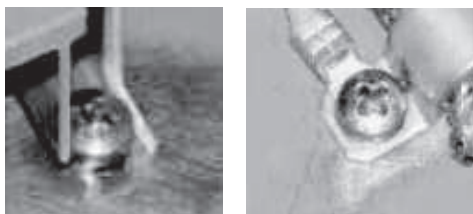


| Voltage  | Inverter model | Listed filter | Voltage     | Inverter model | Listed filter |
|----------|----------------|---------------|-------------|----------------|---------------|
| 3 x 200V | 3G3RX-A2004    | AX-FIR2018-RE | 3 x 400V    | 3G3RX-A4004    | AX-FIR3010-RE |
|          | 3G3RX-A2007    |               |             | 3G3RX-A4007    |               |
|          | 3G3RX-A2015    |               |             | 3G3RX-A4015    |               |
|          | 3G3RX-A2022    |               |             | 3G3RX-A4022    |               |
|          | 3G3RX-A2037    |               |             | 3G3RX-A4040    |               |
|          | 3G3RX-A2055    | AX-FIR2053-RE |             | 3G3RX-A4055    | AX-FIR3030-RE |
|          | 3G3RX-A2075    |               |             | 3G3RX-A4075    |               |
|          | 3G3RX-A2110    |               |             | 3G3RX-A4110    |               |
|          | 3G3RX-A2150    | AX-FIR2110-RE |             | 3G3RX-A4150    | AX-FIR3053-RE |
|          | 3G3RX-A2185    |               |             | 3G3RX-A4185    |               |
|          | 3G3RX-A2220    |               |             | 3G3RX-A4220    |               |
|          | 3G3RX-A2300    | AX-FIR2145-RE |             | 3G3RX-A4300    | AX-FIR3064-RE |
|          | 3G3RX-A2370    | AX-FIR3250-RE |             | 3G3RX-A4370    | AX-FIR3100-RE |
|          | 3G3RX-A2450    | AX-FIR3320-RE |             | 3G3RX-A4450    | AX-FIR3130-RE |
|          | 3G3RX-A2550    |               |             | 3G3RX-A4550    | AX-FIR3250-RE |
|          |                |               | 3G3RX-B4750 |                |               |
|          |                |               | 3G3RX-B4900 |                |               |
|          |                |               | 3G3RX-B411K | AX-FIR3320-RE  |               |
|          |                |               | 3G3RX-B413K |                |               |

### Filter installation

The connecting cable between filter and frequency inverter must be as short as possible and laid separate from other cables/lines. As user you must ensure that the HF impedance between frequency inverter, filter and ground is as small as possible:

Make sure that the connections are metallic and have the largest possible areas. Remove paint and insulating material between the individual mounting points. Use conductive contact grease as anticorrosive. Anodized and yellow-chromated surfaces, e.g. cable/standard-section rail, screws, etc., have a large HF-impedance, although sometimes could be confused with uncoated surfaces.



**Single grounding point:** Ensure that the ground terminal (PE) of the filter is grounded to the same point or backplate like the ground terminal (PE) of the frequency inverter. An HF ground connection via metal contact between the housings of the filter and the frequency inverter, or solely via cable shield, is not permitted as protective conductor connection. The filter must be solidly and permanently connected with the ground potential so as to avoid the danger of electric shock upon touching the filter if a fault occurs. The metallic backplate of the control cabinet accounts as a single connection point (given the advice about coatings influence.)

You can achieve highest filter installation quality by considering:

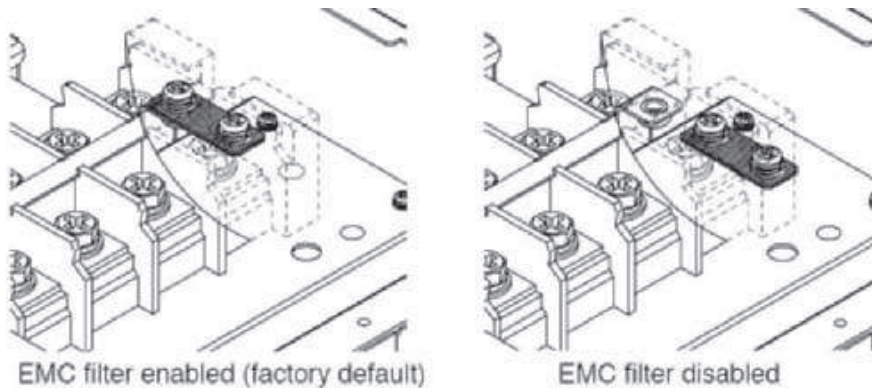
**Lowest impedance to ground:** Connecting it with a grounding conductor of the lowest impedance or parallel/multiple short ground connections if not possible. The cross section of each single protective conductor terminal must be designed for the required nominal load.

**Avoid ground loops:** Conductor loops act like antennas, especially when they encompass large areas. Consequently: (1) Avoid unnecessary conductor loops and (2) Avoid parallel arrangement of "clean" and interference-prone conductors over longer distances.

**Use EMC filters only in grounded systems:** The line filters have been developed for use in grounded systems. Use of the line filters in ungrounded systems or locations without proper ground quality is not recommended, because in these applications: (1) Low current to ground increases, (2) The effect of the filter is reduced and (3) The amount of line-conducted and radiated interference increases in proportion to elementary frequency in frequency inverter.

**Consider motor cable length:** The amount of line-conducted interference also increases as motor cable length increases. Output chokes may be required to countermeasure this effect.

**Disconnect internal RFI filter:** Always when using external mount EMC filter make sure internal filter is disabled (figure corresponds to a 400V, 55kW case.)



### Minimizing radiated interference

The 3G3RX frequency inverters meet the limits of EN61800-3, C1/C2/C3, for radiated interference, if the specified line filter is used and installation is performed according to our instructions, and internal line filter is disabled. Installing inverters only with integrated filters will achieve a limited C3 class category, of application in a limited range of systems, and with limited cable lengths and allowable carrier frequencies.

**Achievable line conducted interference limits classes:**

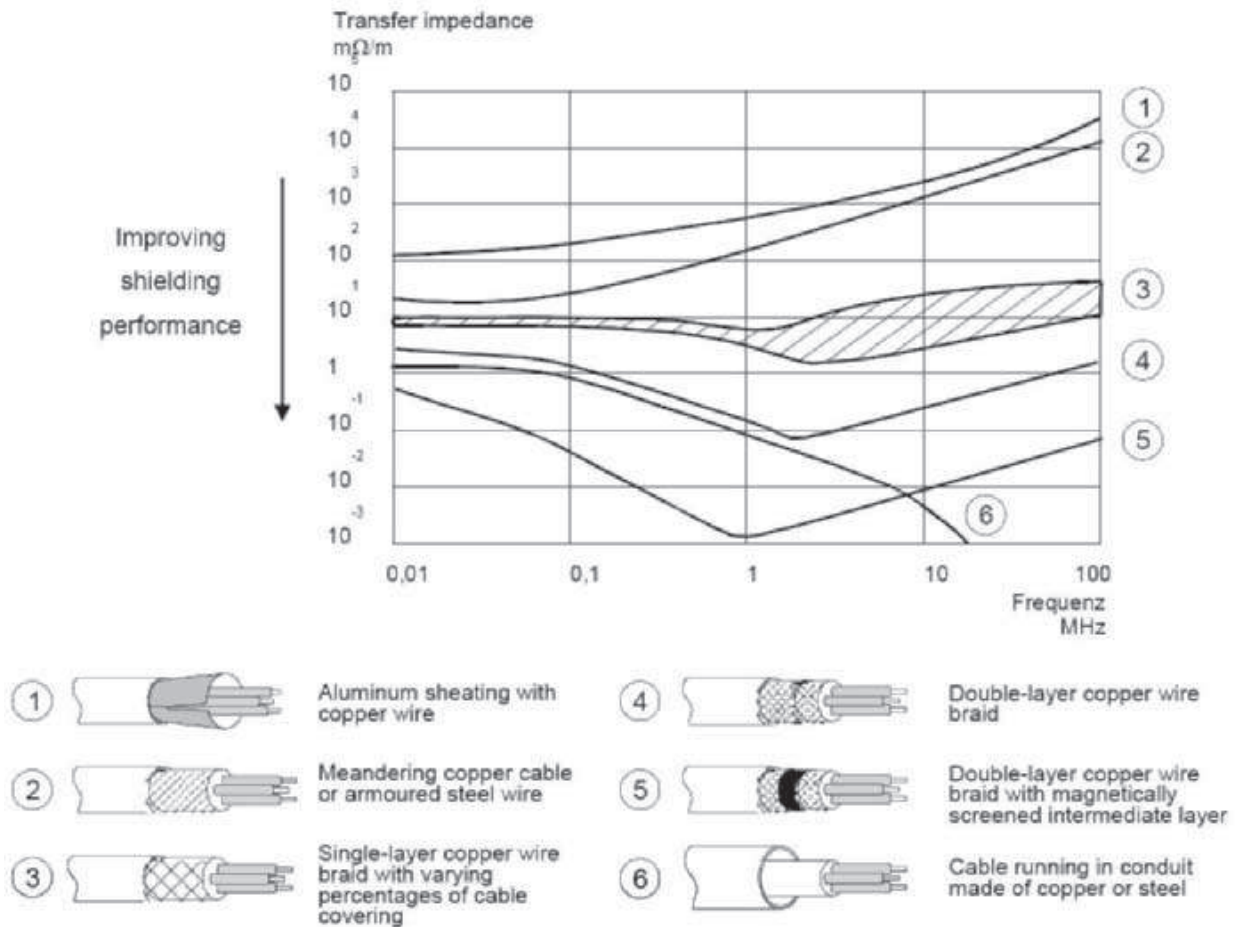
| Test standard   | Test                                                     | Comment |
|-----------------|----------------------------------------------------------|---------|
| EN61800-3: 2004 | Conducted emissions<br>Category C1/C2<br>25m motor cable | Pass    |
| EN61800-3: 2004 | Conducted emissions<br>Category C2<br>100m motor cable   | Pass    |
| EN61800-3: 2004 | Radiated emissions<br>Category C1/C2<br>25m motor cable  | Pass    |
| EN61800-3: 2004 | Radiated emissions<br>Category C2<br>100m motor cable    | Pass    |

**Maximizing immunity. Control and signal lines**

**Using EMC compliant cables for control signals:** To ensure reliable operation of the frequency inverter, analog and digital control lines (encoder connection, all analog inputs, the serial interfaces, etc.) should be laid shielded. You should allow the effective shielding surface to remain as large as possible, i.e., do not move the shield further away than absolutely necessary. As a general rule, the shield has to be applied on both sides on PE, unless differently stated in the device manufacturers documentation. As a basic principle, the shielding of these lines should not be interrupted. Using this shielding can reduce the interference coupled into and out of the cable. The effectiveness of the shielding heavily depends on the construction and the material of the shielding. The screening effectiveness can be characterized by the so called transfer impedance. This effectiveness or performance can be improved by keeping the transfer impedance as low as possible. The transfer impedance is mainly affected by the following variables:

- The cable covering, which is the cable area actually covered by the shielding. It is normally indicated as a percentage value and should be at least 85%.
- The shielding's design. Possible design alternatives are braided cables or shieldings made of metal conduit. These two types should be preferred when shielding is to be implemented.
- The contact (or transition) resistance between the individual stranded conductors of the shielding. The performance of the shielding improves if the resistance is kept as low as possible.

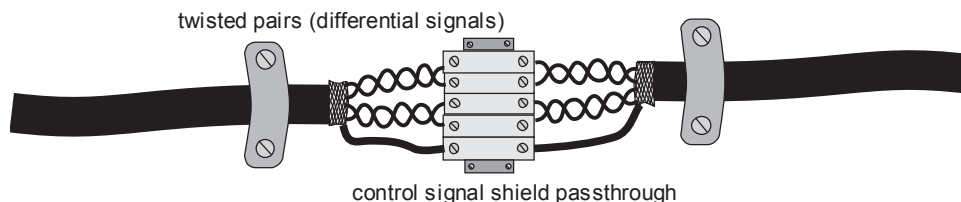
The following diagram shows the transfer impedance for various cable types. By comparing the cables individual design, the shielding effectiveness can be estimated and a suitable cable be chosen.



**Controller signal shields connect only to the ends: Single end or both but never midway.**

Control signals are not emitter, therefore the target is to create a coverage acting as antenna for the radiated emissions and drain them through single point to the ground... multiple shielding points at different potentials will create undesirable recirculating noise currents through ground loops.

**Ensure controller signals shield continuity:** Control lines should remain without interruptions directly connecting signal source and signal reception. Should the case this is not possible (terminal box, plug connector or contactor / relay absolutely needed) then this elements should be selected of the highest quality and adequate for the signal to be managed (it is not the same a START/STOP 24VDC signal, than a 5VDC TTL encoder signal, than a 1Vpp sinusoidal signal of a SINCOS technology encoder from lower to highest sensivity to connection quality). As well, shield should be guaranteed continuity by passthrough contact, and never become grounded in this interruption point. We recommend high quality connectors that handle the shielding.



**Encoders and sensors from the field:** In this case follow the recommendations of the manufacturer of the sensor device. Most encoders and sensors with shielded cables will recommend 360° wrapping of the shield both at the sensing end and at the inverter end. For many of them, the shielding and grounding will be integral to the body of the sensor.

**Direct connection as much as possible:** Direct connection to the communications port of the control unit is mandatory to reduce connection impedance. This is very important, if there is a long distance between the system and you expect there can be different PE-Potential between the systems.

**Shield surface maximization:** The effective shield area of these lines to remain as large as possible; i.e., do not move the shield of conductors further away than absolutely necessary. Avoid pigtailed as much as possible. Avoid long unshielded cable runs.

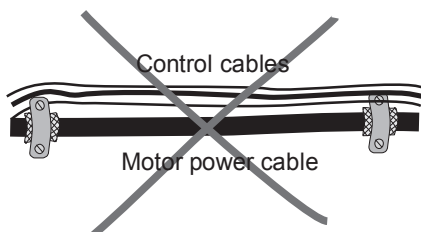
**Control system in the same cabinet - Connect shield in both sides, never midway:** All analog and digital control lines are laid shielded. With compact systems, if the frequency inverter and the control unit area in the same control cabinet connected at the same PE-Potential, the screen should be connected on both sides of the cable with PE (potential is same).

**Control system in separate cabinet - Connect shield only one side:** All analog and digital control lines are laid shielded. With distributed systems, if the communications control unit is not in the same cabinet and there is a distance between the systems, we recommend to put the screen only on the side of the frequency inverter, to avoid ground loops because different PE potential.

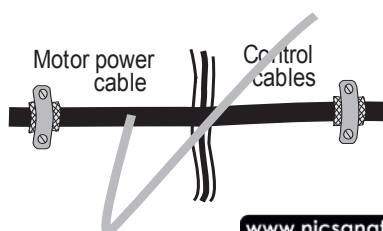
**Distance between sensitive signals and interference sources:** The distance between an interference source and an interference sink (interference-threatened device) essentially determines the effects of the emitted interference on the interference sink. The interference field emitted by the frequency inverter falls sharply with increasing distance. Please note that the emitted interference field (frequency range 30 MHz - 1 GHz) of a drive (drive system) is measured at a distance of 10 m in accordance with EN61800-3. Every device placed closer than 10 m to a source of interference will thus be impacted by appreciably higher interference amplitudes. For this reason, you should use only interference-free devices and maintain a minimum distance of 0.25 m from the drive. Devices which react sensitively to interference from electric and magnetic fields should be kept at least a distance of 0.25 m from the following components:

- Frequency inverter
- EMC input/output filters
- Input or output reactors/transformer
- Motor cable (even if shielded)
- External braking resistor and its wiring (even if shielded)
- AC/DC commutator motors, including any attached separate fans
- DC intermediate circuit coupling/wiring (even if shielded)
- Connected inductors like relays, contactors, solenoid valves, brakes (even if shielded)

**Avoid parallel runs of power and control lines:** The parallel running in same conduit without proper distance of power lines (even shielded cables) and control lines is not allowed. This is source of most of EMC disturbance coupling.



**Crossing power lines and control lines:** Should power and control lines have to cross unavoidably each other, then they should be layout with a 90° crossing.



**If control system recommendations conflict with these in this section:** Always follow additional recommendations of control system manufacturer. If these recommendations happen to conflict with those in this section is usually because the control system has a different internal power and isolation structure. If the conflicting recommendation is to connect the shield to a proprietary point other than PE (power ground point) in the control connector, please respect so, and **DO NOT CONNECT THE SHIELD TO PE** on the inverter side, only follow control system manufacturer recommendations (as those are done to maximize immunity for the characteristic control system structure).

### Installing the motor cable

If you use an EMC line filter or would like to observe certain limits of line-conducted interference, the motor cable which you use must be shielded. The shield is to be grounded on both sides, over a large area. For this purpose, turn the shield through 180°, for instance, and make large-area contact (360°) with the metal PG screw connections.

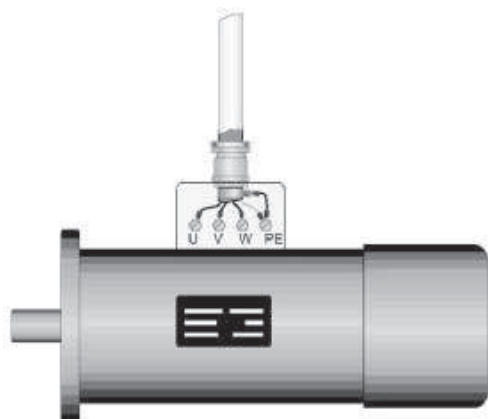
Use only copper mesh cable (CV) with 85% coverage. Foil shields often have a higher coupling impedance than mesh shields and are therefore unsuitable.



Some motors have terminal boxes and PG screw connections of plastic. In these cases, the shield should be connected on the motor side to the motor housing, with as large an area as possible, by means of a cable clamp.

Some motors have a rubber gasket between terminal box and motor housing. Very often, the terminal boxes, and particularly the threads for the metal PG screw connections, are painted. Make sure there is always a good metallic connection between the shielding of the motor cable, the metal PG screw connection, the terminal box and the motor housing, and carefully remove this paint if necessary.

The shielding should not be interrupted at any point in the cable. If the use of reactors, contactors, terminals or safety switches in the motor output is necessary, i.e., if the shield must be interrupted, then the unshielded section should be kept as small as possible. It is better to install the reactor, contactor, terminal or safety switch in a metal housing with as much HF damping as possible. The shield connection to the metal housing should again be made with the smallest possible HF impedance, as already described.



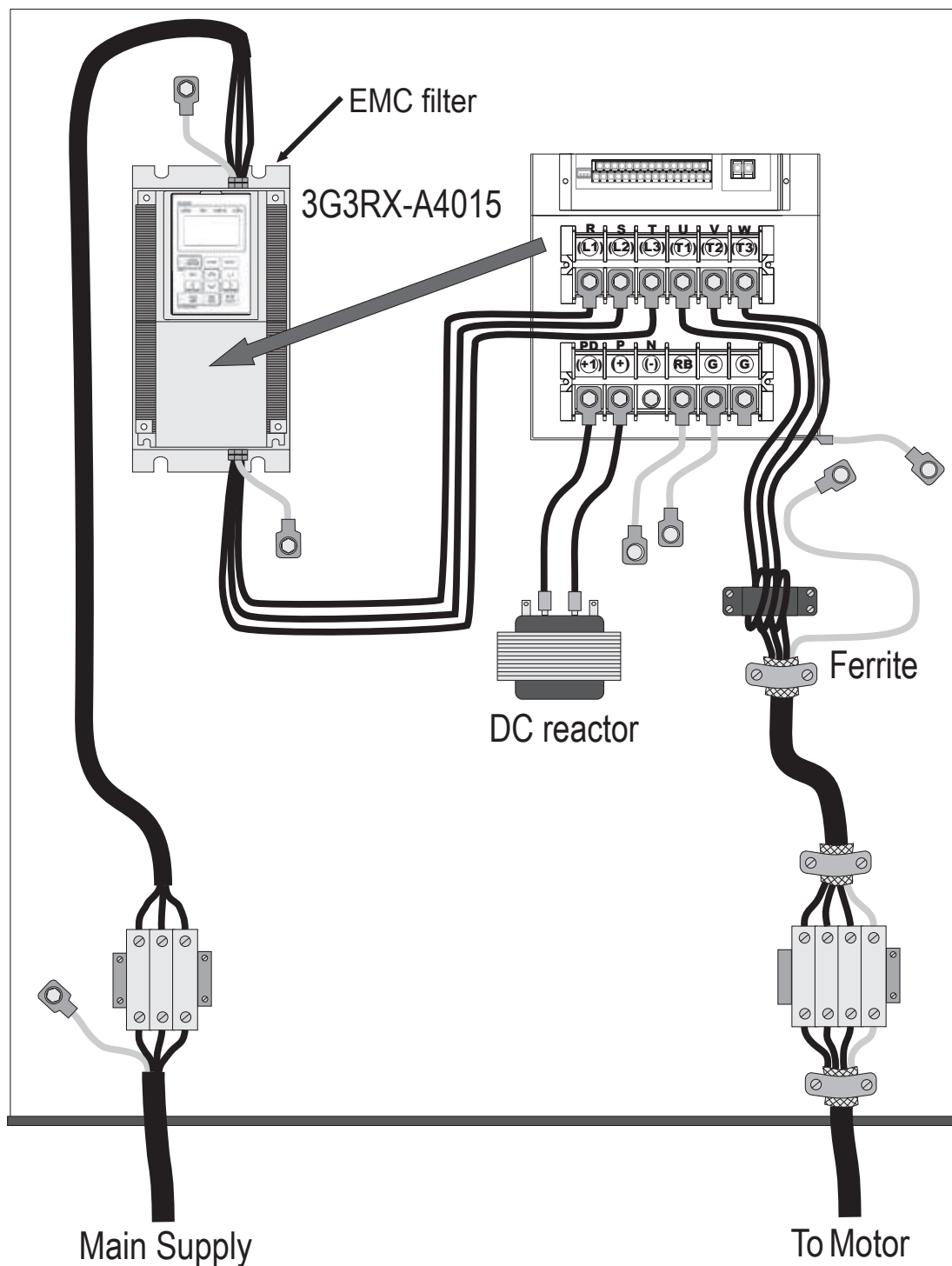
Should no shielded motor cable be available, lay the unshielded cable in a metal tube having the best possible shielding effect, for example. The metal tube should have good HF contact with the frequency inverter and the motor housing, e.g., by means of appropriate clamping. Safety grounding always takes precedence over HF grounding. If, for example, a braking chopper / rheostat is to be connected to the DC intermediate circuit, then this connecting line, too, must be shielded. The shield is to be connected on both sides, with a large area (e.g. to the protective ground terminal of the rheostat). Follows EMC compliant installation for motor.



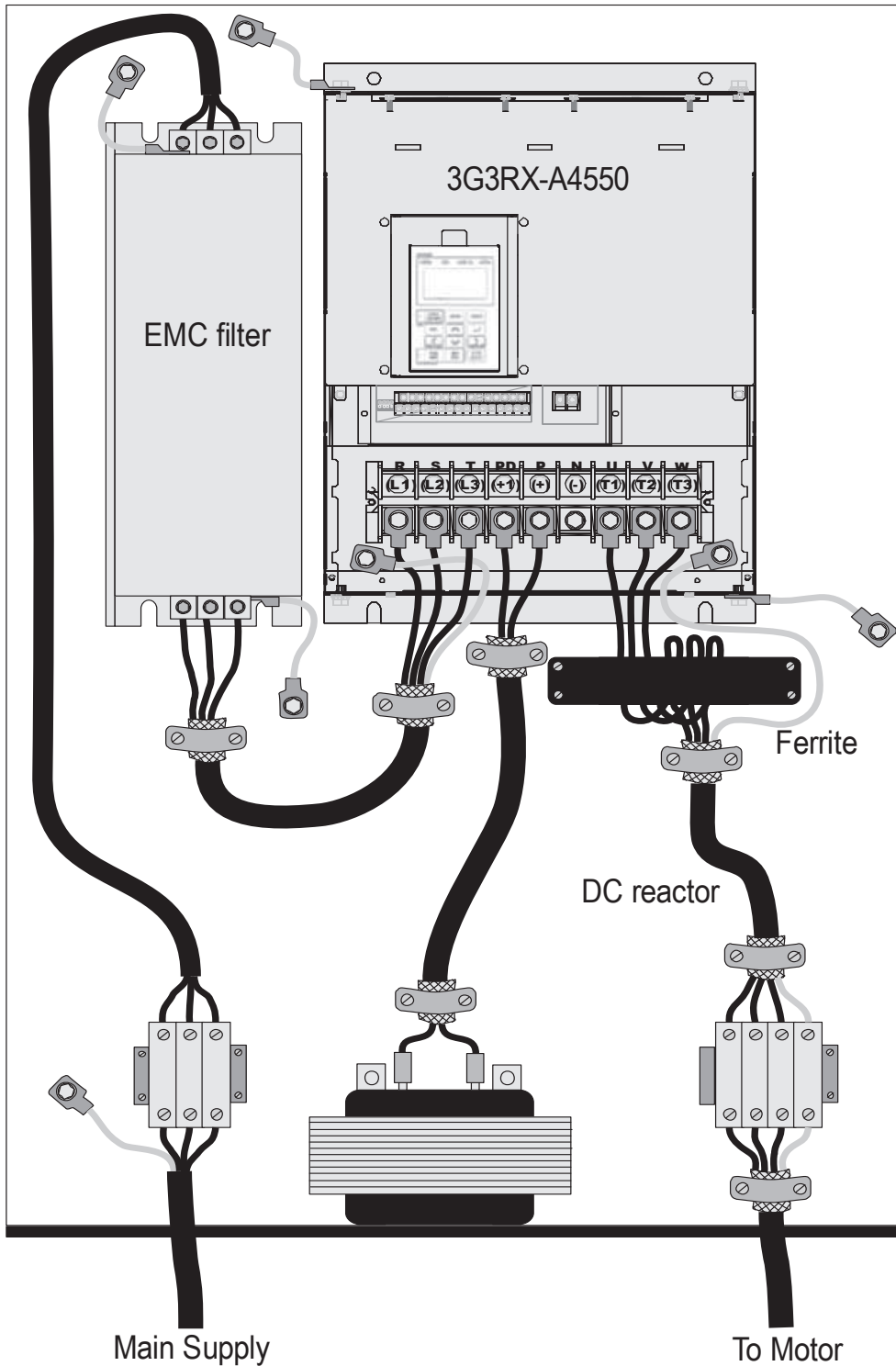
## Shielding and grounding layout in control cabinets

Observe the requirements of European standard EN60204-1, "Electrical Equipment of Industrial Machinery". You get optimum EMC only if you properly arrange and mount the OMRON 3G3RX frequency inverter, the appropriate line filter, and the other equipment which might be necessary, on a metal mounting plate, in accordance with the following mounting instructions.

The following figure shows a 3G3RX 400V 1.5kW inverter installed with a footprint filter, and some additional devices (ferrite to minimize high frequency emissions from motor cable and DC reactor to countermeasure harmonic distortion effect in supply network).



The following figure shows a 3G3RX 400V 55kW inverter installed with a booktype filter, and some additional devices (ferrite to minimize high frequency emissions from motor cable and DC reactor to countermeasure harmonic distortion effect in supply network).





## ■ Additional notes

### Influence of motor cable length

Shielded motor cables have quite a high cable capacity towards ground, which increases linearly as cable length increases. A typical rule-of-thumb figure is 200 pF per meter of cable. But these figures vary among different types of cables and are also dependent on the current-carrying capacity. Long motor cables can give rise to the following:

Frequency inverter and servo amplifiers give a pulse-width-modulated square-wave output voltage with quite steep slopes, which causes high reverse-charging currents in the cable capacities towards ground. This reverse-charging current must be additionally supplied by the device. Unwanted switch-off due to overload may occur.

- Long motor cables produce more line-conducted interference.
- Long motor cables lead to the triggering of a ground fault monitoring device that may be present.
- Long motor cables lead to thermal overload of the line filter due to the higher line-conducted interference.

If a motor output choke of appropriate size is used, you have the following advantages:

- It can counteract unwanted shut-off due to overload, described above.
- The thermal load on the EMC line filter is reduced.

### Multiple motor applications

In multiple motor applications, i.e., a frequency inverter feeds several motors connected in parallel, you should try to minimize the effective cable capacity and/or the effective length of the shielded cable. You can achieve this by creating a neutral cross-connecting point from which you can supply all motors.

Layout to be done so that the shielding is maintained over the entire length of the cable, if possible, or is only very briefly interrupted. It is better to install this neutral cross-connecting point in a metal housing with as much HF damping as possible. The shield connection from/to the metal housing should again be made with the smallest possible HF impedance, as already described.

### Influence of ground fault monitoring devices

In the line filter, capacitors are placed between the phases and ground, which can cause larger charge currents to flow to ground when the filter is first switched on. The amount of this flow has already been minimized by constructional circuit details. Nevertheless, ground fault monitoring devices possibly present may be triggered. Ground currents with high-frequency components and DC components may also flow under normal operating conditions. If faults occur, large DC-carrying ground currents may flow, possibly preventing the ground fault monitoring device from responding. For this reason, the use of ground fault monitoring devices is not recommended.

But should they be prescribed in certain applications for safety reasons, you should choose monitoring devices which are suited for DC, AC and HF ground currents. In addition, you should ensure that their responsiveness and time characteristics are adjustable, so that a disturbance is not immediately caused the first time the frequency inverter is switched on.

### Components susceptible to interference

The following components must be classified as particularly susceptible to interference from electromagnetic fields. Special attention should therefore be paid to them during installation:

- Sensors with analog output voltages (< 1 volt)
- Load cells
- Tractive force meters
- Torque measuring hubs
- Resistance thermometer PT100
- Thermoelements
- Anemometers
- Piezoelectric sensors
- AM radios (only long and medium wave)
- Video cameras and TV sets
- Office PCs
- Compactive proximity switches and filling level sensors
- Inductive proximity switches and metal detectors

- Ripple control transmitters, baby talkers, etc., i.e. all communication devices which use low-voltage systems as transmission medium
- Devices which do not comply with the pertinent EMC requirements

### Built-in filter specifications

3G3RX-E1F includes an embedded EMC filter. However, when using the inverter in Europe, you should comply with the following specifications and requirements to meet the EMC Directive and other standards in Europe:

- Power supply requirements:
  - a. Voltage fluctuation must be -15% to +10% or less.
  - b. Voltage imbalance must be +/- 3% or less.
  - c. Frequency variation must be +/- 4% or less.
  - d. Total harmonic distortion (THD) of voltage must be +/- 10% or less.
- Wiring requirements:
  - a. A shielded wire (screened cable) must be used for motor wiring, and the length of the cable must be according to the following table.
  - b. The carrier frequency must be set according to the following table to meet EMC requirements.
  - c. The main circuit wiring must be separated from the control circuit wiring.
- Environmental requirements:
  - a. Ambient temperature must be within the range -10°C to +40°C.
  - b. Relative humidity must be within the range 20% to 90% (non-condensing).
  - c. Vibrations must be 5.9 m/s<sup>2</sup> (0.6 G) (10 to 55 Hz) or less. (0.4 to 22 kW)  
2.94 m/s<sup>2</sup> (0.3 G) (10 to 55 Hz) or less. (30 to 132 kW)
  - d. The inverter must be installed indoors (not exposed to corrosive gases and dust) at an altitude of 1000 m or less.

| Model       | Cat. | Cable length (m) | Carrier frequency (kHz) | Model       | Cat. | Cable length (m) | Carrier frequency (kHz) |
|-------------|------|------------------|-------------------------|-------------|------|------------------|-------------------------|
| 3G3RX-A2004 | C3   | 5                | 2.5                     | 3G3RX-A4004 | C3   | 5                | 2.5                     |
| 3G3RX-A2007 | C3   | 5                | 2.5                     | 3G3RX-A4007 | C3   | 5                | 2.5                     |
| 3G3RX-A2015 | C3   | 5                | 2.5                     | 3G3RX-A4015 | C3   | 5                | 2.5                     |
| 3G3RX-A2022 | C3   | 5                | 2.5                     | 3G3RX-A4022 | C3   | 5                | 2.5                     |
| 3G3RX-A2037 | C3   | 5                | 2.5                     | 3G3RX-A4040 | C3   | 5                | 2.5                     |
| 3G3RX-A2055 | C3   | 1                | 1                       | 3G3RX-A4055 | C3   | 1                | 2.5                     |
| 3G3RX-A2075 | C3   | 1                | 1                       | 3G3RX-A4075 | C3   | 1                | 2.5                     |
| 3G3RX-A2110 | C3   | 1                | 1                       | 3G3RX-A4110 | C3   | 1                | 2.5                     |
| 3G3RX-A2150 | C3   | 1                | 1                       | 3G3RX-A4150 | C3   | 1                | 2.5                     |
| 3G3RX-A2185 | C3   | 1                | 1                       | 3G3RX-A4185 | C3   | 1                | 2.5                     |
| 3G3RX-A2220 | C3   | 5                | 2.5                     | 3G3RX-A4220 | C3   | 1                | 2.5                     |
| 3G3RX-A2300 | C3   | 5                | 2.5                     | 3G3RX-A4300 | C3   | 1                | 2.5                     |
| 3G3RX-A2370 | C3   | 5                | 2.5                     | 3G3RX-A4370 | C3   | 1                | 2.5                     |
| 3G3RX-A2450 | C3   | 5                | 2.5                     | 3G3RX-A4450 | C3   | 5                | 2.5                     |
| 3G3RX-A2550 | C3   | 5                | 2.5                     | 3G3RX-A4550 | C3   | 5                | 2.5                     |
|             |      |                  |                         | 3G3RX-A4750 | C3   | 10               | 2.5                     |
|             |      |                  |                         | 3G3RX-A4900 | C3   | 10               | 2.5                     |
|             |      |                  |                         | 3G3RX-B411K | C3   | 10               | 2.5                     |
|             |      |                  |                         | 3G3RX-B413K | C3   | 10               | 2.5                     |

# Chapter 3

## Operation

|     |                                                              |      |
|-----|--------------------------------------------------------------|------|
| 3-1 | Operation Method .....                                       | 3-3  |
| 3-2 | LCD Display .....                                            | 3-4  |
| 3-3 | Test Run Procedure .....                                     | 3-5  |
| 3-4 | Operation .....                                              | 3-6  |
| 3-5 | Read/Write function and operation .....                      | 3-13 |
| 3-6 | Test Run Operation .....                                     | 3-14 |
| 3-7 | Part Names and Descriptions of the Digital<br>Operator ..... | 3-17 |
| 3-8 | Parameter Transition .....                                   | 3-19 |
| 3-9 | Parameter List .....                                         | 3-21 |

## ⚠ DANGER

|                                                                                   |                                                                                                                                                                                                                                                                          |
|-----------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | Do not change wiring and slide switches (SW1), put on or take off Digital Operator and optional devices, replace cooling fans while the input power is being supplied. Doing so may result in a serious injury due to an electric shock.                                 |
|  | Do not remove the terminal block cover during the power supply and 10 minutes after the power shutoff. Doing so may result in a serious injury due to an electric shock.                                                                                                 |
|  | Do not operate the Digital Operator or switches with wet hands. Doing so may result in a serious injury due to an electric shock.                                                                                                                                        |
|  | Inspection of the Inverter must be conducted after the power supply has been turned off. Not doing so may result in a serious injury due to an electric shock.<br>The main power supply is not necessarily shut off even if the emergency shutoff function is activated. |

## ⚠ CAUTION

|                                                                                     |                                                                                                                                                                                                                                    |
|-------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|    | Do not touch the Inverter fins, braking resistors and the motor, which become too hot during the power supply and for some time after the power shutoff. Doing so may result in a burn.                                            |
|  | Take safety precautions such as setting up a molded-case circuit breaker (MCCB) that matches the Inverter capacity on the power supply side. Not doing so might result in damage to property due to the short circuit of the load. |

### Safety Information

#### ■ Operation and Adjustment

- Be sure to confirm the permissible range of motors and machines before operation because the Inverter speed can be changed easily from low to high.
- Provide a separate holding brake if necessary.

## Precautions for Use

### ■Error Retry Function

- Do not come close to the machine when using the error retry function because the machine may abruptly start when stopped by an alarm.
- Be sure to confirm the RUN signal is turned off before resetting the alarm because the machine may abruptly start.

### ■Non-Stop Function at Momentary Power Interruption

- Do not come close to the machine when selecting restart in the non-stop function at momentary power interruption selection (b050) because the machine may abruptly start after the power is turned on.

### ■Operation Stop Command

- Provide a separate emergency stop switch because the STOP key on the Digital Operator is valid only when function settings are performed.
- When checking a signal with the main power supply applied, if a signal voltage is erroneously applied to the control input terminals, the motor may start abruptly. Be sure to confirm safety before checking a signal.

## 3-1 Operation Method

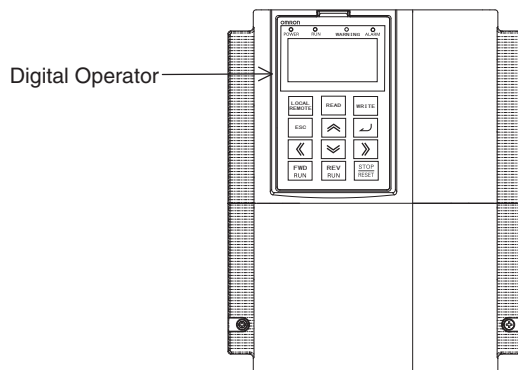
This Inverter has the following operation methods that are selected by the RUN command/frequency reference settings.

The features and the requirements for each operation method are also given below:

3

### ■ To enter the RUN command/frequency reference via the Digital Operator

This action operates the Inverter via a key sequence of the standard or optional Digital Operator. When operating the Inverter only via the Digital Operator, the Inverter does not need to be connected to the control circuit terminal block.



### ■ To enter the RUN command/frequency reference from the control circuit terminal block

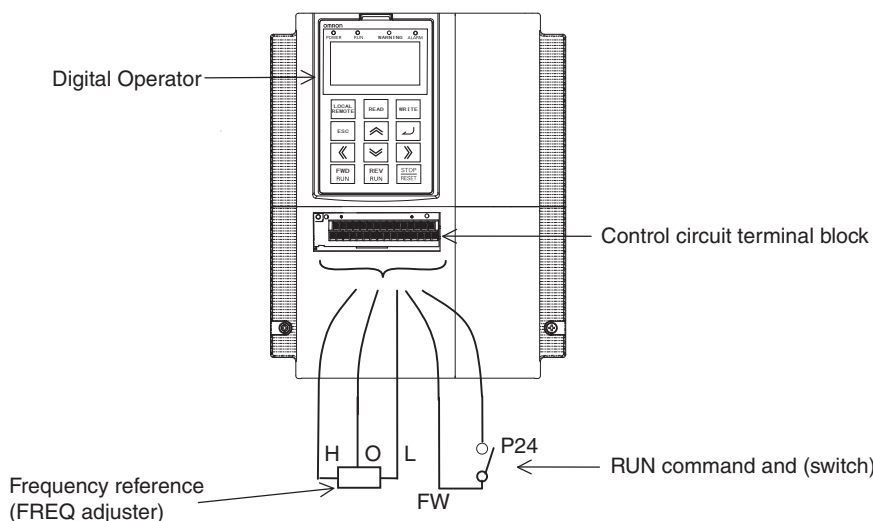
This action operates the Inverter by connecting the external signals (from the frequency setting device, starting switch, etc.) to the control circuit terminal block.

The operation starts by turning ON the RUN command (FW, RV) while the input power supply is turned ON.

Note: that the frequency can be set using a voltage signal or a current signal from the control circuit terminal block, which can be selected according to the system. For details, refer to "Control Circuit Terminal" (page 2-6).

(Requirements for operation)

- RUN command: Switch, Relay etc.
- Frequency reference: External signal (e.g. 0 to 10 V DC, -10 to 10 V DC, 4 to 20 mA)



### ■ To enter the RUN command/frequency reference in a combination of Sources from the Digital Operator and the control circuit terminal block

The RUN command/frequency reference sources can be selected individually from the Digital Operator as well as the control circuit terminal block.

www.nicsanat.com

021-87700210



## 3-2 LCD Display

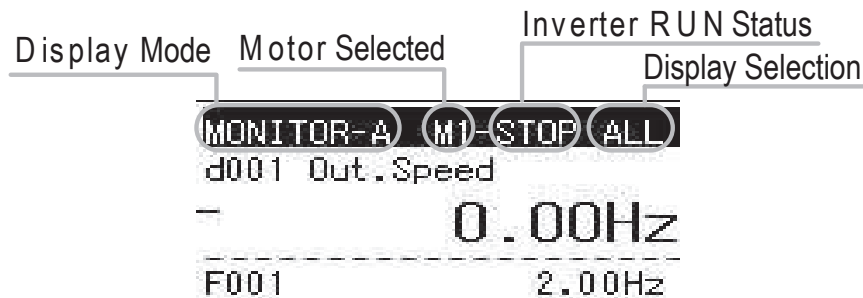
### Backlight

There are two backlight colors in the LCD display, white and orange. They reflect the state of the inverter as follows:

| Backlight Color                                         | Contents                                      |
|---------------------------------------------------------|-----------------------------------------------|
| White                                                   | Normal (not related to inverter driving/stop) |
| Orange                                                  | Warning (Parameter mismatch)                  |
| White <-> Orange<br>(Alternate blinking for one second) | Trip (The same as ALARM LED)                  |

### Details of LCD Display

The first line of LCD monitor always displays the Display Mode, the Motor Selected, the Inverter RUN Status and the Display Selection.



| Item                     | Content of Display | Content                           |
|--------------------------|--------------------|-----------------------------------|
| Display Mode             | MONITOR-A          | Monitor-A mode                    |
|                          | MONITOR-B          | Monitor-B mode                    |
|                          | FUNCTION           | Function mode                     |
|                          | TRIP               | Trip (error) mode                 |
|                          | WARNING            | Warning mode (Alarm)              |
|                          | OPTION             | LCD Configuration Mode            |
| Motor selected           | M1                 | Motor 1 (SET multifunction = OFF) |
|                          | M2                 | Motor 2 (SET multifunction = ON)  |
| Inverter RUN Status      | STOP               | Stopped                           |
|                          | FWD                | Forward running                   |
|                          | REV                | Reverse running                   |
| Display Selection (b037) | ALL                | Display all                       |
|                          | UTL                | Function individual display       |
|                          | USR                | User setting display              |
|                          | CMP                | Data compare display              |
|                          | BAS                | Basic display                     |

## 3-3 Test Run Procedure

| Item                      | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Reference page |
|---------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|
| Installation and Mounting | Install the Inverter according to the installation conditions.<br>• Make sure that the installation conditions are met.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 2-1            |
| Wiring and Connection     | Connect to the power supply and peripheral devices.<br>• Select peripheral devices that meet the specifications, and wire correctly.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 2-5            |
| Power On                  | Check the following before turning on the power.<br>• Make sure that an appropriate power supply voltage is supplied and that the power input terminals (R/L1, S/L2, and T/L3) are wired correctly.<br>• 3G3RX-A2□: 3-phase 200 to 240 V AC<br>• 3G3RX-A4□: 3-phase 380 to 480 V AC<br>• Make sure that the motor output terminals (U/T1, V/T2, and W/T3) are connected to the motor correctly.<br>• Make sure that the control circuit terminals and the control device are wired correctly and that all control terminals are turned off.<br>• Set the motor to no-load status (i.e., not connected to the mechanical system).<br>• After checking the above, turn on the power. |                |
| Display Status Check      | Make sure that there are no faults in the Inverter.<br>• When the power is turned on normally, the display shows:<br>• RUN LED indicator : OFF      ALARM LED indicator : OFF<br>• POWER LED indicator : ON<br>• Data display : Displays the set value in d001.<br>• If an error occurs, the error code is displayed on the data display. In this case, refer to "Chapter 5 Maintenance Operations" and make the necessary changes to remedy.                                                                                                                                                                                                                                      |                |
| Parameter Initialization  | Initialize the parameters.<br>• Set parameter No. b084 to "2", and set parameter No. b180 to "1".                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                |
| Parameter Settings        | Set the parameters required for a test run.<br>• Set the motor capacity selection (H003) and the motor pole number selection (H004).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                |
| No-load Operation         | Start the no-load motor via the Digital Operator.<br>• Display parameter No. F001, set the output frequency using the  key,  key and the  key, and press the  key to confirm the change. Then, press the  key to rotate the motor.        |                |
| Actual Load Operation     | Connect the mechanical system and operate via the Digital Operator.<br>• If there are no difficulties with the no-load operation, connect the mechanical system to the motor and operate via the Digital Operator.                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                |
| Operation                 | Refer to "Chapter 4 Functions", and set the necessary parameters.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                |



## 3-4 Operation

### 1- Changing the Display Modes

LCD digital operator has four display modes which can be changed from one to another by pressing the  or  key at Navigation level. Moreover, there are 3 other models called Read mode, Write mode and Option mode. In any display mode, it moves to Read mode or Write mode via  key or  key, and moves to Option mode after pressing ,  and  at the same time. It returns to display modes via  key.

Each mode has its own layers, where contents and parameters settings cannot be changed at Navigation level.

When pressing  key at Navigation level, a cursor will appear on below layer.

#### - LCD Navigation levels

To move among the different Navigation levels press keys  or  .  
The outline of each mode is shown below.

#### Monitor Mode A

The "d" group inverter parameters and "F~U" group inverter parameter are displayed on the same screen in this mode. The content of "d" group parameter is displayed with big font characters. The function code such as "F001" and contents of "F~U" parameters are displayed, without the function name.

#### Monitor Mode B (Monitor x 4)

In this mode, four "d" group inverter parameters can be displayed at the same screen. The function codes of these parameters are not displayed.

#### Function Mode (setting)

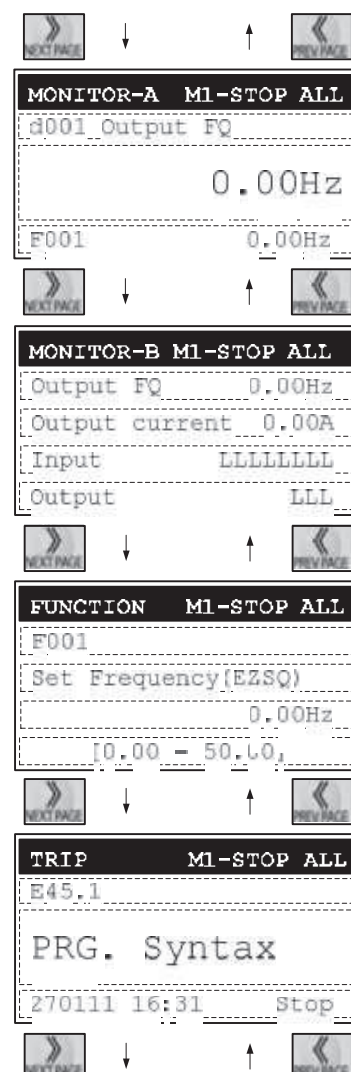
In this mode, "F~U" group parameters can be displayed and set. Function code, function name, parameter content and parameter range are shown.

**Note:** "d" group inverter parameter cannot be set and displayed in this mode.

#### Trip Mode

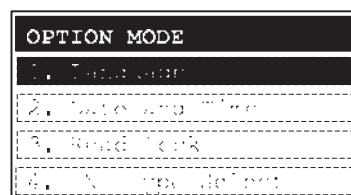
Trip information and warning information are displayed in this mode. With inverter trip or a warning happens, the trip screen will be displayed from any display modes.

In Option Mode, Read Mode and Write Mode, the LED or WARNING LED will light up.

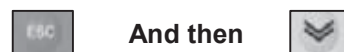
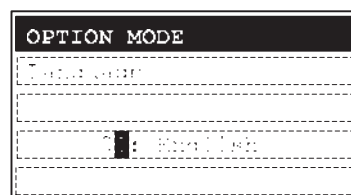


## 2- Option Mode

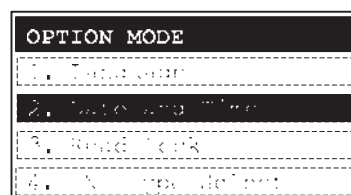
1- Please press ,  and  key at the same time to enter into the OPTION MODE. The cursor will appear in the first row of the Option Mode menu. Use  or  key to move between the option Mode menu. To return to the navigator layer, press the  key.



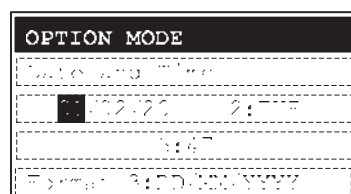
2- Select the Language option and press the  key. The cursor will appear in the Language option value. Use the  or  key to select the value to set. Press the  key to store the new value. Press the  key to cancel the new value.



3- The cursor will appear in the second row. (2. Date and Time).



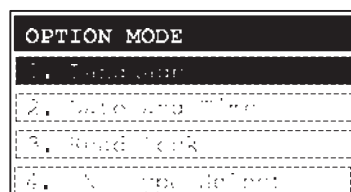
4- Pressing the  key, it enters to the Date and Time layer. Use the  or  key for moving between the Day, Month, Year, Hour, etc...data. When the cursor is over the selected data, pressing  or  key to change the value. The change will be stored after pressing the  key.



The settings available in this mode are:

1. Language
2. Date and Time
3. Read Lock
4. INV Type Select
5. R/W Storage Mode
6. Backlight Auto-off
7. Backlight Flicker
8. Operator Reset
9. Check Mode

Use  or  for moving between the Option Mode Menu.



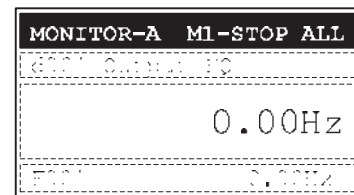
### 3- Details of Option Mode

| Item               | Content                                                                                                                                                                                                                                                                                                                                                                          | Setting range                                                                                                                                        | Default                  |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|
| Language           | Setting language                                                                                                                                                                                                                                                                                                                                                                 | 01: English<br>02: German<br>03: French<br>04: Spanish<br>05: Italian<br>06: Portuguese<br>07: Japanese<br>08: Chinese<br>09: Turkish<br>10: Russian | 01                       |
| Date and Time      | Setting Date and Time for the LCD digital operator                                                                                                                                                                                                                                                                                                                               | Date: 2000/1/1-2099/12/31<br>Time: 00:00 - 23:59<br>Format 1-3                                                                                       | 2009/01/01<br>00:00<br>1 |
| Read Lock          | Set "Read lock" disable to enable, in order to protect the parameter saved in LCD digital operator from being overwritten.                                                                                                                                                                                                                                                       | 01: Enable<br>02: Disable                                                                                                                            | 02                       |
| INV Type Select    | Please select the correct INV type using LCD digital operator. otherwise, "COM ERROR" will be displayed automatically.                                                                                                                                                                                                                                                           | 01: Type 1 (MX2, LX, RX)<br>02: Type 2 (JX)                                                                                                          | 01                       |
| R/W Storage Mode   | Sets the number of parameter sets for READ/WRITE mode.                                                                                                                                                                                                                                                                                                                           | 01: Single<br>02: Quad                                                                                                                               | 02                       |
| Backlight Auto-Off | When LCD digital operator remains without key operations for 1 minute, LCD backlight will be turned off. When a key is pressed it will be turned on.<br>The Backlight Auto-Off function does not work when trip happened.                                                                                                                                                        | 01: Off<br>02: 1 minute                                                                                                                              | 01                       |
| Backlight Flicker  | The Orange backlight will be enabled or disabled.                                                                                                                                                                                                                                                                                                                                | 01: Enable<br>02: Disable                                                                                                                            | 01                       |
| Operator Reset     | Use this function to return to default settings of LCD digital operator.<br>The next items will be reset:<br>1- Language: English<br>2: Date and Time: 2009/01/01 THU 00:00<br>3: Time format: 01:YY/MM/DD<br>4: Read lock: Disable<br>5: R/W Storage Mode: Quad<br>6: Backlight Auto-Off: Off<br>7: Backlight Flicker: Enable<br>After this, date and time setting is required. | 01: YES<br>02: NO                                                                                                                                    | 02                       |
| Check Mode         | Check if LED and key etc. are normal or not.                                                                                                                                                                                                                                                                                                                                     | Key&Led Check, LCD Check, EEPROM Check, RTC Check, Serial Loopback, Debug Mode, Firmware Version.                                                    | -                        |

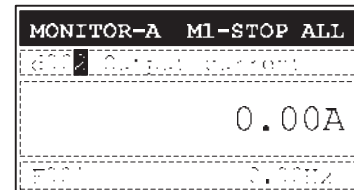
**Note:** Please do not execute the EEPROM check. Otherwise, the data (parameters/Drive program) saved in LCD digital operator will be erased..

## 4- Monitor-A Display Mode

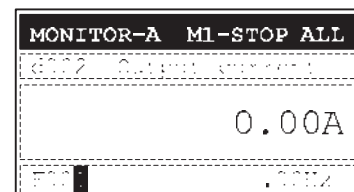
1- Please select monitor mode A by using the  or  key at the navigation layer. The cursor will be displayed in the Monitor-A pressing the  key.



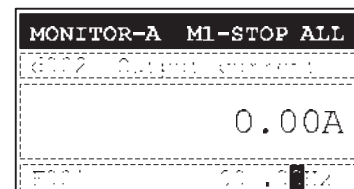
2- After that, use the  or  key to select the function code to be displayed into the Monitor-A.



Use  or  key to move the cursor to the function code (F001 in this case) and use the  or  key to change the function code.

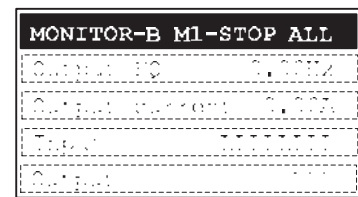


3- Use the  key to access to the function code value. With the  or  key the value can be changed. The changes will be stored after pressing the  key or cancelled pressing the  key.

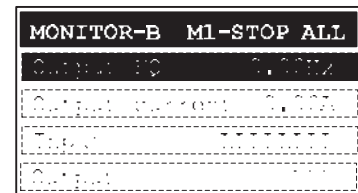


## 5- Monitor-B Display Mode

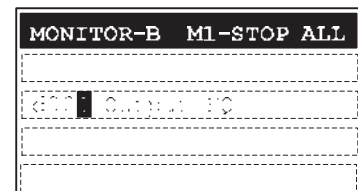
1- Please select the Display Mode Monitor-B using the  or  key at the navigation layer.



2- After pressing the  key the cursor will appear on the first row of the four "d" group inverter parameters. Use the  or  key to move between the four Monitor-B inverter parameters.



3- Pressing the  key the cursor will appear on the function code of the "d" inverter parameters selected. Use the  or  key to select other function code.



- Pressing the  key, the function code is selected, and then displayed on the Monitor-B display Mode.

- Pressing the  key, the change will be cancelled.

## 6- Function Mode

1- Please select Function Mode by using the  or  key at the navigation level.

| FUNCTION               | M1-STOP     | ALL |
|------------------------|-------------|-----|
| ESC                    |             |     |
| Set. Function: M1-STOP |             |     |
|                        | 0.000       |     |
|                        | 0.00 - 0.00 |     |



2- Pressing the  key the cursor will appear in the function code. Then use the , ,  or  key to select the function that will be changed.

| FUNCTION               | M1-STOP     | ALL |
|------------------------|-------------|-----|
| ESC                    |             |     |
| Set. Function: M1-STOP |             |     |
|                        | 0.000       |     |
|                        | 0.00 - 0.00 |     |



3- After that, pressing  key the cursor will appear in the parameter value. Use the  or  key to select the value to be set.

- To store the parameter value, press the  key.
- Pressing the  key, changes will be cancelled.

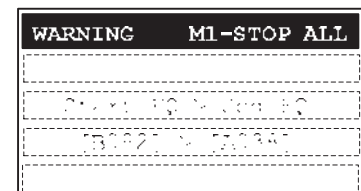
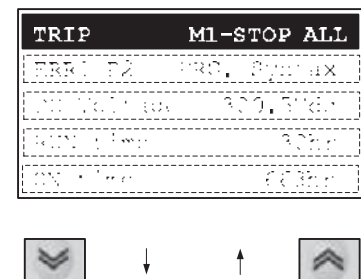
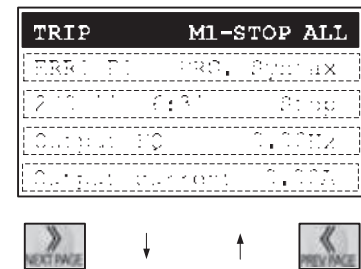
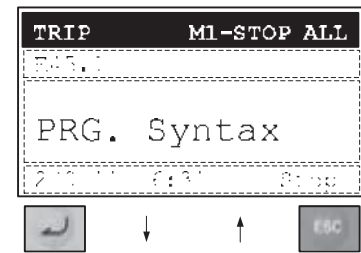
| FUNCTION               | M1-STOP     | ALL |
|------------------------|-------------|-----|
| ESC                    |             |     |
| Set. Function: M1-STOP |             |     |
|                        | 0.000       |     |
|                        | 0.00 - 0.00 |     |

## 7- Trip Mode

1- Select the  or  key to select trip mode at the navigation layer.

2- Pressing the  key, the past trip information (6 trip errors) and the warning information (1 time), that are recorded on the inverter, will be displayed. Trip information is composed in two pages. For change from page 1 (P1) to page 2 (P2), press the  or  key.

Pressing 6 times the  key, it will be displayed the Warning Mode.



**Note:** When a trip happens, ALARM LED will be light on. Press the  key to reset the inverter.

## 3-5 Read/Write function and operation

LCD digital operator can read and save inverter parameter settings and copy them to another inverter. Specifically LCD digital operator can save four inverter's parameter sets or one inverter's parameter set and its Drive Programming. It can be selected via the R/W Storage Mode in the LCD configuration Option Mode.

3

**Note:** If Read operation cannot be executed, please check the Read Lock option in the LCD configuration Option Mode.

### R/W Storage Mode - Single READ/WRITE function

When the R/W Storage Mode is selected to "01: Single" (this is done in the LCD configuration: Option Mode), the function Read or Write is executed immediately after pressing  or  key.

After pressing the  key in any display mode, except Write mode and Option mode, the inverter's parameter configuration are read and saved into LCD digital operator Drive Programming program will be transferred to the LCD digital operator automatically after parameter reading is finished. If the inverter supports Drive Programming function, it returns to the previous display after read function is completed.

After pressing the  key in any display mode except Read mode and Option mode, the parameter settings stored in LCD digital operator are transferred to the inverter. If the inverter supports Drive Programming, it will be transferred to the inverter automatically after the parameter copy is finished. It will return to the previous display after write function is completed.

### R/W Storage Mode - Quad READ function

When the R/W storage mode is selected to 02: Quad option, it will be possible to handle four sets of inverter parameters or read/write an Drive Programming program independently. In this case, LCD digital operator can save four sets of inverter parameters or one set of inverter parameters and one Drive Programming program. Please note that one Drive Programming program takes up three sets of inverter parameters, which are No.2, No.3 and No.4.

**Note:** Refer to "LCD Line Digital Operator User's Manual" for more information.



## 3-6 Test Run Operation

### Power On

#### ■ Checkpoints Before Turning On the Power

- Make sure that an appropriate power supply voltage is supplied and that the power input terminals (R/L1, S/L2, and T/L3) are wired correctly.  
3G3RX- A2□: 3-phase 200 to 240 V AC  
3G3RX- A4□: 3-phase 380 to 480 V AC
- Make sure that the motor output terminals (U/T1, V/T2, and W/T3) are connected to the motor correctly.
- Make sure that the control circuit terminals and the control device are wired correctly and that all control terminals are turned off.
- Set the motor to no-load status (i.e., not connected to the mechanical system).

#### ■ Power On

- After checking the above, turn on the power.

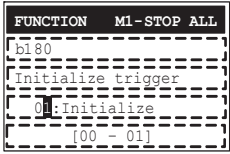
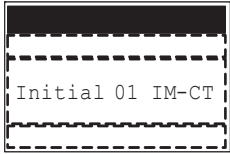
### Display Status Check

- When the power is turned on normally, the display shows:  
[Normal] RUN LED indicator (during RUN) : ON      ALARM LED indicator : OFF  
POWER LED indicator : ON  
Data display : Displays the set value in d001
- If an error occurs, refer to "Chapter 5 Maintenance Operations" and make the necessary changes to remedy.  
[Fault] RUN LED indicator (during RUN) : OFF      ALARM LED indicator : ON  
POWER LED indicator : ON  
Data display : An error code, such as "E01", is displayed.  
(The display varies depending on the type of error.)

## Parameter Initialization

- Initialize the parameters using the following procedure.
- To initialize the parameters, set parameter b084 to "2" and parameter b180 to "1".

| Key sequence | Display example | Description                                                                   |
|--------------|-----------------|-------------------------------------------------------------------------------|
|              |                 | Power On                                                                      |
|              |                 | Press the Prev. Page or Next Page key until function mode is displayed.       |
|              |                 | Press the Set key to enter function mode.                                     |
|              |                 | With the Prev. Page, Next Page, Up and Down keys write the parameter b084.    |
|              |                 | Press the Set key to enter b084 parameter.                                    |
|              |                 | With the Prev. Page, Next Page, Up and Down keys put the parameter b084 to 2. |
|              |                 | Press the Set key to change the parameter b084 to 2.                          |
|              |                 | With the Prev. Page, Next Page, Up and Down keys write the parameter b180.    |
|              |                 | Press the Set key to enter b180 parameter.                                    |

| Key sequence                                                                      | Display example                                                                   | Description                                                                    |
|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|--------------------------------------------------------------------------------|
|  |  | With the Prev. Page, Next Page, Up and Down keys put the parameter b180 to 1.  |
|  |  | Press the Set key to change the parameter b180 to 1 and initialize parameters. |

## No-load Operation

- Start the no-load motor (i.e., not connected to the mechanical system) using the Digital Operator.

### ■ Stopping the Motor

- After completing the no-load operation, press the STOP/RESET key. The motor will stop.

## Actual Load Operation

- After checking the operation with the motor in the no-load status, connect the mechanical system and operate with an actual load.

### ■ Connecting the Mechanical System

- After confirming that the motor has stopped completely, connect the mechanical system.
- Be sure to tighten all the screws when fixing the motor axis and the mechanical system.

### ■ Operation via the Digital Operator

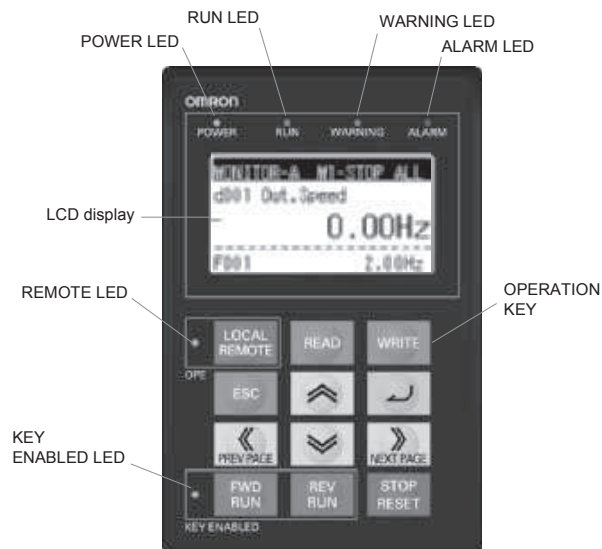
- Because a possible error may occur during operation, make sure that the STOP/RESET key on the Digital Operator is easily accessible.
- Use the Digital Operator to operate the Inverter the same way as in no-load operation.

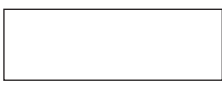
### ■ Checking the Operating Status

- After making sure that the operating direction is correct and that the Inverter is operating smoothly at a slow speed, increase the frequency reference.
  - By changing the frequency reference or the rotation direction, make sure that there is no vibration or abnormal sound from the motor.
- Make sure that the output current (output current monitor [d002]) is not excessive.

## 3-7 Part Names and Descriptions of the Digital Operator

### Part Names and Descriptions



|                                                                                     | Name                  | Function                                                                                                                                                                                                                                                             |
|-------------------------------------------------------------------------------------|-----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | POWER LED indicator   | Light on when the power is supplied to the LCD digital operator.                                                                                                                                                                                                     |
|  | RUN LED indicator     | Light on when the Inverter is running.                                                                                                                                                                                                                               |
|  | WARNING LED indicator | Light on when set value is incorrect.                                                                                                                                                                                                                                |
|  | ALARM LED indicator   | Light on when the Inverter trips.                                                                                                                                                                                                                                    |
|  | Remote LED            | Light on when the REMOTE key makes the compulsion operation function effective. It doesn't light when the compulsion operation function is effective by input terminal OPE. (Press the key more than 2 seconds)                                                      |
|  | Key Enabled LED       | Light on only when operation command is set in LCD digital operator.                                                                                                                                                                                                 |
|  | LCD Display           | Displays relevant data, such as frequency reference, output current, and set values.                                                                                                                                                                                 |
|  | LOCAL REMOTE key      | It changes from Local to Remote mode. Press the key during 2 seconds to change from Local to Remote or Remote to Local. When it is in Local the OPE led will be ON. Use Local to control the motor with LCD digital operator keys (Run Fwd, Run Rev and Stop/Reset). |
|  | READ key              | It transfers inverter parameters to the LCD digital operator's memory.                                                                                                                                                                                               |
|  | WRITE key             | It copies one Parameter Set or a Parameter Set + Drive Programming saved in LCD digital operator to the inverter.                                                                                                                                                    |
|  | ESC key               | It returns to the above layer.                                                                                                                                                                                                                                       |
|  | SET key               | It jumps to the below layer or stores the change introduces on the edit layer (after that it jumps to the above layer).                                                                                                                                              |

|                                                                                   | Name           | Function                                                                                                                                                                                                                            |
|-----------------------------------------------------------------------------------|----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | UP key         | It is used to move up the cursor, it increases a function code in 1 or increases a parameter value.                                                                                                                                 |
|  | DOWN key       | It is used to move down the cursor, it decreases a function code in 1 or it decreases a value.                                                                                                                                      |
|  | PREV. PAGE key | It is used to move the cursor to the left, or it moves to previous mode when the display is a navigation level.                                                                                                                     |
|  | NEXT PAGE key  | It is used to move the cursor to the right, or it moves to the next mode when the display is a navigation level.                                                                                                                    |
|  | FWD RUN key    | It is used to run forward the motor only when the operation command (A002) is reset in Digital operator.                                                                                                                            |
|  | REV RUN key    | It is used to run reverse the motor only when the operation command (A002) is set in Digital operator.                                                                                                                              |
|  | STOP/RESET key | It is used to stop the motor or reset an alarm. It is also possible to invalidate the STOP key by B087 parameter. Besides it does not response when LCD digital operator is reading or writing the parameters from/to the inverter. |

## Display System and Key Sequence of Each Code

- This section explains the examples of typical operation (Basic display, Complete display) and the extended function mode U as a special operation.  
This operation can be performed when other display modes are selected.

The display indicates the setting of "b038" when the power is turned on. For details, refer to "Initial Screen Selection (Initial Screen at Power-ON)" (page 4-56).  
When "b038 = 1" (factory default), output frequency monitor "d001" is displayed.

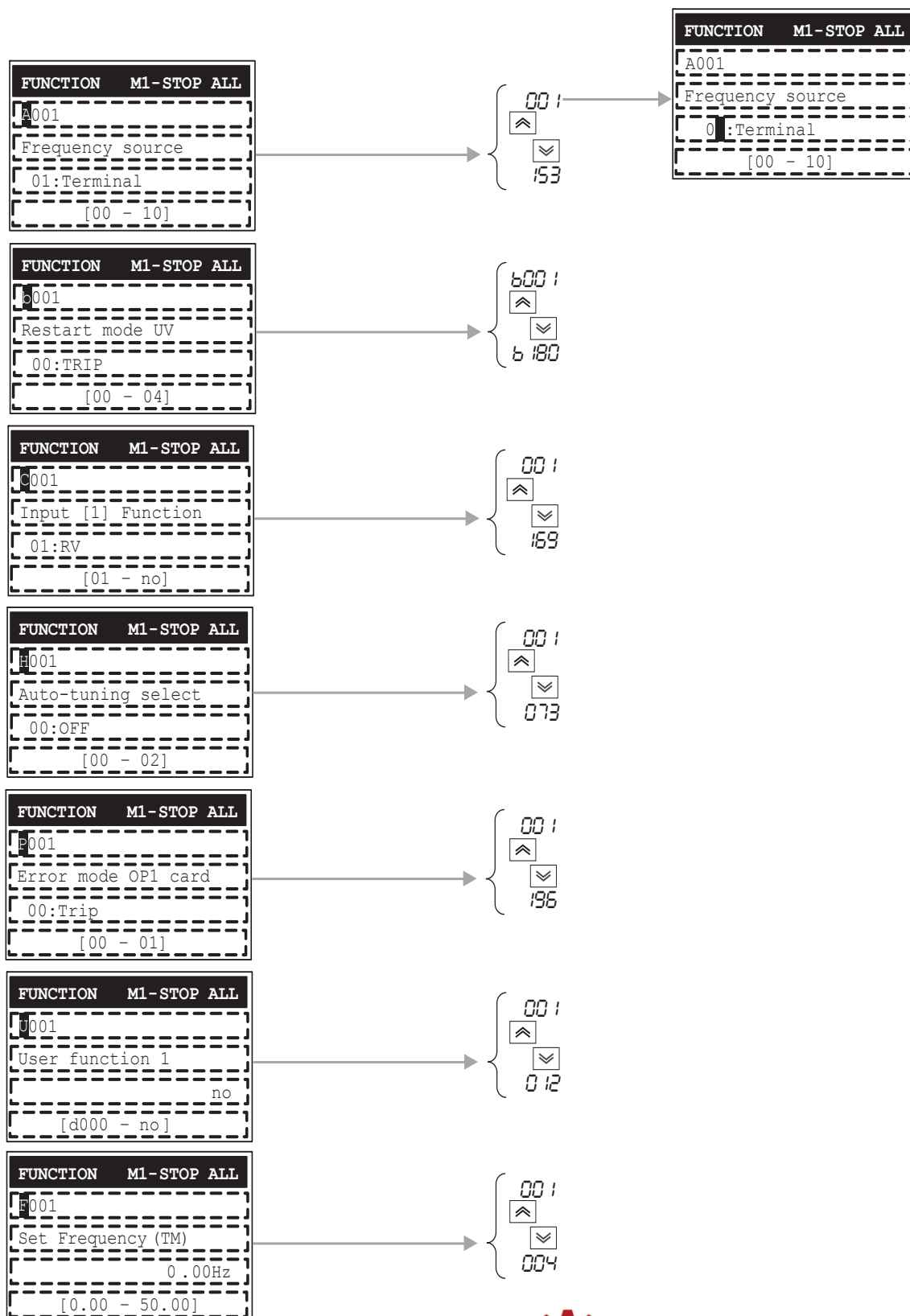
Note: The Digital Operator display varies depending on the settings of display selection "b037", initial screen selection "b038", and user parameter automatic setting function selection "b039". For details, refer to "Display Selection" (page 4-53), "Initial Screen Selection (Initial Screen at Power-ON)" (page 4-56), "User Parameter Automatic Setting Function" (page 4-57).

| Item                                                | Function code | Data    | Description                                |
|-----------------------------------------------------|---------------|---------|--------------------------------------------|
| Display selection                                   | b037          | 00      | Complete display (factory default)         |
|                                                     |               | 01      | Individual display of functions            |
|                                                     |               | 02      | User setting                               |
|                                                     |               | 03      | Data comparison display                    |
|                                                     |               | 04      | Basic display                              |
| Initial screen selection<br>(Power On)              | b038          | 000     | Screen when the Enter key was pressed last |
|                                                     |               | 001-060 | d001-d060 displayed                        |
|                                                     |               | 201     | F001 (Output frequency setting/monitor)    |
|                                                     |               | 202     | Monitor screen                             |
| User parameter automatic setting function selection | b039          | 00      | Disabled (factory default)                 |
|                                                     |               | 01      | Enabled                                    |

## 3-8 Parameter Transition

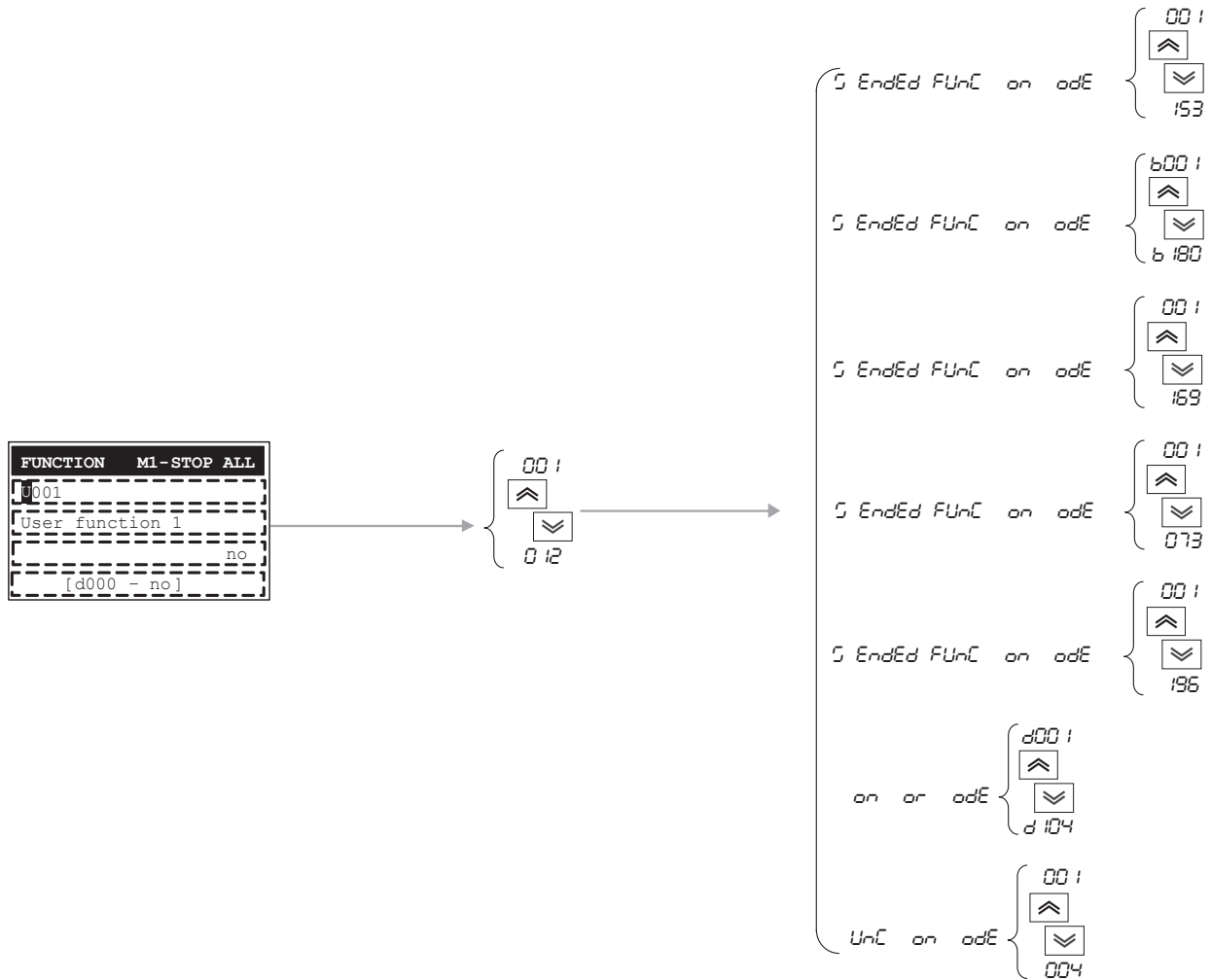
### ■ Operation Example for Complete Display (Default: "b037 = 00")

Displays all parameters.



## ■ User Functions

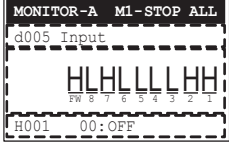
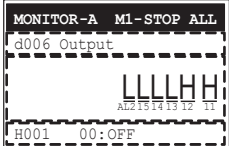
The extended function mode U is the parameter to optionally register (or automatically record) other extended function codes, and differs in operation from other extended function modes.



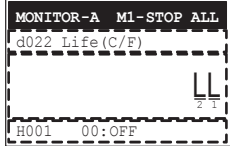
## 3-9 Parameter List

### Monitor Mode (d□□□)

•The default setting displays "d001" at power-on. To select the optional display, change the setting in "b038".

| Parameter No. | Function name                               | Monitor or data range                                                                                                                                                                                                            | Default setting | Changes during operation | Unit | Page |
|---------------|---------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|--------------------------|------|------|
| d001          | Output frequency monitor                    | 0.00 to 400.00                                                                                                                                                                                                                   | —               | Yes                      | Hz   | 4-1  |
| d002          | Output current monitor                      | 0.0 to 9999.0                                                                                                                                                                                                                    | —               | —                        | A    | 4-1  |
| d003          | Rotation direction monitor                  | FWD: Forward<br>STOP: Stop<br>REV: Reverse                                                                                                                                                                                       | —               | —                        | —    | 4-1  |
| d004          | PID feedback value monitor                  | 0.00 to 999000.00<br>(Enabled when the PID function is selected)                                                                                                                                                                 | —               | —                        | —    | 4-1  |
| d005          | Multi-function input monitor                |  <p>Example<br/>FW, Multi-function input terminals 7, 2, 1: ON<br/>Multi-function input terminals 8, 6, 5, 4, 3: OFF</p>                       | —               | —                        | —    | 4-2  |
| d006          | Multi-function output monitor               |  <p>Example<br/>Multi-function output terminals 12, 11: ON<br/>Relay output terminal AL2, Multi-function output terminals 15, 14, 13: OFF</p> | —               | —                        | —    | 4-2  |
| d007          | Output frequency monitor (after conversion) | 0.00 to 39960.00<br>(Output frequency × Conversion factor of b086)                                                                                                                                                               | —               | Yes                      | —    | 4-2  |
| d008          | Real frequency monitor                      | -400.00 to 400.00                                                                                                                                                                                                                | —               | —                        | Hz   | 4-3  |
| d009          | Torque reference monitor                    | -200 to 200                                                                                                                                                                                                                      | —               | —                        | %    | 4-3  |
| d010          | Torque bias monitor                         | -200 to 200                                                                                                                                                                                                                      | —               | —                        | %    | 4-3  |
| d012          | Output torque monitor                       | -200 to 200                                                                                                                                                                                                                      | —               | —                        | %    | 4-3  |
| d013          | Output voltage monitor                      | 0.0 to 600.0                                                                                                                                                                                                                     | —               | —                        | V    | 4-3  |
| d014          | Input power monitor                         | 0.0 to 999.9                                                                                                                                                                                                                     | —               | —                        | W    | 4-4  |
| d015          | Power ON time monitor                       | 0.0 to 999999.9                                                                                                                                                                                                                  | —               | —                        | —    | 4-4  |
| d016          | Total RUN time                              | 0 to 999999                                                                                                                                                                                                                      | —               | —                        | h    | 4-4  |
| d017          | Power ON time monitor                       | 0 to 999999                                                                                                                                                                                                                      | —               | —                        | h    | 4-4  |
| d018          | Fin temperature monitor                     | -020. to 200.0                                                                                                                                                                                                                   | —               | —                        | °C   | 4-4  |



| Parameter No. | Function name                          | Monitor or data range                                                                                                                                                  | Default setting | Changes during operation | Unit | Page         |
|---------------|----------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|--------------------------|------|--------------|
| d019          | Motor temperature monitor              | -020. to 200.0                                                                                                                                                         | —               | —                        | °C   | 4-5          |
| d022          | Life assessment monitor                |  <p>1: Main circuit board capacitor service life<br/>2: Cooling fan rpm reduction</p> | —               | —                        | —    | 4-5          |
| d023          | Program counter                        | 0 to 1024                                                                                                                                                              | —               | —                        | —    | —            |
| d024          | Program number                         | 0 to 9999                                                                                                                                                              | —               | —                        | —    | —            |
| d025          | Drive programming monitor (UM0)        | -2147483647 to 2147483647                                                                                                                                              | —               | —                        | —    | —            |
| d026          | Drive programming monitor (UM1)        | -2147483647 to 2147483647                                                                                                                                              | —               | —                        | —    | —            |
| d027          | Drive programming monitor (UM2)        | -2147483647 to 2147483647                                                                                                                                              | —               | —                        | —    | —            |
| d028          | Pulse counter monitor                  | 0 to 2147483647                                                                                                                                                        | —               | —                        | —    | 4-6          |
| d029          | Position command monitor               | -1073741823 to 1073741823 when HAPR is selected<br>-268435456 to 268435456 when APR2 is selected.                                                                      | —               | —                        | —    | 4-6          |
| d030          | Current position monitor               | -1073741823 to 1073741823 when HAPR is selected<br>-268435456 to 268435456 when APR2 is selected.                                                                      | —               | —                        | —    | 4-6<br>4-137 |
| d031          | Clock                                  | Setting Data and Time for the LCD digital operator                                                                                                                     | —               | —                        | —    | —            |
| d060          | Inverter mode                          | 00 to 01                                                                                                                                                               | —               | —                        | —    | —            |
| d080          | Fault frequency monitor                | 0 to 65535                                                                                                                                                             | —               | —                        | Time | 4-6          |
| d081          | Fault monitor 1 (Latest)               | Error code (condition of occurrence)<br>→Output frequency [Hz] → Output current [A]<br>→Internal DC voltage [V]<br>→RUN time [h]<br>→ON time [h]                       | —               | —                        | —    | 4-7          |
| d082          | Fault monitor 2                        |                                                                                                                                                                        |                 |                          |      | 4-7          |
| d083          | Fault monitor 3                        |                                                                                                                                                                        |                 |                          |      | 4-7          |
| d084          | Fault monitor 4                        |                                                                                                                                                                        |                 |                          |      | 4-7          |
| d085          | Fault monitor 5                        |                                                                                                                                                                        |                 |                          |      | 4-7          |
| d086          | Fault monitor 6                        |                                                                                                                                                                        |                 |                          |      | 4-7          |
| d090          | Warning monitor                        | Warning code<br>0 to 385                                                                                                                                               | —               | —                        | —    | 4-7          |
| d102          | DC voltage monitor                     | 0.0 to 999.9                                                                                                                                                           | —               | —                        | V    | 4-7          |
| d103          | Regenerative braking load rate monitor | 0.0 to 100.0                                                                                                                                                           | —               | —                        | %    | 4-7          |
| d104          | Electronic thermal monitor             | 0.0 to 100.0                                                                                                                                                           | —               | —                        | %    | 4-7          |

**Basic Function Mode (F□□□)**

| Parameter No. | Function name                         | Monitor or data range                                                  | Default setting | Changes during operation | Unit | Page |
|---------------|---------------------------------------|------------------------------------------------------------------------|-----------------|--------------------------|------|------|
| F001          | Output frequency setting/monitor      | 0.0/Starting frequency to 1st/2nd/3rd max. frequency<br>0.00 to 400.00 | 0.00            | Yes                      | Hz   | 4-8  |
| F002          | Acceleration time 1                   | 0.01 to 3600.00                                                        | 10.00           | Yes                      | s    | 4-8  |
| F202          | * 2nd acceleration time 1             | 0.01 to 3600.00                                                        | 10.00           | Yes                      | s    | 4-8  |
| F302          | * 3rd acceleration time 1             | 0.01 to 3600.00                                                        | 10.00           | Yes                      | s    | 4-8  |
| F003          | Deceleration time 1                   | 0.01 to 3600.00                                                        | 10.00           | Yes                      | s    | 4-8  |
| F203          | * 2nd deceleration time 1             | 0.01 to 3600.00                                                        | 10.00           | Yes                      | s    | 4-8  |
| F303          | * 3rd deceleration time 1             | 0.01 to 3600.00                                                        | 10.00           | Yes                      | s    | 4-8  |
| F004          | Operator rotation direction selection | 00: FWD (Forward)<br>01: REV (Reverse)                                 | 00              | No                       | —    | 4-9  |

\* 2nd/3rd control is displayed when "SET(08)/SET3(17)" is allocated to one of multi-function inputs from C001 to C008.

## Extended Function Mode

| Parameter No.        | Function name | Monitor or data range                                                                                                                                                                                                                                                                                                                                                                                                                                     | Default setting                    | Changes during operation | Unit | Page          |               |
|----------------------|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|--------------------------|------|---------------|---------------|
| Basic setting        | A001          | Frequency reference selection<br>00: VR (Digital Operator (FREQ adjuster))<br>(Enabled when 3G3AX-OP01 is used.)<br>01: Terminal<br>02: Digital Operator (F001)<br>03: RS485 (ModBus communication)<br>04: Option 1<br>05: Option 2<br>06: Pulse train frequency<br>07: EzSQ (Drive programming)<br>10: (Math) Operation function result                                                                                                                  | 01                                 | No                       | —    | 4-10<br>4-144 |               |
|                      | A002          | RUN command selection<br>01: Terminal<br>02: Digital Operator (F001)<br>03: RS485 (ModBus communication)<br>04: Option 1<br>05: Option 2                                                                                                                                                                                                                                                                                                                  | 01                                 | No                       | —    | 4-11          |               |
|                      | A003          | Base frequency                                                                                                                                                                                                                                                                                                                                                                                                                                            | 30 to Maximum frequency [A004]     | 50                       | No   | Hz            | 4-11<br>4-112 |
|                      | A203          | * 2nd set base frequency                                                                                                                                                                                                                                                                                                                                                                                                                                  | 30 to 2nd maximum frequency [A204] | 50                       |      |               | 4-11          |
|                      | A303          | * 3rd set base frequency                                                                                                                                                                                                                                                                                                                                                                                                                                  | 30 to 3rd maximum frequency [A304] | 50                       |      |               |               |
|                      | A004          | Maximum frequency                                                                                                                                                                                                                                                                                                                                                                                                                                         | A003 to 400                        | 50                       | No   | Hz            | 4-12          |
|                      | A204          | * 2nd maximum frequency                                                                                                                                                                                                                                                                                                                                                                                                                                   | A203 to 400                        | 50                       |      |               |               |
|                      | A304          | * 3rd maximum frequency                                                                                                                                                                                                                                                                                                                                                                                                                                   | A303 to 400                        | 50                       |      |               |               |
| Analog input, Others | A005          | O/OI selection<br>00: [O]/[O2] Switches between O/OI via terminal AT<br>01: [O]/[O2] Switches between O/O2 via terminal AT<br>02: [O]/VR Switches between O/FREQ adjuster via terminal AT<br>(Enabled only when 3G3AX-OP01 is used)<br>03: [OI]/VR Switches between OI/FREQ adjuster via terminal AT<br>(Enabled only when 3G3AX-OP01 is used)<br>04: [O2]/VR Switches between O2/FREQ adjuster via terminal AT<br>(Enabled only when 3G3AX-OP01 is used) | 00                                 | No                       | —    | 4-12          |               |
|                      | A006          | O2 selection<br>00: [O2] only<br>01: [O/OI-P] auxiliary frequency reference (not reversible)<br>02: [O/OI-PM] auxiliary frequency reference (reversible)<br>03: [OFF] O2 disabled                                                                                                                                                                                                                                                                         | 03                                 | No                       | —    | 4-12          |               |

\* 2nd/3rd control is displayed when "SET(08)/SET3(17)" is allocated to one of multi-function inputs from C001 to C008.

| Parameter No.             |      | Function name                      | Monitor or data range                                                                        | Default setting | Changes during operation | Unit | Page        |
|---------------------------|------|------------------------------------|----------------------------------------------------------------------------------------------|-----------------|--------------------------|------|-------------|
| Analog input, Others      | A011 | O start frequency                  | 0.00 to 400.00                                                                               | 0.00            | No                       | Hz   | 4-14        |
|                           | A012 | O end frequency                    | 0.00 to 400.00                                                                               | 0.00            | No                       | Hz   |             |
|                           | A013 | O start ratio                      | 0 to 100                                                                                     | 0               | No                       | %    |             |
|                           | A014 | O end ratio                        | 0 to 100                                                                                     | 100             | No                       | %    |             |
|                           | A015 | O start selection                  | 00: External start frequency<br>(A011 set value)<br>01: 0 Hz                                 | 01              | No                       | —    |             |
|                           | A016 | O, O2, OI sampling                 | 1 to 30<br>31 (with 500 ms filter ± 0.1 Hz hysteresis)                                       | 31              | No                       | —    | 4-15        |
|                           | A017 | Drive Programming (EzSQ) Selection | 0: Disable<br>1: [PRG] start<br>2: Always ON                                                 | 00              | No                       | —    | —           |
| Multi-step speed, Jogging | A019 | Multi-step speed selection         | 00: Binary: 16-step selection with 4 terminals<br>01: Bit: 8-step selection with 7 terminals | 00              | No                       | —    | 4-16        |
|                           | A020 | Multi-step speed reference 0       | 0.00 to Max. Frequency [A004]                                                                | 6.00            | Yes                      | Hz   | 4-8<br>4-16 |
|                           | A220 | * 2nd multi-step speed reference 0 | 0.00 to Max. Frequency [A204]                                                                | 6.00            | Yes                      | Hz   |             |
|                           | A320 | * 3rd multi-step speed reference 0 | 0.00 to Max. Frequency [A304]                                                                | 6.00            | Yes                      | Hz   |             |

\* 2nd/3rd control is displayed when "SET(08)/SET3(17)" is allocated to one of multi-function inputs from C001 to C008.

| Parameter No.             | Function name          | Monitor or data range                                                                                                                                                                                                                                                                                                                                                                                                                  | Default setting                           | Changes during operation | Unit | Page |
|---------------------------|------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------|--------------------------|------|------|
| Multi-step speed, Jogging | A021                   | Multi-step speed reference 1                                                                                                                                                                                                                                                                                                                                                                                                           | 0.00                                      | Yes                      | Hz   | 4-16 |
|                           | A022                   | Multi-step speed reference 2                                                                                                                                                                                                                                                                                                                                                                                                           | 0.00                                      |                          |      |      |
|                           | A023                   | Multi-step speed reference 3                                                                                                                                                                                                                                                                                                                                                                                                           | 0.00                                      |                          |      |      |
|                           | A024                   | Multi-step speed reference 4                                                                                                                                                                                                                                                                                                                                                                                                           | 0.00                                      |                          |      |      |
|                           | A025                   | Multi-step speed reference 5                                                                                                                                                                                                                                                                                                                                                                                                           | 0.00                                      |                          |      |      |
|                           | A026                   | Multi-step speed reference 6                                                                                                                                                                                                                                                                                                                                                                                                           | 0.00                                      |                          |      |      |
|                           | A027                   | Multi-step speed reference 7                                                                                                                                                                                                                                                                                                                                                                                                           | 0.00                                      |                          |      |      |
|                           | A028                   | Multi-step speed reference 8                                                                                                                                                                                                                                                                                                                                                                                                           | 0.00/Starting frequency to Max. frequency |                          |      |      |
|                           | A029                   | Multi-step speed reference 9                                                                                                                                                                                                                                                                                                                                                                                                           | 0.00                                      |                          |      |      |
|                           | A030                   | Multi-step speed reference 10                                                                                                                                                                                                                                                                                                                                                                                                          | 0.00                                      |                          |      |      |
|                           | A031                   | Multi-step speed reference 11                                                                                                                                                                                                                                                                                                                                                                                                          | 0.00                                      |                          |      |      |
|                           | A032                   | Multi-step speed reference 12                                                                                                                                                                                                                                                                                                                                                                                                          | 0.00                                      |                          |      |      |
|                           | A033                   | Multi-step speed reference 13                                                                                                                                                                                                                                                                                                                                                                                                          | 0.00                                      |                          |      |      |
|                           | A034                   | Multi-step speed reference 14                                                                                                                                                                                                                                                                                                                                                                                                          | 0.00                                      |                          |      |      |
|                           | A035                   | Multi-step speed reference 15                                                                                                                                                                                                                                                                                                                                                                                                          | 0.00                                      |                          |      |      |
| A038                      | Jogging frequency      | 0.00/Starting frequency to 9.99                                                                                                                                                                                                                                                                                                                                                                                                        | 6.00                                      | Yes                      | Hz   | 4-18 |
| A039                      | Jogging stop selection | 00: FRS (Free running on jogging stop/ Disabled in operation)<br>01: DEC (Deceleration stop on jogging stop/ Disabled in operation)<br>02: DB (DC injection braking on jogging stop/ Disabled in operation)<br>03: FRS (RUN) (Free running on jogging stop/Enabled in operation)<br>04: DEC (RUN) (Deceleration stop on jogging stop/Enabled in operation)<br>05: DB (RUN) (DC injection braking on jogging stop/Enabled in operation) | 04                                        | No                       | —    |      |

\* 2nd/3rd control is displayed when "SET(08)/SET3(17)" is allocated to one of multi-function inputs from C001 to C008.

| Parameter No.       |                                     | Function name                                                                               | Monitor or data range                                                                                                                                                                                                                               | Default setting | Changes during operation | Unit | Page |
|---------------------|-------------------------------------|---------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|--------------------------|------|------|
| V/f characteristics | A041                                | Torque boost selection                                                                      | 00: Manual torque boost<br>01: Automatic torque boost                                                                                                                                                                                               | 00              | No                       | —    | 4-19 |
|                     | A241                                | * 2nd torque boost selection                                                                |                                                                                                                                                                                                                                                     | 00              |                          |      |      |
|                     | A042                                | Manual torque boost voltage                                                                 | 0.0 to 20.0                                                                                                                                                                                                                                         | 1.0             | Yes                      | %    |      |
|                     | A242                                | * 2nd manual torque boost voltage                                                           |                                                                                                                                                                                                                                                     | 1.0             |                          |      |      |
|                     | A342                                | * 3rd manual torque boost voltage                                                           |                                                                                                                                                                                                                                                     | 1.0             |                          |      |      |
|                     | A043                                | Manual torque boost frequency                                                               | 0.0 to 50.0                                                                                                                                                                                                                                         | 5.0             | Yes                      | %    |      |
|                     | A243                                | * 2nd manual torque boost frequency                                                         |                                                                                                                                                                                                                                                     | 5.0             |                          |      |      |
|                     | A343                                | * 3rd manual torque boost frequency                                                         |                                                                                                                                                                                                                                                     | 5.0             |                          |      |      |
|                     | A044                                | V/f characteristics selection                                                               | 00: VC (Constant torque characteristics)<br>01: VP (Special reduced torque characteristics)<br>02: Free V/f (characteristics)<br>03: SLV (Sensorless vector control)<br>04: 0SLV (0-Hz sensorless vector control)<br>05: V2 (Sensor vector control) | 00              | No                       | —    | 4-21 |
|                     | A244                                | * 2nd V/f characteristics selection                                                         | 00: VC (Constant torque characteristics)<br>01: VP (Special reduced torque characteristics)<br>02: Free V/f (characteristics)<br>03: SLV (Sensorless vector control)<br>04: 0SLV (0-Hz sensorless vector control)<br>05: V2 (Sensor vector control) | 00              |                          |      |      |
| A344                | * 3rd V/f characteristics selection | 00: VC (Constant torque characteristics)<br>01: VP (Special reduced torque characteristics) | 00                                                                                                                                                                                                                                                  |                 |                          |      |      |
| A045                | Output voltage gain                 | 20 to 100                                                                                   | 100                                                                                                                                                                                                                                                 | Yes             | %                        | 4-24 |      |
| V/f characteristics | A046                                | Automatic torque boost voltage compensation gain                                            | 0 to 255                                                                                                                                                                                                                                            | 100             | Yes                      | —    | 4-20 |
|                     | A246                                | * 2nd automatic torque boost voltage compensation gain                                      | 0 to 255                                                                                                                                                                                                                                            | 100             |                          |      |      |
|                     | A047                                | Automatic torque boost slip compensation gain                                               | 0 to 255                                                                                                                                                                                                                                            | 100             | Yes                      | —    |      |
|                     | A247                                | * 2nd automatic torque boost slip compensation gain                                         | 0 to 255                                                                                                                                                                                                                                            | 100             |                          |      |      |

\* 2nd/3rd control is displayed when "SET(08)/SET3(17)" is allocated to one of multi-function inputs from C001 to C008.

| Parameter No.             | Function name | Monitor or data range                                                                                                        | Default setting                                                   | Changes during operation | Unit | Page          |
|---------------------------|---------------|------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------|--------------------------|------|---------------|
| DC injection braking      | A051          | DC injection braking selection<br>00: OFF (Disabled)<br>01: ON (Enabled)<br>02: ON (FQ) (Frequency control [A052 set value]) | 00                                                                | No                       | —    | 4-24<br>4-112 |
|                           | A052          | DC injection braking frequency                                                                                               | 0.50                                                              | No                       | Hz   | 4-24          |
|                           | A053          | DC injection braking delay time                                                                                              | 0.0                                                               | No                       | s    |               |
| DC injection braking      | A054          | DC injection braking power                                                                                                   | 0 to 100 (0.4 to 55 kW)                                           | 50                       | No   | %             |
|                           |               |                                                                                                                              | 0 to 80 (75 to 132 kW)                                            | 40                       | No   | %             |
|                           | A055          | DC injection braking time                                                                                                    | 0.0 to 60.0                                                       | 0.5                      | No   | s             |
|                           | A056          | DC injection braking method selection                                                                                        | 00: Edge operation<br>01: Level operation                         | 01                       | No   | —             |
|                           | A057          | Startup DC injection braking power                                                                                           | 0 to 100 (0.4 to 55 kW)<br>0 to 80 (75 to 132 kW)                 | 0                        | No   | %             |
|                           | A058          | Startup DC injection braking time                                                                                            | 0.0 to 60.0                                                       | 0.0                      | No   | s             |
|                           | A059          | DC injection braking carrier frequency                                                                                       | 0.5 to 15.0 (0.4 to 55 kW)                                        | 5.0                      | No   | kHz           |
|                           |               |                                                                                                                              | 0.5 to 10.0 (75 to 132 kW)                                        | 3.0                      | No   | kHz           |
| Upper/Lower limiter, Jump | A061          | Frequency upper limit                                                                                                        | 0.00/Frequency lower limit to Max. frequency                      | 0.00                     | No   | Hz            |
|                           | A261          | * 2nd frequency upper limit                                                                                                  | 0.00/2nd frequency lower limit to 2nd Max. frequency              | 0.00                     |      |               |
|                           | A062          | Frequency lower limit                                                                                                        | 0.00/Starting frequency to Frequency upper limit                  | 0.00                     | No   | Hz            |
|                           | A262          | * 2nd frequency lower limit                                                                                                  | 0.00/Starting frequency to 2nd frequency upper limit              | 0.00                     |      |               |
| Upper/Lower limit, Jump   | A063          | Jump frequency 1                                                                                                             | Jump frequency: 0.0 to 400.0<br>Jump frequency width: 0.0 to 10.0 | 0.00                     | No   | Hz            |
|                           | A064          | Jump frequency width 1                                                                                                       |                                                                   | 0.50                     |      |               |
|                           | A065          | Jump frequency 2                                                                                                             |                                                                   | 0.00                     |      |               |
|                           | A066          | Jump frequency width 2                                                                                                       |                                                                   | 0.50                     |      |               |
|                           | A067          | Jump frequency 3                                                                                                             |                                                                   | 0.00                     |      |               |
|                           | A068          | Jump frequency width 3                                                                                                       |                                                                   | 0.50                     |      |               |
|                           | A069          | Acceleration stop frequency                                                                                                  | 0.00 to 400.00                                                    | 0.00                     | No   | Hz            |
|                           | A070          | Acceleration stop time                                                                                                       | 0.0 to 60.0                                                       | 0.0                      | No   | s             |

\* 2nd/3rd control is displayed when "SET(08)/SET3(17)" is allocated to one of multi-function inputs from C001 to C008.

| Parameter No. | Function name                              | Monitor or data range                                                                                                            | Default setting | Changes during operation | Unit | Page |
|---------------|--------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------|-----------------|--------------------------|------|------|
| A071          | PID selection                              | 00: OFF (Disabled)<br>01: ON (+) (Enabled)<br>02: ON (+/-) (Reverse output enabled)                                              | 00              | No                       | —    | 4-31 |
|               | PID P gain                                 | 0.2 to 5.0                                                                                                                       | 1.0             | Yes                      | —    |      |
|               | PID I gain                                 | 0.0 to 3600.0                                                                                                                    | 1.0             | Yes                      | s    |      |
|               | PID D gain                                 | 0.00 to 100.00                                                                                                                   | 0.00            | Yes                      | s    |      |
|               | PID scale                                  | 0.01 to 99.99                                                                                                                    | 1.00            | No                       | Time |      |
|               | PID feedback selection                     | 00: OI<br>01: O<br>02: Modbus (RS485 communication)<br>03: Pulse (Pulse train frequency)<br>10: Math (Operation function output) | 00              | No                       | —    |      |
|               | Reverse PID function                       | 00: OFF (Deviation = Target value - Feedback value)<br>01: ON (Deviation = Feedback value - Target value)                        | 00              | No                       | —    |      |
|               | PID output limit function                  | 0.0 to 100.0                                                                                                                     | 0.0             | No                       | %    |      |
| A079          | PID feedforward selection                  | 00: Disabled<br>01: O<br>02: OI<br>03: O2                                                                                        | 00              | No                       | —    | 4-31 |
|               |                                            |                                                                                                                                  |                 |                          |      |      |
| A081          | AVR selection                              | 00: Always ON<br>01: Always OFF<br>02: OFF during deceleration                                                                   | 02              | No                       | —    | 4-35 |
|               | AVR voltage selection                      | 200-V class: 200/215/220/230/240<br>400-V class: 380/400/415/440/460/480                                                         | 200/400         | No                       | V    |      |
| A085          | RUN mode selection                         | 00: Normal operation<br>01: Energy-saving operation<br>02: Automatic operation                                                   | 00              | No                       | —    | 4-36 |
|               | Energy-saving response/accuracy adjustment | 0.0 to 100.0                                                                                                                     | 50.0            | Yes                      | —    |      |

\* 2nd/3rd control is displayed when "SET(08)/SET3(17)" is allocated to one of multi-function inputs from C001 to C008.



| Parameter No.                                 |      | Function name                                     | Monitor or data range                                                                                                                                       | Default setting | Changes during operation | Unit | Page |      |
|-----------------------------------------------|------|---------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|--------------------------|------|------|------|
| RUN mode, Acceleration/Deceleration functions | A092 | Acceleration time 2                               | 0.01 to 3600.00                                                                                                                                             | 10.00           | Yes                      | s    | 4-37 |      |
|                                               | A292 | * 2nd acceleration time 2                         |                                                                                                                                                             | 10.00           |                          |      |      |      |
|                                               | A392 | * 3rd acceleration time 2                         |                                                                                                                                                             | 10.00           |                          |      |      |      |
|                                               | A093 | Deceleration time 2                               |                                                                                                                                                             | 10.00           |                          |      |      |      |
|                                               | A293 | * 2nd deceleration time 2                         |                                                                                                                                                             | 10.00           |                          |      |      |      |
|                                               | A393 | * 3rd deceleration time 2                         |                                                                                                                                                             | 10.00           |                          |      |      |      |
|                                               | A094 | 2-step acceleration/ deceleration selection       | 00: 2CH-Terminal (Switched via multi-function input 09)<br>01: Preset FQ (Switched by setting)<br>02: FWD-REV (Enabled only when switching forward/reverse) | 00              | No                       | —    |      |      |
|                                               | A294 | * 2nd 2-step acceleration/ deceleration selection |                                                                                                                                                             | 00              |                          |      |      |      |
|                                               | A095 | 2-step acceleration frequency                     | 0.00 to 400.00                                                                                                                                              | 0.00            | No                       | Hz   |      |      |
|                                               | A295 | * 2nd 2-step acceleration frequency               |                                                                                                                                                             | 0.00            |                          |      |      |      |
|                                               | A096 | 2-step deceleration frequency                     |                                                                                                                                                             | 0.00            | No                       | Hz   |      |      |
|                                               | A296 | * 2nd 2-step deceleration frequency               |                                                                                                                                                             | 0.00            |                          |      |      |      |
|                                               | A097 | Acceleration pattern selection                    | 00: Line<br>01: S-curve<br>02: U-curve<br>03: inv. U curve<br>04: EL-S curve                                                                                | 01              | No                       | —    |      | 4-38 |
|                                               | A098 | Deceleration pattern selection                    |                                                                                                                                                             | 01              | No                       | —    |      |      |

\* 2nd/3rd control is displayed when "SET(08)/SET3(17)" is allocated to one of multi-function inputs from C001 to C008.

| Parameter No.                 | Function name | Monitor or data range                  | Default setting                                                                                                                                                                                                                                                            | Changes during operation | Unit | Page |
|-------------------------------|---------------|----------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|------|------|
| External frequency adjustment | A101          | OI start frequency                     | 0.00                                                                                                                                                                                                                                                                       | No                       | Hz   | 4-14 |
|                               | A102          |                                        | 0.00                                                                                                                                                                                                                                                                       | No                       | Hz   |      |
|                               | A103          | OI start ratio                         | 20                                                                                                                                                                                                                                                                         | No                       | %    |      |
|                               | A104          | OI end ratio                           | 100                                                                                                                                                                                                                                                                        | No                       | %    |      |
|                               | A105          | OI start selection                     | 00: Start FQ (Use OI start frequency [A101])<br>01: 0 Hz                                                                                                                                                                                                                   | No                       | —    | 4-15 |
|                               | A111          | O2 start frequency                     | 0.00                                                                                                                                                                                                                                                                       | No                       | Hz   |      |
| External frequency adjustment | A112          | O2 end frequency                       | 0.00                                                                                                                                                                                                                                                                       | No                       | Hz   |      |
|                               | A113          | O2 start ratio                         | -100                                                                                                                                                                                                                                                                       | No                       | %    |      |
| External frequency adjustment | A114          | O2 end ratio                           | 100                                                                                                                                                                                                                                                                        | No                       | %    | 4-38 |
|                               | A131          | Acceleration curve parameter           | 02                                                                                                                                                                                                                                                                         | No                       | —    |      |
| Accel/Decel                   | A132          | Deceleration curve parameter           | 02                                                                                                                                                                                                                                                                         | No                       | —    | 4-41 |
|                               | A141          | Operation frequency input A setting    | 00: Operator (Digital Operator (F001))<br>01: VR (Digital Operator (FREQ adjuster))<br>(Enabled when 3G3AX-OP01 is used.)<br>02: O (Input O)<br>03: OI (Input OI)<br>04: Modbus (RS485 communication)<br>05: Option 1<br>06: Option 2<br>07: Pulse (Pulse train frequency) | No                       | —    |      |
| Operation frequency           | A142          | Operation frequency input B setting    | 03                                                                                                                                                                                                                                                                         | No                       | —    | 4-39 |
|                               | A143          | Operator selection                     | 00: ADD (Addition (A + B))<br>01: SUB (Subtraction (A - B))<br>02: MUL (Multiplication (A × B))                                                                                                                                                                            | No                       | —    |      |
|                               | A145          | Frequency addition amount              | 0.00 to 99.99<br>100.0 to 400.0                                                                                                                                                                                                                                            | No                       | Hz   |      |
|                               | A146          | Frequency addition direction           | 00: ADD (Add A145 value to output frequency)<br>01: SUB (Subtract A145 value from output frequency)                                                                                                                                                                        | No                       | —    |      |
| Acceleration/Deceleration     | A150          | EL-S-curve ratio 1 during acceleration | 10                                                                                                                                                                                                                                                                         | No                       | %    | 4-39 |
|                               | A151          | EL-S-curve ratio 2 during acceleration | 10                                                                                                                                                                                                                                                                         | No                       | %    |      |
|                               | A152          | EL-S-curve ratio 1 during deceleration | 10                                                                                                                                                                                                                                                                         | No                       | %    |      |
|                               | A153          | EL-S-curve ratio 2 during deceleration | 10                                                                                                                                                                                                                                                                         | No                       | %    |      |

\* 2nd/3rd control is displayed when "SET(08)/SET3(17)" is allocated to one of multi-function inputs from C001 to C008.

| Parameter No.                             | Function name | Monitor or data range                                                                                                                                                                                                               | Default setting | Changes during operation | Unit | Page                 |
|-------------------------------------------|---------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|--------------------------|------|----------------------|
| Momentary power interruption/Trip restart | b001          | Retry selection<br>00: TRIP (Alarm)<br>01: 0 Hz start<br>02: f-match (Frequency matching start)<br>03: f-match Trip (Trip after frequency matching deceleration stop)<br>04: Actv. f-match (Active Frequency Matching restart)      | 00              | No                       | —    | 4-42                 |
|                                           | b002          | Allowable momentary power interruption time                                                                                                                                                                                         | 1.0             | No                       | s    |                      |
|                                           | b003          | Retry wait time                                                                                                                                                                                                                     | 1.0             | No                       | s    | 4-87                 |
|                                           | b004          | Momentary power interruption/ undervoltage trip during stop selection<br>00: OFF (Disabled)<br>01: ON (Enabled)<br>02: Decel-OFF (Disabled during stop and deceleration stop)                                                       | 00              | No                       | —    | 4-42                 |
|                                           | b005          | Momentary power interruption retry time selection<br>00: 16 times<br>01: No limit                                                                                                                                                   | 00              | No                       | —    |                      |
| Momentary power interruption/Trip restart | b006          | Input phase loss protection selection<br>00: OFF (Disabled)<br>01: ON (Enabled)                                                                                                                                                     | 01              | No                       | —    | 4-46                 |
|                                           | b007          | Frequency matching lower limit frequency setting<br>0.00 to 400.00                                                                                                                                                                  | 0.00            | No                       | Hz   | 4-42<br>4-71<br>4-87 |
|                                           | b008          | Trip retry selection<br>00: TRIP (Alarm)<br>01: 0 Hz start<br>02: f-match (Frequency matching start)<br>03: f-match Trip (Trip after frequency matching deceleration stop)<br>04: Actv. f-match (Active Frequency Matching restart) | 00              | No                       | —    | 4-42                 |
|                                           | b009          | Undervoltage retry time selection<br>00: 16 times<br>01: No limit                                                                                                                                                                   | 00              | No                       | —    | 4-42                 |
|                                           | b010          | Overvoltage/ overcurrent retry time selection<br>1 to 3                                                                                                                                                                             | 3               | No                       | Time |                      |
|                                           | b011          | Trip retry wait time<br>0.3 to 100.0                                                                                                                                                                                                | 1.0             | No                       | s    |                      |

\* 2nd/3rd control is displayed when "SET(08)/SET3(17)" is allocated to one of multi-function inputs from C001 to C008.

| Parameter No. | Function name                                      | Monitor or data range                                                                                                              | Default setting | Changes during operation | Unit | Page |
|---------------|----------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------|-----------------|--------------------------|------|------|
| b012          | Electronic thermal level                           | 0.20 × Rated current to 1.00 × Rated current                                                                                       | Rated current   | No                       | A    | 4-46 |
| b212          | * 2nd electronic thermal level                     |                                                                                                                                    |                 |                          |      |      |
| b312          | * 3rd electronic thermal level                     |                                                                                                                                    |                 |                          |      |      |
| b013          | Electronic thermal characteristics selection       | 00: Reduced TRQ (Reduced torque characteristics)<br>01: Const TRQ (Constant torque characteristics)<br>02: Free set (Free setting) | 00              | No                       | —    | 4-46 |
| b213          | * 2nd electronic thermal characteristics selection |                                                                                                                                    |                 |                          |      |      |
| b313          | * 3rd electronic thermal characteristics selection |                                                                                                                                    |                 |                          |      |      |
| b015          | Free setting, electronic thermal frequency 1       | 0 to 400                                                                                                                           | 0               | No                       | Hz   | 4-46 |
| b017          | Free setting, electronic thermal frequency 2       |                                                                                                                                    |                 |                          |      |      |
| b019          | Free setting, electronic thermal frequency 3       |                                                                                                                                    |                 |                          |      |      |
| b016          | Free setting, electronic thermal current 1         | 0.0 to Rated current                                                                                                               | 0.0             | No                       | A    | 4-46 |
| b018          | Free setting, electronic thermal current 2         |                                                                                                                                    |                 |                          |      |      |
| b020          | Free setting, electronic thermal current 3         |                                                                                                                                    |                 |                          |      |      |

\* 2nd/3rd control is displayed when "SET(08)/SET3(17)" is allocated to one of multi-function inputs from C001 to C008.

| Parameter No.                          | Function name | Monitor or data range                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Default setting      | Changes during operation | Unit | Page         |
|----------------------------------------|---------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|--------------------------|------|--------------|
| Overload limit, Overcurrent Protection | b021          | Overload limit selection<br>00: OFF (Disabled)<br>01: ON-Acc/Cnst (Enabled in acceleration/ constant speed operation)<br>02: ON-Cnst (Enabled in constant speed operation)<br>03: ON-A/C(R) (Enabled in acceleration/ constant speed operation (Accelerates during regeneration))                                                                                                                                                                                                    | 01                   | No                       | —    | 4-49         |
|                                        | b022          | Overload limit level<br>0.20 × Rated current to 2.00 × Rated current (0.4 to 55 kW)<br>0.20 × Rated current to 1.80 × Rated current (75 to 132 kW)                                                                                                                                                                                                                                                                                                                                   | 1.50 × Rated current | No                       | A    |              |
|                                        | b023          | Overload limit parameter<br>0.10 to 30.00                                                                                                                                                                                                                                                                                                                                                                                                                                            | 1.00                 | No                       | s    |              |
|                                        | b024          | Overload limit selection 2<br>00: OFF (Disabled)<br>01: ON-Acc/Cnst (Enabled in acceleration/ constant speed operation)<br>02: ON-Cnst (Enabled in constant speed operation)<br>03: ON-A/C(R) (Enabled in acceleration/ constant speed operation (Accelerates during regeneration))                                                                                                                                                                                                  | 01                   | No                       | —    |              |
|                                        | b025          | Overload limit level 2<br>0.20 × Rated current to 2.00 × Rated current (0.4 to 55 kW)<br>0.20 × Rated current to 1.80 × Rated current (75 to 132 kW)                                                                                                                                                                                                                                                                                                                                 | 1.50 × Rated current | No                       | A    |              |
|                                        | b026          | Overload limit parameter 2<br>0.10 to 30.00                                                                                                                                                                                                                                                                                                                                                                                                                                          | 1.00                 | No                       | s    | 4-51         |
|                                        | b027          | Overcurrent suppression function<br>00: OFF (Disabled)<br>01: ON (Enabled)                                                                                                                                                                                                                                                                                                                                                                                                           | 00                   | No                       | —    |              |
|                                        | b028          | Active Frequency Matching restart level<br>0.20 × Rated current to 2.00 × Rated current (0.4 to 55 kW)<br>0.20 × Rated current to 1.80 × Rated current (75 to 132 kW)                                                                                                                                                                                                                                                                                                                | Rated current        | No                       | A    |              |
|                                        | b029          | Active Frequency Matching restart parameter<br>0.10 to 30.00                                                                                                                                                                                                                                                                                                                                                                                                                         | 0.50                 | No                       | s    |              |
|                                        | b030          | Starting frequency at Active Frequency Matching restart<br>00: Off FQ (Frequency at interruption)<br>01: Max.FQ (Max. frequency)<br>02: Set FQ (Set frequency)                                                                                                                                                                                                                                                                                                                       | 00                   | No                       | —    | 4-43<br>4-71 |
| Lock                                   | b031          | Soft lock selection<br>00: Lock (SFT) (Data other than b031 cannot be changed when terminal SFT is ON)<br>01: Only FQ (SFT) (Data other than b031 and the specified frequency parameter cannot be changed when terminal SFT is ON)<br>02: Lock (Data other than b031 cannot be changed)<br>03: Only FQ (Data other than b031 and the specified frequency parameter cannot be changed)<br>10: RUN chg mode (Data other than parameters changeable during operation cannot be changed) | 01                   | No                       | —    | 4-51         |

\* 2nd/3rd control is displayed when "SET(08)/SET3(17)" is allocated to one of multi-function inputs from C001 to C008.

| Parameter No. |      | Function name                                             | Monitor or data range                                                                                                                                                         | Default setting | Changes during operation | Unit | Page         |
|---------------|------|-----------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|--------------------------|------|--------------|
| Others        | b034 | RUN time/Power ON time setting                            | 0 to 65535                                                                                                                                                                    | 0               | No                       | h    | 4-52         |
|               | b035 | Rotation direction limit selection                        | 00: FREE (Forward and Reverse are enabled)<br>01: FWD (Only Forward is enabled)<br>02: REV (Only Reverse is enabled)                                                          | 00              | No                       | —    | 4-52         |
|               | b036 | Reduced voltage startup selection                         | 0 (Reduced voltage startup time: small) to 255 (Reduced voltage startup time: large)                                                                                          | 6               | No                       | —    | 4-53         |
|               | b037 | Display selection                                         | 00: All (Complete display)<br>01: Utilized (Individual display of functions)<br>02: User (User setting)<br>03: Compare (Data comparison display)<br>04: Basic (Basic display) | 00              | No                       | —    | 4-53         |
|               | b038 | Initial screen selection                                  | 000 to 202                                                                                                                                                                    | 001             | No                       | —    | 4-56         |
|               | b039 | User parameter automatic setting function selection       | 00: OFF (Disabled)<br>01: ON (Enabled)                                                                                                                                        | 00              | No                       | —    | 4-57         |
| Torque limit  | b040 | Torque limit selection                                    | 00: 4-quadrant (Four-quadrant separate setting)<br>01: TRQ input (Terminal switch)<br>02: [O] input (Analog input)<br>03: Option 1<br>04: Option 2                            | 00              | No                       | —    | 4-57<br>4-59 |
|               | b041 | Torque limit 1 (Four-quadrant mode forward power running) | 0 to 200 (0.4 to 55 kW)<br>0 to 180 (75 to 132 kW)<br>no (Torque limit disabled)                                                                                              | 150             | No                       | %    | 4-57<br>4-59 |
|               | b042 | Torque limit 2 (Four-quadrant mode reverse regeneration)  | 0 to 200 (0.4 to 55 kW)<br>0 to 180 (75 to 132 kW)<br>no (Torque limit disabled)                                                                                              | 150             | No                       | %    | 4-57<br>4-59 |
|               | b043 | Torque limit 3 (Four-quadrant mode reverse power running) | 0 to 200 (0.4 to 55 kW)<br>0 to 180 (75 to 132 kW)<br>no (Torque limit disabled)                                                                                              | 150             | No                       | %    |              |
|               | b044 | Torque limit 4 (Four-quadrant mode forward regeneration)  | 0 to 200 (0.4 to 55 kW)<br>0 to 180 (75 to 132 kW)<br>no (Torque limit disabled)                                                                                              | 150             | No                       | %    |              |
|               | b045 | Torque LADSTOP selection                                  | 00: OFF (Disabled)<br>01: ON (Enabled)                                                                                                                                        | 00              | No                       | —    | 4-59         |
| Others        | b046 | Reverse rotation prevention selection                     | 00: OFF (Disabled)<br>01: ON (Enabled)                                                                                                                                        | 00              | No                       | —    | 4-59         |
|               | b049 | Dual rate selection                                       | 00: CT (Constant torque)<br>01: VT (Variable torque)                                                                                                                          | 00              | No                       | —    | —            |

\* 2nd/3rd control is displayed when "SET(08)/SET3(17)" is allocated to one of multi-function inputs from C001 to C008.

| Parameter No. | Function name | Monitor or data range                                                                                                                                                                                                | Default setting | Changes during operation | Unit | Page |
|---------------|---------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|--------------------------|------|------|
| Others        | b050          | Selection of non-stop function at momentary power interruption<br>00: OFF (Disabled)<br>01: V-Cnst (STOP) (Enabled (deceleration stop))<br>02: NS1 (Enabled (without recovery))<br>03: NS2 (Enabled (with recovery)) | 00              | No                       | —    | 4-60 |
|               | b051          | Starting voltage of non-stop function at momentary power interruption                                                                                                                                                | 220/440         | No                       | V    |      |
|               | b052          | Stop deceleration level of non-stop function at momentary power interruption                                                                                                                                         | 360/720         | No                       | V    |      |
|               | b053          | Deceleration time of non-stop function at momentary power interruption                                                                                                                                               | 1.00            | No                       | s    |      |
|               | b054          | Deceleration starting width of non-stop function at momentary power interruption                                                                                                                                     | 0.00            | No                       | Hz   |      |
|               | b055          | Proportional gain setting of non-stop function at momentary power interruption                                                                                                                                       | 0.20            | Yes                      | —    |      |
|               | b056          | Integral time setting of non-stop function at momentary power interruption                                                                                                                                           | 0.100           | Yes                      | s    | 4-63 |

\* 2nd/3rd control is displayed when "SET(08)/SET3(17)" is allocated to one of multi-function inputs from C001 to C008.

| Parameter No. | Function name                              | Monitor or data range                                                                                                                                     | Default setting | Changes during operation | Unit | Page |
|---------------|--------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|--------------------------|------|------|
| b060          | Window comparator O upper limit level      | Set an upper limit level.<br>Setting range: 0 to 100<br>Lower limit: Lower limit level + Hysteresis width $\times 2$                                      | 100             | Yes                      | %    | 4-66 |
| b061          | Window comparator O lower limit level      | Set a lower limit level.<br>Setting range: 0 to 100<br>Upper limit: Upper limit level - Hysteresis width $\times 2$                                       | 0               | Yes                      | %    |      |
| b062          | Window comparator O hysteresis width       | Set a hysteresis width for the upper and lower limit levels.<br>Setting range: 0 to 10<br>Upper limit: (Upper limit level - Lower limit level) $\times 2$ | 0               | Yes                      | %    |      |
| b063          | Window comparator OI upper limit level     | Set an upper limit level.<br>Setting range: 0 to 100<br>Lower limit: Lower limit level + Hysteresis width $\times 2$                                      | 100             | Yes                      | %    |      |
| b064          | Window comparator OI lower limit level     | Set a lower limit level.<br>Setting range: 0 to 100<br>Upper limit: Upper limit level - Hysteresis width $\times 2$                                       | 0               | Yes                      | %    |      |
| b065          | Window comparator OI hysteresis width      | Set a hysteresis width for the upper and lower limit levels.<br>Setting range: 0 to 10<br>Upper limit: (Upper limit level - Lower limit level) $\times 2$ | 0               | Yes                      | %    |      |
| b066          | Window comparator O2 upper limit level     | Set an upper limit level.<br>Setting range: -100 to 100<br>Lower limit: Lower limit level + Hysteresis width $\times 2$                                   | 100             | Yes                      | %    | 4-66 |
| b067          | Window comparator O2 lower limit level     | Set a lower limit level.<br>Setting range: -100 to 100<br>Upper limit: Upper limit level - Hysteresis width $\times 2$                                    | -100            | Yes                      | %    |      |
| b068          | Window comparator O2 hysteresis width      | Set a hysteresis width for the upper and lower limit levels.<br>Setting range: 0 to 10<br>Upper limit: (Upper limit level - Lower limit level) $\times 2$ | 0               | Yes                      | %    |      |
| b070          | Analog operation level at O disconnection  | 0 to 100/no (ignored)                                                                                                                                     | no              | No                       | —    |      |
| b071          | Analog operation level at OI disconnection | 0 to 100/no (ignored)                                                                                                                                     | no              | No                       | —    |      |
| b072          | Analog operation level at O2 disconnection | -100 to 100/no (ignored)                                                                                                                                  | no              | No                       | —    |      |

\* 2nd/3rd control is displayed when "SET(08)/SET3(17)" is allocated to one of multi-function inputs from C001 to C008.



| Parameter No. | Function name                                     | Monitor or data range                                                                                                                                                                                                                                                        | Default setting | Changes during operation | Unit | Page          |
|---------------|---------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|--------------------------|------|---------------|
| b078          | Integrated power clear                            | Cleared with the Enter key after changing to 01                                                                                                                                                                                                                              | 00              | Yes                      | —    | 4-4           |
| b079          | Integrated power display gain                     | 1 to 1000                                                                                                                                                                                                                                                                    | 1               | No                       | —    |               |
| b082          | Starting frequency                                | 0.10 to 9.99                                                                                                                                                                                                                                                                 | 0.50            | No                       | Hz   | 4-68          |
| b083          | Carrier frequency                                 | 0.5 to 15.0 (0.4 to 55 kW)<br>*Derating enabled                                                                                                                                                                                                                              | 5.0             | No                       | kHz  | 4-68<br>4-120 |
|               |                                                   | 0.5 to 10.0 (75 to 132 kW)<br>*Derating enabled                                                                                                                                                                                                                              | 3.0             | No                       | kHz  |               |
| b084          | Initialization selection                          | 00: no (Clears the trip monitor)<br>01: Trip data (Initializes data)<br>02: Parameters (Clears the trip monitor and initializes data)<br>03: Trip+Param (Clears the trip monitor and parameters)<br>04: Trp+Prm+EzSQ (Clears the trip monitor, parameters and Drive program) | 00              | No                       | —    | 4-70          |
| b085          | Initialization parameter selection                | 01<br>*Do not change.                                                                                                                                                                                                                                                        | 01              | No                       | —    |               |
| b086          | Frequency conversion coefficient                  | 0.1 to 99.9                                                                                                                                                                                                                                                                  | 1.0             | Yes                      | —    | 4-2           |
| b087          | STOP key selection                                | 00: ON (Enabled)<br>01: OFF (Disabled)<br>02: Only RESET (Disabled only during stop)                                                                                                                                                                                         | 00              | No                       | —    | 4-70          |
| b088          | Free-run stop selection                           | 00: 0 Hz start<br>01: f-match (Frequency matching start)<br>02: Actv. f-match (Active Frequency Matching restart)                                                                                                                                                            | 00              | No                       | —    | 4-71          |
| b089          | Automatic carrier reduction                       | 00: OFF (Disabled)<br>01: ON (Enabled)                                                                                                                                                                                                                                       | 00              | No                       | —    | 4-73          |
| b090          | Usage rate of regenerative braking function       | 0.0 to 100.0                                                                                                                                                                                                                                                                 | 0.0             | No                       | %    | 4-74          |
| b091          | Stop selection                                    | 00: Decel-Stop (Deceleration → Stop)<br>01: Free-RUN (Free-run stop)                                                                                                                                                                                                         | 00              | No                       | —    | 4-70          |
| b092          | Cooling fan control                               | 00: Alws-ON (Always ON)<br>01: ON in RUN (ON during RUN)                                                                                                                                                                                                                     | 01              | No                       | —    | 4-74          |
| b095          | Regenerative braking function operation selection | 00: OFF (Disabled)<br>01: RUN-ON (Enabled (Disabled during stop))<br>02: Alws-ON (Enabled (Enabled during stop))                                                                                                                                                             | 00              | No                       | —    |               |
| b096          | Regenerative braking function ON level            | 330 to 380<br>660 to 760                                                                                                                                                                                                                                                     | 360/<br>720     | No                       | V    |               |
| b098          | Thermistor selection                              | 00: Disabled<br>01: PTC enabled<br>02: NTC enabled                                                                                                                                                                                                                           | 00              | No                       | —    | 4-75          |
| b099          | Thermistor error level                            | 0 to 9999                                                                                                                                                                                                                                                                    | 3000            | No                       | Ω    |               |

\* 2nd/3rd control is displayed when "SET(08)/SET3(17)" is allocated to one of multi-function inputs from C001 to C008.

### 3-9 Parameter List

| Parameter No.   | Function name | Monitor or data range            | Default setting                                                                          | Changes during operation | Unit | Page |
|-----------------|---------------|----------------------------------|------------------------------------------------------------------------------------------|--------------------------|------|------|
| Vf free setting | b100          | Free V/f frequency 1             | 0 to Free V/f frequency 2                                                                | 0                        | No   | Hz   |
|                 | b101          | Free V/f voltage 1               | 0.0 to 800.0                                                                             | 0.0                      | No   | V    |
|                 | b102          | Free V/f frequency 2             | 0 to Free V/f frequency 3                                                                | 0                        | No   | Hz   |
|                 | b103          | Free V/f voltage 2               | 0.0 to 800.0                                                                             | 0.0                      | No   | V    |
|                 | b104          | Free V/f frequency 3             | 0 to Free V/f frequency 4                                                                | 0                        | No   | Hz   |
|                 | b105          | Free V/f voltage 3               | 0.0 to 800.0                                                                             | 0.0                      | No   | V    |
|                 | b106          | Free V/f frequency 4             | 0 to Free V/f frequency 5                                                                | 0                        | No   | Hz   |
|                 | b107          | Free V/f voltage 4               | 0.0 to 800.0                                                                             | 0.0                      | No   | V    |
|                 | b108          | Free V/f frequency 5             | 0 to Free V/f frequency 6                                                                | 0                        | No   | Hz   |
|                 | b109          | Free V/f voltage 5               | 0.0 to 800.0                                                                             | 0.0                      | No   | V    |
|                 | b110          | Free V/f frequency 6             | 0 to Free V/f frequency 7                                                                | 0                        | No   | Hz   |
|                 | b111          | Free V/f voltage 6               | 0.0 to 800.0                                                                             | 0.0                      | No   | V    |
|                 | b112          | Free V/f frequency 7             | 0 to 400                                                                                 | 0                        | No   | Hz   |
|                 | b113          | Free V/f voltage 7               | 0.0 to 800.0                                                                             | 0.0                      | No   | V    |
| Others          | b120          | Brake control selection          | 00: OFF (Disabled)<br>01: ON (Enabled)                                                   | 00                       | No   | —    |
|                 | b121          | Brake wait time for release      | 0.00 to 5.00                                                                             | 0.00                     | No   | s    |
|                 | b122          | Brake wait time for acceleration | 0.00 to 5.00                                                                             | 0.00                     | No   | s    |
|                 | b123          | Brake wait time for stopping     | 0.00 to 5.00                                                                             | 0.00                     | No   | s    |
|                 | b124          | Brake wait time for confirmation | 0.00 to 5.00                                                                             | 0.00                     | No   | s    |
|                 | b125          | Brake release frequency          | 0.00 to 400.00                                                                           | 0.00                     | No   | Hz   |
|                 | b126          | Brake release current            | 0.0 to 2.00 × Rated current (0.4 to 55 kW)<br>0.0 to 1.80 × Rated current (75 to 132 kW) | Rated current            | No   | —    |
|                 | b127          | Brake input frequency            | 0.00 to 400.00                                                                           | 0.00                     | No   | Hz   |

\* 2nd/3rd control is displayed when "SET(08)/SET3(17)" is allocated to one of multi-function inputs from C001 to C008.

| Parameter No. | Function name | Monitor or data range                                                                                                                                             | Default setting | Changes during operation | Unit | Page |
|---------------|---------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|--------------------------|------|------|
| Others        | b130          | Overvoltage protection function selection during deceleration<br>00: OFF (Disabled)<br>01: V-const (DC voltage kept constant)<br>02: Accel (Acceleration enabled) | 01              | No                       | —    | 4-78 |
|               | b131          | Overvoltage protection level during deceleration<br>200-V class: 330 to 390<br>400-V class: 660 to 780                                                            | 380/760         | No                       | V    |      |
|               | b132          | Overvoltage protection parameter                                                                                                                                  | 1.00            | No                       | s    |      |
|               | b133          | Overvoltage protection proportional gain setting                                                                                                                  | 0.50            | Yes                      | —    |      |
|               | b134          | Overvoltage protection integral time setting                                                                                                                      | 0.060           | Yes                      | s    |      |
|               | b164          | Auto return initial display<br>00: OFF<br>01: ON                                                                                                                  | 00              | No                       | —    | —    |
|               | b166          | Data Read/Write selection<br>00: R/W OK (Read/Write OK)<br>01: R/W Protected (Read/Write Protected)                                                               | 00              | No                       | —    | —    |
|               | b180          | Initialize trigger<br>00: No action<br>01: Initialize                                                                                                             | 00              | No                       | —    | —    |

\* 2nd/3rd control is displayed when "SET(08)/SET3(17)" is allocated to one of multi-function inputs from C001 to C008.

| Parameter No.                  | Function name | Monitor or data range                          | Default setting                                                                                                                                                                                                                                                                                                                                                         | Changes during operation | Unit | Page |
|--------------------------------|---------------|------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|------|------|
| Multi-function input terminals | C001          | Multi-function input 1 selection <sup>*1</sup> | 01: RV (reverse)<br>02: CF1 (multi-step speed setting binary 1)<br>03: CF2 (multi-step speed setting binary 2)<br>04: CF3 (multi-step speed setting binary 3)<br>05: CF4 (multi-step speed setting binary 4)<br>06: JG (jogging)<br>07: DB (external DC injection braking)<br>08: SET (2nd control)<br>09: 2CH (2-step acceleration/deceleration)                       | 01 <sup>*1</sup>         | No   | —    |
|                                | C002          | Multi-function input 2 selection               | 11: FRS (free-run stop)<br>12: EXT (external trip)<br>13: USP (USP function)<br>14: CS (commercial switch)<br>15: SFT (soft lock)<br>16: AT (analog input switching)<br>17: SET3 (3rd control)<br>18: RS (reset)                                                                                                                                                        | 12                       |      |      |
|                                | C003          | Multi-function input 3 selection <sup>*1</sup> | 20: STA (3-wire start)<br>21: STP (3-wire stop)<br>22: F/R (3-wire forward/reverse)<br>23: PID (PID enabled/disabled)<br>24: PIDC (PID integral reset)<br>26: CAS (control gain switching)<br>27: UP (UP/DWN function accelerated)<br>28: DWN (UP/DWN function decelerated)<br>29: UDC (UP/DWN function data clear)<br>31: OPE (forced operator)                        | 18                       |      |      |
|                                | C004          | Multi-function input 4 selection               | 32: SF1 (multi-step speed setting bit 1)<br>33: SF2 (multi-step speed setting bit 2)<br>34: SF3 (multi-step speed setting bit 3)<br>35: SF4 (multi-step speed setting bit 4)<br>36: SF5 (multi-step speed setting bit 5)<br>37: SF6 (multi-step speed setting bit 6)<br>38: SF7 (multi-step speed setting bit 7)<br>39: OLR (overload limit switching)                  | 02                       |      |      |
|                                | C005          | Multi-function input 5 selection               | 40: TL (torque limit enabled)<br>41: TRQ1 (torque limit switching 1)<br>42: TRQ2 (torque limit switching 2)<br>43: PPI (P/PI switching)<br>44: BOK (Brake confirmation)<br>45: ORT (orientation)<br>46: LAC (LAD cancel)<br>47: PCLR (position deviation clear)<br>48: STAT (pulse train position command input permission)                                             | 03                       |      |      |
|                                | C006          | Multi-function input 6 selection               | 50: ADD (frequency addition)<br>51: F-TM (forced terminal block)<br>52: ATR (torque command input permission)<br>53: KHC (integrated power clear)<br>54: SON (servo ON)<br>55: FOC (preliminary excitation)<br>56: MI1 (Drive programming input 1)<br>57: MI2 (Drive programming input 2)<br>58: MI3 (Drive programming input 3)<br>59: MI4 (Drive programming input 4) | 06                       |      |      |
|                                | C007          | Multi-function input 7 selection               | 60: MI5 (Drive programming input 5)<br>61: MI6 (Drive programming input 6)<br>62: MI7 (Drive programming input 7)<br>63: MI8 (Drive programming input 8)<br>65: AHD (analog command held)<br>66: CP1 (position command selection 1)<br>67: CP2 (position command selection 2)<br>68: CP3 (position command selection 3)<br>69: ORL (zero return limit signal)           | 08                       |      |      |
|                                | C008          | Multi-function input 8 selection               | 70: ORG (zero return startup signal)<br>71: FOT (forward driving stop)<br>72: ROT (reverse driving stop)<br>73: SPD (speed/position switching)<br>74: PCNT (pulse counter)<br>75: PCC (pulse counter clear)<br>82: PRG (Drive program start)<br>no: NO (no allocation)                                                                                                  | no                       |      |      |

\*1. C001 and C003 are forcibly rewritten into 18 (RS) and 64 (EMR), respectively, when the emergency shutoff function is enabled (SW1 = ON). (64 cannot be set optionally.)  
When SW1 is turned ON once and then OFF, C003 has no allocations ("no").

\* 2nd/3rd control is displayed when "SET(08)/SET3(17)" is allocated to one of multi-function inputs from C001 to C008.

| Parameter No.                  | Function name | Monitor or data range                      | Default setting | Changes during operation | Unit | Page |
|--------------------------------|---------------|--------------------------------------------|-----------------|--------------------------|------|------|
| Multi-function input terminals | C011          | Multi-function input 1 operation selection | 00              | No                       | —    | 4-81 |
|                                | C012          | Multi-function input 2 operation selection | 00              |                          |      |      |
|                                | C013          | Multi-function input 3 operation selection | 00              |                          |      |      |
|                                | C014          | Multi-function input 4 operation selection | 00              |                          |      |      |
|                                | C015          | Multi-function input 5 operation selection | 00              |                          |      |      |
|                                | C016          | Multi-function input 6 operation selection | 00              |                          |      |      |
|                                | C017          | Multi-function input 7 operation selection | 00              |                          |      |      |
|                                | C018          | Multi-function input 8 operation selection | 00              |                          |      |      |
|                                | C019          | FW terminal operation selection            | 00              |                          |      |      |
|                                |               | 00: NO<br>01: NC                           |                 |                          |      |      |

\* 2nd/3rd control is displayed when "SET(08)/SET3(17)" is allocated to one of multi-function inputs from C001 to C008.

| Parameter No.                  | Function name | Monitor or data range                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Default setting | Changes during operation | Unit | Page |
|--------------------------------|---------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|--------------------------|------|------|
| Multi-function output terminal | C021          | Multi-function output terminal 11 selection<br>00: RUN (signal during RUN)<br>01: FA1 (constant speed arrival signal)<br>02: FA2 (over set frequency arrival signal)<br>03: OL (overload warning)<br>04: OD (excessive PID deviation)<br>05: AL (alarm output)<br>06: FA3 (set-frequency-only arrival signal)<br>07: OTQ (overtorque)<br>08: IP (signal during momentary power interruption)                                                                                   | 00              | No                       | —    | 4-95 |
|                                | C022          | Multi-function output terminal 12 selection<br>09: UV (signal during undervoltage)<br>10: TRQ (torque limit)<br>11: RNT (RUN time over)<br>12: ONT (Power ON time over)<br>13: THM (thermal warning)<br>19: BRK (brake release)<br>20: BER (brake error)<br>21: ZS (0 Hz signal)<br>22: DSE (excessive speed deviation)                                                                                                                                                        | 21              |                          |      |      |
|                                | C023          | Multi-function output terminal 13 selection<br>23: POK (position ready)<br>24: FA4 (set frequency exceeded 2)<br>25: FA5 (set frequency only 2)<br>26: OL2 (overload warning 2)<br>27: ODc (analog O disconnection detection)<br>28: OIdc (analog OI disconnection detection)<br>29: O2Dc (analog O2 disconnection detection)<br>31: FBV (PID FB status output)<br>32: NDc (network error)                                                                                     | 03              |                          |      |      |
|                                | C024          | Multi-function output terminal 14 selection<br>33: LOG1 (logic operation output 1)<br>34: LOG2 (logic operation output 2)<br>35: LOG3 (logic operation output 3)<br>36: LOG4 (logic operation output 4)<br>37: LOG5 (logic operation output 5)<br>38: LOG6 (logic operation output 6)<br>39: WAC (capacitor life warning signal)<br>40: WAF (cooling fan life warning signal)<br>41: FR (starting contact signal)<br>42: OHF (fin overheat warning)                            | 07              |                          |      |      |
|                                | C025          | Multi-function output terminal 15 selection<br>43: LOC (light load detection signal)<br>44: MO1 (Drive programming output 1)<br>45: MO2 (Drive programming output 2)<br>46: MO3 (Drive programming output 3)<br>47: MO4 (Drive programming output 4)<br>48: MO5 (Drive programming output 5)<br>49: MO6 (Drive programming output 6)<br>50: IRDY (operation ready signal)<br>51: FWR (forward run signal)                                                                      | 01              |                          |      |      |
|                                | C026          | Relay output (AL2, AL1) function selection<br>52: RVR (reverse run signal)<br>53: MJA (fatal fault signal)<br>54: WCO (window comparator O)<br>55: WCOI (window comparator OI)<br>56: WCO2 (window comparator O2)<br>63: OPO (Option board output)<br>no: Not used<br>(When C062 is used to select the alarm code output, the multi-function output terminals 11 to 13, or 11 to 14 are forcibly changed to AC0 to AC2 or AC0 to AC3 [Acn 'Alarm code output'], respectively.) | 05              |                          |      |      |

\* 2nd/3rd control is displayed when "SET(08)/SET3(17)" is allocated to one of multi-function inputs from C001 to C008.

| Parameter No.  | Function name                                | Monitor or data range                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Default setting | Changes during operation | Unit | Page           |
|----------------|----------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|--------------------------|------|----------------|
| Analog monitor | C027 FM selection                            | When inverter is in sensor vector control (A044=05) the real motor speed from the motor encoder (d008 monitor) is used instead of the output frequency.<br>00: Output FQ (Output frequency)<br>01: Output I (Output current)<br>02: Output TRQ (Output torque)<br>03: Pulse FQ (Digital output frequency)<br>04: Output V (Output voltage)<br>05: Power<br>06: Thermal (Thermal load rate)<br>07: LAD-FQ (LAD frequency)<br>08: Pulse I (Digital current monitor)<br>09: Motor tmp (Motor temperature)<br>10: Heatsink tmp (Fin temperature)<br>12: YA0 (Drive programming)<br>19: OP1 (Option board 1)<br>20: OP2 (Option board 2)   | 00              | No                       | —    | 4-109<br>4-118 |
|                | C028 AM selection                            | When inverter is in sensor vector control (A044=05) the real motor speed from the motor encoder (d008 monitor) is used instead of the output frequency.<br>00: Output FQ (Output frequency)<br>01: Output I (Output current)<br>02: Output TRQ (Output torque)<br>04: Output V (Output voltage)<br>05: Power<br>06: Thermal (Thermal load rate)<br>07: LAD-FQ (LAD frequency)<br>08: Pulse I (Digital current monitor)<br>09: Motor tmp (Motor temperature)<br>10: Heatsink tmp (Fin temperature)<br>11: Out TRQ sign (Output torque <signed>)<br>13: YA1 (Drive programming)<br>19: OP1 (Option board 1)<br>20: OP2 (Option board 2) | 00              | No                       | —    | 4-110<br>4-118 |
|                | C029 AMI selection                           | When inverter is in sensor vector control (A044=05) the real motor speed from the motor encoder (d008 monitor) is used instead of the output frequency.<br>00: Output FQ (Output frequency)<br>01: Output I (Output current)<br>02: Output TRQ (Output torque)<br>04: Output V (Output voltage)<br>05: Power<br>06: Thermal (Thermal load rate)<br>07: LAD-FQ (LAD frequency)<br>09: Motor tmp (Motor temperature)<br>10: Heatsink tmp (Fin temperature)<br>14: YA2 (Drive programming)                                                                                                                                               | 00              | No                       | —    |                |
|                | C030 Digital current monitor reference value | 0.20 × Rated current to<br>2.00 × Rated current (Under 55 kW)<br>0.20 × Rated current to<br>1.50 × Rated current (Over 75 kW)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Rated current   | Yes                      | A    | 4-109          |

\* 2nd/3rd control is displayed when "SET(08)/SET3(17)" is allocated to one of multi-function inputs from C001 to C008.

| Parameter No.                    | Function name | Monitor or data range                               | Default setting | Changes during operation | Unit | Page  |
|----------------------------------|---------------|-----------------------------------------------------|-----------------|--------------------------|------|-------|
| Multi-function output terminal   | C031          | Multi-function output terminal 11 contact selection | 00              | No                       | —    | 4-96  |
|                                  | C032          | Multi-function output terminal 12 contact selection |                 |                          |      |       |
|                                  | C033          | Multi-function output terminal 13 contact selection |                 |                          |      |       |
|                                  | C034          | Multi-function output terminal 14 contact selection |                 |                          |      |       |
|                                  | C035          | Multi-function output terminal 15 contact selection |                 |                          |      |       |
|                                  | C036          | Relay output (AL2, AL1) contact selection           | 01              |                          |      |       |
| Level and output terminal status | C038          | Light load signal output mode                       | 01              | No                       | —    | 4-106 |
|                                  | C039          | Light load detection level                          | Rated current   | No                       | A    |       |
|                                  | C040          | Overload warning signal output mode                 | 01              | No                       | —    | 4-49  |
|                                  | C041          | Overload warning level                              | Rated current   | No                       | A    |       |
|                                  | C042          | Arrival frequency during acceleration               | 0.00            | No                       | Hz   | 4-98  |
|                                  | C043          | Arrival frequency during deceleration               | 0.00            | No                       | Hz   |       |
|                                  | C044          | PID deviation excessive level                       | 3.0             | No                       | %    | 4-31  |
|                                  | C045          | Arrival frequency during acceleration 2             | 0.00            | No                       | Hz   | 4-98  |
|                                  | C046          | Arrival frequency during deceleration 2             | 0.00            | No                       | Hz   |       |
|                                  | C052          | PID FB upper limit                                  | 100.0           | No                       | %    | 4-31  |
|                                  | C053          | PID FB lower limit                                  | 0.0             | No                       | %    |       |

\* 2nd/3rd control is displayed when "SET(08)/SET3(17)" is allocated to one of multi-function inputs from C001 to C008.



| Parameter No.                    | Function name | Monitor or data range                               | Default setting                                                                                                                               | Changes during operation | Unit | Page |
|----------------------------------|---------------|-----------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|------|------|
| Level and output terminal status | C055          | Overtorque level (Forward power running)            | 0 to 200 (0.4 to 55 kW)                                                                                                                       | 200                      | No   | %    |
|                                  |               |                                                     | 0 to 180 (75 to 132 kW)                                                                                                                       |                          |      |      |
|                                  | C056          | Overtorque level (Reverse regeneration)             | 0 to 200 (0.4 to 55 kW)                                                                                                                       | 200                      | No   | %    |
|                                  |               |                                                     | 0 to 180 (75 to 132 kW)                                                                                                                       |                          |      |      |
|                                  | C057          | Overtorque level (Reverse power running)            | 0 to 200 (0.4 to 55 kW)                                                                                                                       | 200                      | No   | %    |
|                                  |               |                                                     | 0 to 180 (75 to 132 kW)                                                                                                                       |                          |      |      |
|                                  | C058          | Overtorque level (Forward regeneration)             | 0 to 200 (0.4 to 55 kW)                                                                                                                       | 200                      | No   | %    |
|                                  |               |                                                     | 0 to 180 (75 to 132 kW)                                                                                                                       |                          |      |      |
|                                  | C061          | Thermal warning level                               | 0 to 100                                                                                                                                      | 80                       | No   | %    |
| Communication function           | C062          | Alarm code selection                                | 00: OFF (Disabled)<br>01: 3-bit<br>02: 4-bit                                                                                                  | 00                       | No   | —    |
|                                  | C063          | 0 Hz detection level                                | 0.00 to 100.00                                                                                                                                | 0.00                     | No   | Hz   |
|                                  | C064          | Fin overheat warning level                          | 0 to 200                                                                                                                                      | 120                      | No   | °C   |
|                                  | C071          | Communication speed selection (Baud rate selection) | 02: Loop-back test<br>03: 2400 bps<br>04: 4800 bps<br>05: 9600 bps<br>06: 19200 bps                                                           | 05                       | No   | —    |
|                                  | C072          | Communication station No. selection                 | 1 to 247                                                                                                                                      | 1                        | No   | —    |
|                                  | C073          | Communication bit length selection                  | 7: 7-bit<br>8: 8-bit                                                                                                                          | 8                        | No   | —    |
|                                  | C074          | Communication parity selection                      | 00: No parity<br>01: Even<br>02: Odd                                                                                                          | 00                       | No   | —    |
|                                  | C075          | Communication stop bit selection                    | 1: 1-bit<br>2: 2-bit                                                                                                                          | 1                        | No   | —    |
|                                  | C076          | Communication error selection                       | 00: Trip<br>01: Decel-Trip (Trip after deceleration stop)<br>02: Ignore<br>03: Free-RUN (Free-run stop)<br>04: Decel-Stop (Deceleration stop) | 02                       | No   | —    |
|                                  | C077          | Communication error timeout                         | 0.00 to 99.99                                                                                                                                 | 0.00                     | No   | s    |
|                                  | C078          | Communication wait time                             | 0 to 1000                                                                                                                                     | 0                        | No   | ms   |
|                                  | C079          | Communication method selection                      | 00: ASCII<br>01: ModBus-RTU                                                                                                                   | 01                       | No   | —    |

\* 2nd/3rd control is displayed when "SET(08)/SET3(17)" is allocated to one of multi-function inputs from C001 to C008.

| Parameter No.    | Function name | Monitor or data range              | Default setting                                                                                                                                                                                         | Changes during operation | Unit | Page |
|------------------|---------------|------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|------|------|
| Adjustment       | C081          | O adjustment                       | 0 to 65535                                                                                                                                                                                              | Factory default          | Yes  | —    |
|                  | C082          | OI adjustment                      | 0 to 65535                                                                                                                                                                                              | Factory default          | Yes  | —    |
|                  | C083          | O2 adjustment                      | 0 to 65535                                                                                                                                                                                              | Factory default          | Yes  | —    |
|                  | C085          | Thermistor adjustment              | 0.0 to 1000.0                                                                                                                                                                                           | Factory default          | Yes  | 4-75 |
|                  | C091          | Debug mode selection               | Use "00".<br>* Do not change.                                                                                                                                                                           | 00                       | No   | —    |
| Others           | C101          | UP/DWN selection                   | 00: Not save (Do not store the frequency data)<br>01: Save (Store the frequency data)                                                                                                                   | 00                       | No   | —    |
|                  | C102          | Reset selection                    | 00: ON-RESET (Trip reset at power-on)<br>01: OFF-RESET (Trip reset when the power is OFF)<br>02: On in Trip (Enabled only during trip (Reset when the power is ON))<br>03: Trip RESET (Trip reset only) | 00                       | Yes  | —    |
|                  | C103          | Reset frequency matching selection | 00: 0 Hz start<br>01: f-match (Frequency matching start)<br>02: Actv, f-match (Active Frequency Matching restart)                                                                                       | 00                       | No   | —    |
| Meter adjustment | C105          | FM gain setting                    | 50 to 200                                                                                                                                                                                               | 100                      | Yes  | %    |
|                  | C106          | AM gain setting                    | 50 to 200                                                                                                                                                                                               | 100                      | Yes  | %    |
|                  | C107          | AMI gain setting                   | 50 to 200                                                                                                                                                                                               | 100                      | Yes  | %    |
|                  | C109          | AM bias setting                    | 0 to 100                                                                                                                                                                                                | 0                        | Yes  | %    |
|                  | C110          | AMI bias setting                   | 0 to 100                                                                                                                                                                                                | 20                       | Yes  | %    |
| Terminal         | C111          | Overload warning level 2           | 0.0 to 2.00 × Rated current (0.4 to 55 kW)<br>0.0 to 1.80 × Rated current (75 to 132 kW)                                                                                                                | Rated current            | No   | A    |
| Adjustment       | C121          | O zero adjustment                  | 0 to 65535                                                                                                                                                                                              | Factory default          | Yes  | —    |
|                  | C122          | OI zero adjustment                 | 0 to 65535                                                                                                                                                                                              | Factory default          | Yes  | —    |
|                  | C123          | O2 zero adjustment                 | 0 to 65535                                                                                                                                                                                              | Factory default          | Yes  | —    |

\* 2nd/3rd control is displayed when "SET(08)/SET3(17)" is allocated to one of multi-function inputs from C001 to C008.

| Parameter No.                      | Function name | Monitor or data range                    | Default setting                                           | Changes during operation | Unit | Page |
|------------------------------------|---------------|------------------------------------------|-----------------------------------------------------------|--------------------------|------|------|
| Output terminal operation function | C130          | Output 11 ON delay                       | 0.0 to 100.0                                              | 0.0                      | No   | s    |
|                                    | C131          | Output 11 OFF delay                      | 0.0 to 100.0                                              | 0.0                      |      |      |
|                                    | C132          | Output 12 ON delay                       | 0.0 to 100.0                                              | 0.0                      |      |      |
|                                    | C133          | Output 12 OFF delay                      | 0.0 to 100.0                                              | 0.0                      |      |      |
|                                    | C134          | Output 13 ON delay                       | 0.0 to 100.0                                              | 0.0                      |      |      |
|                                    | C135          | Output 13 OFF delay                      | 0.0 to 100.0                                              | 0.0                      |      |      |
|                                    | C136          | Output 14 ON delay                       | 0.0 to 100.0                                              | 0.0                      |      |      |
|                                    | C137          | Output 14 OFF delay                      | 0.0 to 100.0                                              | 0.0                      |      |      |
|                                    | C138          | Output 15 ON delay                       | 0.0 to 100.0                                              | 0.0                      |      |      |
|                                    | C139          | Output 15 OFF delay                      | 0.0 to 100.0                                              | 0.0                      |      |      |
|                                    | C140          | Relay output ON delay                    | 0.0 to 100.0                                              | 0.0                      |      |      |
|                                    | C141          | Relay output OFF delay                   | 0.0 to 100.0                                              | 0.0                      |      |      |
| Output terminal operation function | C142          | Logic output signal 1 selection 1        | Same as options for C021 to C026 (excluding LOG1 to LOG6) | 00                       | No   | —    |
|                                    | C143          | Logic output signal 1 selection 2        | Same as options for C021 to C026 (excluding LOG1 to LOG6) | 00                       |      |      |
|                                    | C144          | Logic output signal 1 operator selection | 00: AND<br>01: OR<br>02: XOR                              | 00                       |      |      |
|                                    | C145          | Logic output signal 2 selection 1        | Same as options for C021 to C026 (excluding LOG1 to LOG6) | 00                       |      |      |
|                                    | C146          | Logic output signal 2 selection 2        | Same as options for C021 to C026 (excluding LOG1 to LOG6) | 00                       |      |      |
|                                    | C147          | Logic output signal 2 operator selection | 00: AND<br>01: OR<br>02: XOR                              | 00                       |      |      |
|                                    | C148          | Logic output signal 3 selection 1        | Same as options for C021 to C026 (excluding LOG1 to LOG6) | 00                       |      |      |
|                                    | C149          | Logic output signal 3 selection 2        | Same as options for C021 to C026 (excluding LOG1 to LOG6) | 00                       |      |      |
|                                    | C150          | Logic output signal 3 operator selection | 00: AND<br>01: OR<br>02: XOR                              | 00                       |      |      |
|                                    | C151          | Logic output signal 4 selection 1        | Same as options for C021 to C026 (excluding LOG1 to LOG6) | 00                       |      |      |
|                                    |               |                                          |                                                           |                          |      |      |

\* 2nd/3rd control is displayed when "SET(08)/SET3(17)" is allocated to one of multi-function inputs from C001 to C008.

| Parameter No.                      | Function name | Monitor or data range                         | Default setting                                           | Changes during operation | Unit | Page                |
|------------------------------------|---------------|-----------------------------------------------|-----------------------------------------------------------|--------------------------|------|---------------------|
| Output terminal operation function | C152          | Logic output signal 4 selection 2             | Same as options for C021 to C026 (excluding LOG1 to LOG6) | 00                       | No   | —<br>4-102          |
|                                    | C153          | Logic output signal 4 operator selection      | 00: AND<br>01: OR<br>02: XOR                              | 00                       |      |                     |
|                                    | C154          | Logic output signal 5 selection 1             | Same as options for C021 to C026 (excluding LOG1 to LOG6) | 00                       |      |                     |
|                                    | C155          | Logic output signal 5 selection 2             | Same as options for C021 to C026 (excluding LOG1 to LOG6) | 00                       |      |                     |
|                                    | C156          | Logic output signal 5 operator selection      | 00: AND<br>01: OR<br>02: XOR                              | 00                       |      |                     |
|                                    | C157          | Logic output signal 6 selection 1             | Same as options for C021 to C026 (excluding LOG1 to LOG6) | 00                       |      |                     |
|                                    | C158          | Logic output signal 6 selection 2             | Same as options for C021 to C026 (excluding LOG1 to LOG6) | 00                       |      |                     |
|                                    | C159          | Logic output signal 6 operator selection      | 00: AND<br>01: OR<br>02: XOR                              | 00                       |      |                     |
| Input terminal response            | C160          | Input terminal response time 1                | 0 to 200 (× 2 ms)                                         | 1                        | No   | ms<br>4-108         |
|                                    | C161          | Input terminal response time 2                | 0 to 200 (× 2 ms)                                         | 1                        |      |                     |
|                                    | C162          | Input terminal response time 3                | 0 to 200 (× 2 ms)                                         | 1                        |      |                     |
|                                    | C163          | Input terminal response time 4                | 0 to 200 (× 2 ms)                                         | 1                        |      |                     |
|                                    | C164          | Input terminal response time 5                | 0 to 200 (× 2 ms)                                         | 1                        |      |                     |
|                                    | C165          | Input terminal response time 6                | 0 to 200 (× 2 ms)                                         | 1                        |      |                     |
|                                    | C166          | Input terminal response time 7                | 0 to 200 (× 2 ms)                                         | 1                        |      |                     |
|                                    | C167          | Input terminal response time 8                | 0 to 200 (× 2 ms)                                         | 1                        |      |                     |
|                                    | C168          | FW terminal response time                     | 0 to 200 (× 2 ms)                                         | 1                        |      |                     |
| Others                             | C169          | Multi-step speed/ position determination time | 0 to 200 (× 2 ms)                                         | 0                        | No   | ms<br>4-16<br>4-137 |

\* 2nd/3rd control is displayed when "SET(08)/SET3(17)" is allocated to one of multi-function inputs from C001 to C008.

| Parameter No.     |      | Function name                     | Monitor or data range                                                                                                  | Default setting                | Changes during operation | Unit | Page                            |
|-------------------|------|-----------------------------------|------------------------------------------------------------------------------------------------------------------------|--------------------------------|--------------------------|------|---------------------------------|
| Control parameter | H001 | Auto-tuning selection             | 00: OFF (Disabled)<br>01: ON (STOP)<br>02: ON (Rotation)                                                               | 00                             | No                       | —    | 4-111                           |
|                   | H002 | Motor parameter selection         | 00: Standard motor parameter<br>01: Auto-tuning parameter<br>02: Auto-tuning parameter<br>(online auto-tuning enabled) | 00                             | No                       | —    | 4-111<br>4-113<br>4-115         |
|                   | H202 | * 2nd motor parameter selection   |                                                                                                                        | 00                             |                          |      |                                 |
|                   | H003 | Motor capacity selection          | 0.20 to 160.0                                                                                                          | Factory default                | No                       | kW   | 4-19<br>4-111<br>4-115<br>4-118 |
|                   | H203 | * 2nd motor capacity selection    |                                                                                                                        | Factory default                |                          |      |                                 |
|                   | H004 | Motor pole number selection       | 2/4/6/8/10                                                                                                             | 4                              | No                       | Pole |                                 |
|                   | H204 | * 2nd motor pole number selection |                                                                                                                        | 4                              |                          |      |                                 |
|                   | H005 | Speed response                    | 0.001 to 80.000                                                                                                        | 1.590                          | Yes                      | —    | 4-89<br>4-92                    |
|                   | H205 | * 2nd speed response              |                                                                                                                        | 1.590                          |                          |      |                                 |
|                   | H006 | Stabilization parameter           | 0 to 255                                                                                                               | 100                            | Yes                      | —    | 4-120                           |
|                   | H206 | * 2nd stabilization parameter     |                                                                                                                        | 100                            |                          |      |                                 |
|                   | H306 | * 3rd stabilization parameter     |                                                                                                                        | 100                            |                          |      |                                 |
|                   | H020 | Motor parameter R1                | 0.001 to 65.535                                                                                                        | Depends on the motor capacity. | No                       | Ω    | 4-115                           |
|                   | H220 | * 2nd motor parameter R1          |                                                                                                                        | Depends on the motor capacity. |                          |      |                                 |
|                   | H021 | Motor parameter R2                | 0.001 to 65.535                                                                                                        | Depends on the motor capacity. | No                       | Ω    |                                 |
|                   | H221 | * 2nd motor parameter R2          |                                                                                                                        | Depends on the motor capacity. |                          |      |                                 |
|                   | H022 | Motor parameter L                 | 0.01 to 655.35                                                                                                         | Depends on the motor capacity. | No                       | mH   |                                 |
|                   | H222 | * 2nd motor parameter L           |                                                                                                                        | Depends on the motor capacity. |                          |      |                                 |

\* 2nd/3rd control is displayed when "SET(08)/SET3(17)" is allocated to one of multi-function inputs from C001 to C008.

| Parameter No.     |                                             | Function name                               | Monitor or data range          | Default setting                | Changes during operation | Unit             | Page           |
|-------------------|---------------------------------------------|---------------------------------------------|--------------------------------|--------------------------------|--------------------------|------------------|----------------|
| Control parameter | H023                                        | Motor parameter IO                          | 0.01 to 655.35                 | Depends on the motor capacity. | No                       | A                | 4-115          |
|                   | H223                                        | * 2nd motor parameter IO                    |                                | Depends on the motor capacity. |                          |                  |                |
|                   | H024                                        | Motor parameter J                           | 0.001 to 9999.000              | Depends on the motor capacity. | No                       | kgm <sup>2</sup> |                |
|                   | H224                                        | * 2nd motor parameter J                     |                                | Depends on the motor capacity. |                          |                  |                |
|                   | H030                                        | Motor parameter R1 (auto-tuning data)       | 0.001 to 65.535                | Depends on the motor capacity. | No                       | Ω                | 4-111<br>4-115 |
|                   | H230                                        | * 2nd motor parameter R1 (auto-tuning data) |                                | Depends on the motor capacity. |                          |                  |                |
|                   | H031                                        | Motor parameter R2 (auto-tuning data)       | 0.001 to 65.535                | Depends on the motor capacity. | No                       | Ω                |                |
|                   | H231                                        | * 2nd motor parameter R2 (auto-tuning data) |                                | Depends on the motor capacity. |                          |                  |                |
|                   | H032                                        | Motor parameter L (auto-tuning data)        | 0.01 to 655.35                 | Depends on the motor capacity. | No                       | mH               |                |
|                   | H232                                        | * 2nd motor parameter L (auto-tuning data)  |                                | Depends on the motor capacity. |                          |                  |                |
| H033              | Motor parameter IO (auto-tuning data)       | 0.01 to 655.35                              | Depends on the motor capacity. | No                             | A                        |                  |                |
| H233              | * 2nd motor parameter IO (auto-tuning data) |                                             | Depends on the motor capacity. |                                |                          |                  |                |

\* 2nd/3rd control is displayed when "SET(08)/SET3(17)" is allocated to one of multi-function inputs from C001 to C008.

| Parameter No.     |      | Function name                              | Monitor or data range | Default setting                | Changes during operation | Unit             | Page           |
|-------------------|------|--------------------------------------------|-----------------------|--------------------------------|--------------------------|------------------|----------------|
| Control parameter | H034 | Motor parameter J (auto-tuning data)       | 0.001 to 9999.000     | Depends on the motor capacity. | No                       | kgm <sup>2</sup> | 4-111<br>4-115 |
|                   | H234 | * 2nd motor parameter J (auto-tuning data) |                       | Depends on the motor capacity. |                          |                  |                |
|                   | H050 | PI proportional gain                       | 0.0 to 1000.0         | 100.0                          | Yes                      | —                | 4-89<br>4-92   |
|                   | H250 | * 2nd PI proportional gain                 |                       | 100.0                          |                          |                  |                |
|                   | H051 | PI integral gain                           | 0.0 to 1000.0         | 100.0                          | Yes                      | —                |                |
|                   | H251 | *2nd PI integral gain                      |                       | 100.0                          |                          |                  |                |
|                   | H052 | P proportional gain                        | 0.01 to 10.00         | 1.00                           | Yes                      | —                |                |
|                   | H252 | *2nd P proportional gain                   |                       | 1.00                           |                          |                  |                |
|                   | H060 | Limit at 0 Hz                              | 0.0 to 100.0          | 100.0                          | Yes                      | %                | 4-117          |
|                   | H260 | * 2nd limit at 0 Hz                        |                       | 100.0                          |                          |                  |                |
|                   | H061 | Boost amount at SLV startup, 0 Hz          | 0 to 50               | 50                             | Yes                      | %                |                |
|                   | H261 | * 2nd boost amount at SLV startup, 0 Hz    |                       | 50                             |                          |                  |                |
|                   | H070 | For PI proportional gain switching         | 0.0 to 1000.0         | 100.0                          | Yes                      | —                | 4-89           |
|                   | H071 | For PI integral gain switching             | 0.0 to 1000.0         | 100.0                          | Yes                      | —                |                |
|                   | H072 | For P proportional gain switching          | 0.00 to 10.00         | 1.00                           | Yes                      | —                |                |
|                   | H073 | Gain switching time                        | 0 to 9999             | 100                            | Yes                      | ms               |                |

\* 2nd/3rd control is displayed when "SET(08)/SET3(17)" is allocated to one of multi-function inputs from C001 to C008.

### 3-9 Parameter List

| Parameter No. | Function name                                              | Monitor or data range                                                                                                                                                                 | Default setting | Changes during operation | Unit  | Page                                      |
|---------------|------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|--------------------------|-------|-------------------------------------------|
| P001          | Operation selection at option 1 error                      | 00: Trip<br>01: RUN (Continues operation)                                                                                                                                             | 00              | No                       | —     | 4-111                                     |
| P002          | Operation selection at option 2 error                      | 00: Trip<br>01: RUN (Continues operation)                                                                                                                                             | 00              | No                       | —     |                                           |
| P011          | Encoder pulses                                             | 128 to 65535                                                                                                                                                                          | 1024            | No                       | Pulse | 4-124<br>4-133<br>4-134                   |
| P012          | V2 control mode selection                                  | 00: ASR (speed control mode)<br>01: APR (pulse train position control mode)<br>02: APR2 (absolute position control mode)<br>03: HAPR (High resolution absolute position control mode) | 00              | No                       | —     | 4-124<br>4-136                            |
| P013          | Pulse train mode selection                                 | 00: Mode 1<br>01: Mode 2<br>02: Mode 3                                                                                                                                                | 00              | No                       | —     | 4-127                                     |
| P014          | Orientation stop position                                  | 0 to 4095                                                                                                                                                                             | 0               | No                       | —     | 4-134                                     |
| P015          | Orientation speed setting                                  | Starting frequency to Max. frequency (upper limit: 120.0)                                                                                                                             | 5.00            | No                       | Hz    |                                           |
| P016          | Orientation direction setting                              | 00: FWD (Forward side)<br>01: REV (Reverse side)                                                                                                                                      | 00              | No                       | —     |                                           |
| P017          | Position ready range setting                               | 0 to 10000                                                                                                                                                                            | 5               | No                       | Pulse | 4-127<br>4-134                            |
| P018          | Position ready delay time setting                          | 0.00 to 9.99                                                                                                                                                                          | 0.00            | No                       | s     | 4-127<br>4-134                            |
| P019          | Electronic gear setting position selection                 | 00: FB (Position feedback side)<br>01: REF (Position command side)                                                                                                                    | 00              | Yes                      | —     | 4-128<br>4-129                            |
| P020          | Electronic gear ratio numerator                            | 1 to 9999                                                                                                                                                                             | 1               | Yes                      | —     |                                           |
| P021          | Electronic gear ratio denominator                          | 1 to 9999                                                                                                                                                                             | 1               | Yes                      | —     |                                           |
| P022          | Position control feedforward gain                          | 0.00 to 655.35                                                                                                                                                                        | 0.00            | Yes                      | —     |                                           |
| P023          | Position loop gain                                         | 0.00 to 100.00                                                                                                                                                                        | 0.50            | Yes                      | rad/s | 4-124<br>4-128<br>4-129<br>4-134<br>4-136 |
| P024          | Position bias amount                                       | -2048 to 2048                                                                                                                                                                         | 0               | Yes                      | rad/s | 4-128                                     |
| P025          | Secondary resistance compensation enable/disable selection | 00: OFF (Disabled)<br>01: ON (Enabled)                                                                                                                                                | 00              | No                       | —     | 4-114                                     |
| P026          | Overspeed error detection level                            | 0.0 to 150.0                                                                                                                                                                          | 135.0           | No                       | %     | 5-7                                       |
| P027          | Speed deviation error detection level                      | 0.00 to 120.00                                                                                                                                                                        | 7.50            | No                       | Hz    | 4-124                                     |

\* 2nd/3rd control is displayed when "SET(08)/SET3(17)" is allocated to one of multi-function inputs from C001 to C008.



| Parameter No. | Function name                                 | Monitor or data range                                                                                                            | Default setting | Changes during operation | Unit | Page           |
|---------------|-----------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------|-----------------|--------------------------|------|----------------|
| P028          | Motor gear ratio numerator                    | 1 to 9999                                                                                                                        | 1               | No                       | —    | 4-133          |
| P029          | Motor gear ratio denominator                  | 1 to 9999                                                                                                                        | 1               | No                       | —    |                |
| P031          | Acceleration/ deceleration time input type    | 00: OPE (Digital Operator)<br>01: Option 1<br>02: Option 2<br>03: EzSQ (Drive Programming)                                       | 00              | No                       | —    | 4-8            |
| P032          | Orientation stop position input type          | 00: OPE (Digital Operator)<br>01: Option 1<br>02: Option 2                                                                       | 00              | No                       | —    | —              |
| P033          | Torque reference input selection              | 00: O (Terminal O)<br>01: OI (Terminal OI)<br>02: O2 (Terminal O2)<br>03: OPE (Digital Operator)<br>06: Option 1<br>07: Option 2 | 00              | No                       | —    | 4-126          |
| P034          | Torque reference setting                      | 0 to 200 (0.4 to 55 kW)<br>0 to 180 (75 to 132 kW)                                                                               | 0               | Yes                      | %    |                |
| P035          | Polarity selection at torque reference via O2 | 00: Sign (Signed)<br>01: Direction (Depends on the RUN direction)                                                                | 00              | No                       | —    |                |
| P036          | Torque bias mode                              | 00: OFF (None)<br>01: OPE (Digital Operator)<br>02: O2 (Terminal O2)<br>05: Option 1<br>06: Option 2                             | 00              | No                       | —    | 4-126<br>4-127 |
| P037          | Torque bias value                             | -200 to +200 (0.4 to 55 kW)<br>-180 to +180 (75 to 132 kW)                                                                       | 0               | Yes                      | %    |                |
| P038          | Torque bias polarity selection                | 00: Sign (Signed)<br>01: Direction (Depends on the RUN direction)                                                                | 00              | No                       | —    |                |
| P039          | Speed limit value in torque control (forward) | 0.00 to Maximum frequency                                                                                                        | 0.00            | Yes                      | Hz   | 4-126          |
| P040          | Speed limit value in torque control (reverse) | 0.00 to Maximum frequency                                                                                                        | 0.00            | Yes                      | Hz   |                |
| P044          | DeviceNet comm Watch dog timer                | 0.00 to 99.99                                                                                                                    | 1.00            | No                       | s    | —              |
| P045          | Operation setting at communications error     | 00: Trip<br>01: Decel-Trip (Trip after deceleration stop)<br>02: Ignore<br>03: Free RUN<br>04: Decel-Stop (Deceleration stop)    | 00              | No                       | —    | —              |

\* 2nd/3rd control is displayed when "SET(08)/SET3(17)" is allocated to one of multi-function inputs from C001 to C008.

| Parameter No. | Function name                              | Monitor or data range                                                                                                                                                                                                                                                           | Default setting | Changes during operation | Unit | Page  |
|---------------|--------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|--------------------------|------|-------|
| P046          | Instance Number                            | 0: Basic speed I/O<br>1: Extended speed I/O<br>2: Extended speed and Torque control<br>3: Special I/O<br>4: Extended control I/O<br>5: Extended control I/O and multifunction I/O monitor<br>6: Flexible format<br>7: Extended speed and Acceleration control<br>8-20: Not used | 1               | No                       | —    | —     |
| P048          | Operation setting at idle mode detection   | 00: Trip<br>01: Decel-Trip (Trip after deceleration stop)<br>02: Ignore<br>03: Free RUN<br>04: Decel-Stop (Deceleration stop)                                                                                                                                                   | 00              | No                       | —    | —     |
| P049          | Polarity setting for rotation speed        | 0/2/4/6/8/10/12/14/16/18/20/22/24/26/28/30/32/34/36/38                                                                                                                                                                                                                          | 0               | No                       | —    | —     |
| P055          | Pulse train frequency scale                | 1.0 to 50.0                                                                                                                                                                                                                                                                     | 25.0            | No                       | kHz  | 4-144 |
| P056          | Pulse train frequency filter time constant | 0.01 to 2.00                                                                                                                                                                                                                                                                    | 0.10            | No                       | s    |       |
| P057          | Pulse train frequency bias amount          | -100 to 100                                                                                                                                                                                                                                                                     | 0               | No                       | %    |       |
| P058          | Pulse train frequency limit                | 0 to 100                                                                                                                                                                                                                                                                        | 100             | No                       | %    |       |

\* 2nd/3rd control is displayed when "SET(08)/SET3(17)" is allocated to one of multi-function inputs from C001 to C008.

| Parameter No.             | Function name | Monitor or data range                  | Default setting                                                                                                       | Changes during operation | Unit | Page |
|---------------------------|---------------|----------------------------------------|-----------------------------------------------------------------------------------------------------------------------|--------------------------|------|------|
| Absolute position control | P060          | Multi-step position command 0          | Position range specification (reverse side) to Position range specification (forward side)<br>-268435455 to 268435455 | 0                        | Yes  | —    |
|                           | P061          | Multi-step position command 1          | Position range specification (reverse side) to Position range specification (forward side)<br>-268435455 to 268435455 | 0                        |      |      |
|                           | P062          | Multi-step position command 2          | Position range specification (reverse side) to Position range specification (forward side)<br>-268435455 to 268435455 | 0                        |      |      |
|                           | P063          | Multi-step position command 3          | Position range specification (reverse side) to Position range specification (forward side)<br>-268435455 to 268435455 | 0                        |      |      |
|                           | P064          | Multi-step position command 4          | Position range specification (reverse side) to Position range specification (forward side)<br>-268435455 to 268435455 | 0                        |      |      |
|                           | P065          | Multi-step position command 5          | Position range specification (reverse side) to Position range specification (forward side)<br>-268435455 to 268435455 | 0                        |      |      |
|                           | P066          | Multi-step position command 6          | Position range specification (reverse side) to Position range specification (forward side)<br>-268435455 to 268435455 | 0                        |      |      |
|                           | P067          | Multi-step position command 7          | Position range specification (reverse side) to Position range specification (forward side)<br>-268435455 to 268435455 | 0                        |      |      |
|                           | P068          | Zero return mode                       | 00: Low speed<br>01: High speed 1<br>02: High speed 2                                                                 | 00                       | Yes  | —    |
|                           | P069          | Zero return direction selection        | 00: FWD (Forward side)<br>01: REV (Reverse side)                                                                      | 00                       | Yes  | —    |
|                           | P070          | Low-speed zero return frequency        | 0.00 to 10.00                                                                                                         | 0.00                     | Yes  | Hz   |
|                           | P071          | High-speed zero return frequency       | 0.00 to Maximum frequency                                                                                             | 0.00                     | Yes  | Hz   |
|                           | P072          | Position range specification (forward) | 0 to 268435455 (at P012 = 02)<br>0 to 1073741823 (at P012 = 03)                                                       | 268435455                | Yes  | —    |

\* 2nd/3rd control is displayed when "SET(08)/SET3(17)" is allocated to one of multi-function inputs from C001 to C008.

| Parameter No. | Function name                          | Monitor or data range                                                                                                                                                                                                                                                                                                                                                                                        | Default setting | Changes during operation | Unit | Page  |
|---------------|----------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|--------------------------|------|-------|
| P073          | Position range specification (reverse) | -268435455 to 0 (at P012 = 02)<br>-1073741823 to 0 (at P012 = 03)                                                                                                                                                                                                                                                                                                                                            | -268435455      | Yes                      | —    | 4-137 |
| P074          | Teaching selection                     | 00: X00 (Multi-step position command 0 (P060))<br>01: X01 (Multi-step position command 1 (P061))<br>02: X02 (Multi-step position command 2 (P062))<br>03: X03 (Multi-step position command 3 (P063))<br>04: X04 (Multi-step position command 4 (P064))<br>05: X05 (Multi-step position command 5 (P065))<br>06: X06 (Multi-step position command 6 (P066))<br>07: X07 (Multi-step position command 7 (P067)) | 00              | Yes                      | —    |       |
| P100 to P131  | Drive Program parameter U(00) to U(31) | 0 to 65535                                                                                                                                                                                                                                                                                                                                                                                                   | 0               | Yes                      | —    | —     |
| P160 to P169  | Option I/F cmd W register 1 to 10      | 0000 to FFFF                                                                                                                                                                                                                                                                                                                                                                                                 | 0000            | Yes                      | —    | —     |
| P170 to P179  | Option I/F cmd R register 1 to 10      | 0000 to FFFF                                                                                                                                                                                                                                                                                                                                                                                                 | 0000            | Yes                      | —    | —     |
| P180          | Profibus node address                  | 0 to 125                                                                                                                                                                                                                                                                                                                                                                                                     | 0               | No                       | —    | —     |
| P181          | Profibus clear mode                    | 00: Clear<br>01: Last value                                                                                                                                                                                                                                                                                                                                                                                  | 00              | No                       | —    | —     |
| P182          | Profibus Map selection                 | 00: PPO<br>01: Conventional<br>02: Flexible mode                                                                                                                                                                                                                                                                                                                                                             | 00              | No                       | —    | —     |
| P185          | CANOpen Node address                   | 0 to 127                                                                                                                                                                                                                                                                                                                                                                                                     | 0               | No                       | —    | —     |
| P186          | CANOpen communication speed            | 00: Auto<br>01: 10Kbps<br>02: 20Kbps<br>03: 50Kbps<br>04: 125Kbps<br>05: 250Kbps<br>06: 500Kbps<br>07: 800Kbps<br>08: 1Mbps                                                                                                                                                                                                                                                                                  | 06              | No                       | —    | —     |
| P190          | CompoNet node address                  | 0 to 63                                                                                                                                                                                                                                                                                                                                                                                                      | 0               | No                       | —    | —     |
| P192          | DeviceNet node address                 | 0 to 63                                                                                                                                                                                                                                                                                                                                                                                                      | 63              | No                       | —    | —     |
| P195          | ML2 frame length                       | 00: 32 bytes<br>01: 17 bytes                                                                                                                                                                                                                                                                                                                                                                                 | 00              | No                       | —    | —     |
| P196          | ML2 node address                       | 21 to 3E                                                                                                                                                                                                                                                                                                                                                                                                     | 21              | No                       | —    | —     |

\* 2nd/3rd control is displayed when "SET(08)/SET3(17)" is allocated to one of multi-function inputs from C001 to C008.

| Parameter No.  | Function name | Monitor or data range | Default setting | Changes during operation | Unit | Page |
|----------------|---------------|-----------------------|-----------------|--------------------------|------|------|
| User parameter | U001          | User 1 selection      | no/d001 to P196 | Yes                      | —    | 4-53 |
|                | U002          | User 2 selection      | no/d001 to P196 |                          |      |      |
|                | U003          | User 3 selection      | no/d001 to P196 |                          |      |      |
|                | U004          | User 4 selection      | no/d001 to P196 |                          |      |      |
|                | U005          | User 5 selection      | no/d001 to P196 |                          |      |      |
|                | U006          | User 6 selection      | no/d001 to P196 |                          |      |      |
|                | U007          | User 7 selection      | no/d001 to P196 |                          |      |      |
|                | U008          | User 8 selection      | no/d001 to P196 |                          |      |      |
|                | U009          | User 9 selection      | no/d001 to P196 |                          |      |      |
|                | U010          | User 10 selection     | no/d001 to P196 |                          |      |      |
|                | U011          | User 11 selection     | no/d001 to P196 |                          |      |      |
|                | U012          | User 12 selection     | no/d001 to P196 |                          |      |      |

\* 2nd/3rd control is displayed when "SET(08)/SET3(17)" is allocated to one of multi-function inputs from C001 to C008.



# Chapter 4

## Functions

|     |                                                           |       |
|-----|-----------------------------------------------------------|-------|
| 4-1 | Monitor Mode.....                                         | 4-1   |
| 4-2 | Function Mode.....                                        | 4-8   |
| 4-3 | Functions When PG Option Board (3G3AX-PG01) Is Used ..... | 4-123 |
| 4-4 | Communication Function.....                               | 4-145 |

## 4-1 Monitor Mode

### Output Frequency Monitor [d001]

Displays the set point of output frequency of the Inverter affected by acceleration and deceleration ramps but without compensations. During stop, "0.00" is displayed.

(Display)

0.00 to 400.00 : Displays in increments of 0.01 Hz.

Note: When the frequency reference is set using the Digital Operator, the output frequency can be changed with the Increment/Decrement key during operation only.

The frequency setting changed with this monitor will be reflected in frequency reference F001.

Pressing the Enter key overwrites the currently selected frequency reference.

Note: This will correspond with the theoretical motor speed but not with the real output frequency of the inverter.

### Output Current Monitor [d002]

Displays the output current value of the Inverter. During stop, "0.00" is displayed.

(Display)

0.0 to 9999.0: Displays in increments of 0.1 A.

### Rotation Direction Monitor [d003]

Displays the RUN direction of the Inverter.

The RUN LED indicator lights up during forward/reverse rotation.

(Display)

FWD: Forward

STOP: Stop

REV: Reverse

### PID Feedback Value Monitor [d004]

When "Enabled" (01) or "Reverse output enabled" (02) is selected in PID selection A071, the PID feedback value can be monitored.

Gain conversion is enabled with PID scale A075.

"d004 display" = "PID feedback value (%)" × "PID scale (A075)"

(A075): 0.01 to 99.99 (Can be set in increments of 0.01.)

(Display)

0.00 to 999000.00: Displays in increments of 0.01.



## Multi-function Input Monitor [d005]

- This monitor indicates the input status of the multi-function input terminals.
- The item that the built-in CPU recognizes to be "significant" is indicated as being ON. This does not depend on the NO/NC contact setting.

(Example)

FW, Multi-function input terminals 7, 2, 1: ON

Multi-function input terminals 8, 6, 5, 4, 3: OFF



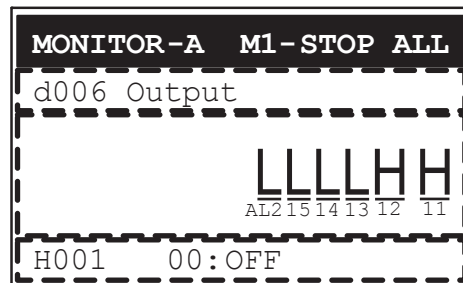
## Multi-function Output Monitor [d006]

- This monitor indicates the output status of the multi-function output terminals.
- This monitor displays the output status of the built-in CPU, not the control circuit terminal status.

(Example)

Multi-function output terminals 12, 11: ON

Relay output terminal AL2, Multi-function output terminals 15, 14, 13: OFF



## Output Frequency Monitor (After Conversion) [d007]

Displays a gain conversion value based on the coefficient set in frequency conversion coefficient b086. This monitor is used to change the unit of displayed data (e.g. motor rpm).

"d007 display" = "Output frequency (d001)" × "Frequency conversion coefficient (b086)"  
(b086) 0.1 to 99.9 (Can be set in increments of 0.1.)

(Example)

To display 4-pole motor rpm:

$$\text{Motor rpm } N \text{ (min}^{-1}\text{)} = (120 \times f \text{ (Hz)}) / P \text{ (pole)} \\ = f \text{ (Hz)} \times 30$$

As such, when b086 = 30.0, a motor rpm of 1800 (60 × 30.0) is displayed.

(Display)

0.00 to 39960.00: Displays in increments of 0.01.

Note: When the frequency reference is set using the Digital Operator, the output frequency can be changed with the Increment/Decrement key during operation only.  
The frequency setting changed with this monitor will be reflected in frequency reference F001.  
Pressing the Enter key overwrites the currently selected frequency reference. (The data storage accuracy depends on each frequency reference.)

## Real Frequency Monitor [d008]

When a motor with an encoder is connected to a load, and the PG board (3G3AX-PG01) is used, this monitor displays the real frequency of the motor (regardless of the control method).

(Display)

In forward rotation: 0.00 to 400.00 : Displays in increments of 0.01 Hz.

In reverse rotation: 0.00 to -400.00 : Displays in increments of 0.01 Hz.

Note 1: To use this monitor, set the number of encoder pulses (P011) and the motor pole number selection (H004 or H204) correctly.

Note 2: The monitored value does not depend on V/f characteristics selection A044.

## Torque Reference Monitor [d009]

When torque control is selected for sensor vector control, this monitor displays the currently entered torque reference value.

(Display)

-200 to 200: Displays in increments of 1%.

## Torque Bias Monitor [d010]

When sensor vector control is selected, this monitor displays the torque bias amount currently set in display code d010.

(Display)

-200 to 200: Displays in increments of 1%.

## Output Torque Monitor [d012]

Displays an estimated value of the Inverter's output torque.

(Display)

-200 to 200: Displays in increments of 1%.

Note: This monitor is enabled only when "sensorless vector control", "0-Hz sensorless vector control", or "sensor vector control" is selected as the control mode.

## Output Voltage Monitor [d013]

Displays the output voltage of the Inverter.

(Display)

0.0 to 600.0: Displays in increments of 0.1 V.

## Input Power Monitor [d014]

Displays the input power (instantaneous value) of the Inverter.

(Display)

0.0 to 999.9: Displays in increments of 0.1 W.

## Power ON Time Monitor [d015]

•Displays the integrated power (integrated value of input power) of the Inverter.

The gain conversion of displayed data is performed with integrated power display gain b079.

"d015 display" = "Input power calculation value (kWh)" / "Integrated power display gain (b079)"  
(b079) 1. to 1000. (Can be set in increments of 1.)

•When integrated power clear b078 is set to "01", pressing the Enter key clears the integrated power value.

•The integrated power value can also be cleared via terminal input, if "53" (KHC: Integrated power clear) is allocated to any of the multi-function input terminals.

•When b079 is set to "1000", up to "999000" (kWh) can be displayed.

(Display)

0 to 999999.9 : Displays in increments of 1 kWh/(b079) set value.

## Total RUN Time [d016]

Displays the total RUN time of the Inverter.

(Display)

0 to 999999 : Displays in increments of 1 hour.

## Power ON Time Monitor [d017]

Displays the total power ON time of the Inverter.

(Display)

0 to 999999 : Displays in increments of 1 hour.

## Fin Temperature Monitor [d018]

Displays the temperature of the fin inside the Inverter.

(Display)

-020. to 200.0: Displays in increments of 0.1°C.

## Motor Temperature Monitor [d019]

- Displays the temperature of the thermistor connected between the control circuit terminals TH and CM1.
- Set thermistor selection b098 to "02" (NTC enabled).

(Display)

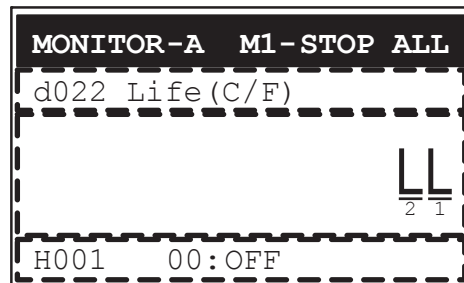
-020. to 200.0: Displays in increments of 0.1°C.

Note: When b098 = "01" (PTC enabled), the motor temperature monitor is disabled.

## 4

## Life Assessment Monitor [d022]

- This monitor indicates a life assessment result.  
The following two items can be monitored:
  - 1: Main circuit board capacitor service life
  - 2: Cooling fan rpm reduction



Note 1: The capacitor service life is calculated every 10 minutes. If the Inverter is turned on/off frequently within this interval, the capacitor service life cannot be correctly diagnosed.

Note 2: While the cooling fan is stopped with b092 set to "01", the cooling fan rpm is judged as being normal.

## Program Counter [d023]

Refer to Drive Programming Manual.

Display: 0 to 1024

## Program Number [d024]

Refer to Drive Programming Manual.

Display: 0 to 9999

## Drive Programming Monitor (UM0 to UM2) [d025 to d027]

Refer to Drive Programming Manual.

Display: -2147483647 to 2147483647

## Pulse Counter Monitor [d028]

You can monitor a total pulse count of multi-function input function pulse counter 74 (PCNT).

Display: 0 to 2147483647

## Position Command Monitor (Absolute Position Control Mode) [d029]

You can monitor a position command in absolute position control mode.

Note: This monitor is enabled only when V2 control mode selection P012 is set to "02" or "03" in sensor vector control mode.

Display: -1073741823 to 1073741823 when HAPR is selected  
-268435456 to 268435456 when APR2 is selected

## Current Position Monitor (Absolute Position Control Mode) [d030]

You can monitor the current position in absolute position control mode.

Note: This monitor is enabled only when V2 control mode selection P012 is set to "02" or "03" in sensor vector control mode.

Display: -1073741823 to 1073741823 when HAPR is selected  
-268435456 to 268435456 when APR2 is selected

## Clock [d031]

Setting Date and Time for the LCD digital operator.

(Display)

2000/1/1 to 2099/12/31: Displays in increments of 1 day.

00:00 to 23:59: Displays in increments of 1 minute.

## Inverter Mode [d060]

Dual rating. Refer to b049 parameter.

(Display)

00 : Constant torque.

01 : Variable torque.

## Fault Frequency Monitor [d080]

Displays the number of times the Inverter has tripped.

(Display)

0 to 65535 : Displays in increments of 1 time.

## Fault Monitors 1 to 6 [d081] to [d086]

Refer to **7. Trip Mode** in *Chapter 3.4 Operation*.

## Warning Monitor [d090]

- If the set data is inconsistent with other data, a warning code is displayed.
- While this warning remains in effect, the Warning LED indicator stays lit until forced to rewrite or correct the data.
- For details on the Warning display, refer to "5-2 Warning Function".

Display: 0 to 385

## DC Voltage Monitor [d102]

- Displays the DC voltage (between P and N) of the Inverter.
- During operation, the monitor value changes depending on the actual DC voltage of the Inverter.

(Display)

0.0 to 999.9: Displays in increments of 0.1 V.

## Regenerative Braking Load Rate Monitor [d103]

Displays a regenerative braking load rate. When the monitor value comes close to exceeding the value set in usage rate of the regenerative braking function b090, "E06 (Braking resistor overload protection)" works to trip the Inverter.

(Display)

0.0 to 100.0: Displays in increments of 0.1%.

## Electronic Thermal Monitor [d104]

Displays an electronic thermal load rate. When the monitor value comes close to exceeding 100%, "E05 (Overload protection)" works to trip the Inverter.

(Display)

0.0 to 100.0: Displays in increments of 0.1%.

## 4-2 Function Mode

### <Group F: Basic Function Parameters>

#### Output Frequency Setting/Monitor

- Set the Inverter output frequency.
- With frequency reference selection A001 set to 02, you can set the output frequency with F001. For other methods, refer to the [A001] section in "Frequency Reference Selection" (page 4-10). (If A001 is set other than to "02", F001 functions as the frequency reference monitor.)
- If a frequency is set in F001, the same value is automatically set in multi-step speed reference 0 (A020). To set the 2nd/3rd control, use the 2nd multi-step speed reference 0 (A220)/3rd multi-step speed reference 0 (A320) or use F001 with the SET/SET3 terminal turned on. To set using the SET/SET3 terminal, allocate 08 (SET)/17 (SET3) to the desired multi-function input.
- When this monitor is used to display a target value of the PID function, the monitor value is displayed as a percentage (%). (100% = Max. frequency)

| Parameter No.     | Function name                     | Data                                                 | Default setting | Unit |
|-------------------|-----------------------------------|------------------------------------------------------|-----------------|------|
| F001              | Output frequency setting/monitor  | 0.0/Starting frequency to 1st/2nd/3rd max. frequency | 0.00            | Hz   |
| A020              | Multi-step speed reference 0      |                                                      | 6.00            |      |
| A220              | *2nd multi-step speed reference 0 |                                                      |                 |      |
| A320              | *3rd multi-step speed reference 0 |                                                      |                 |      |
| Related functions |                                   | A001, A020, A220, A320, C001 to C008                 |                 |      |

\* To switch to the 2nd/3rd control, allocate 08 (SET)/17 (SET3) to the desired multi-function input and then turn it on.

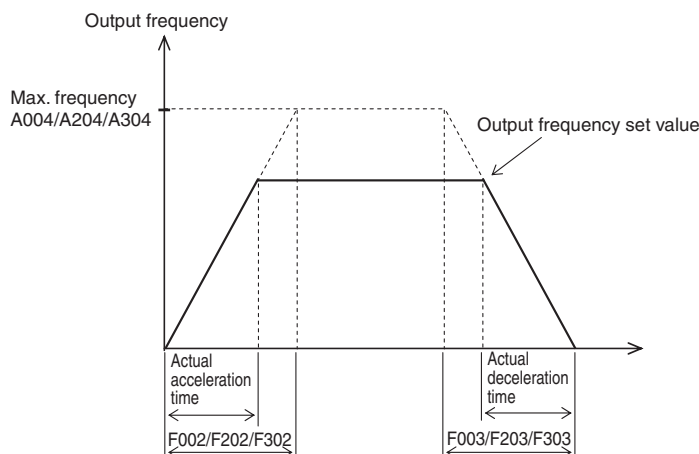
#### Acceleration/Deceleration Time

- Set an acceleration/deceleration time for the motor. For a slow transition, set to a large value, and for a fast transition, set to a small one.

| Parameter No.     | Function name                             | Data                                                                                       | Default setting | Unit |
|-------------------|-------------------------------------------|--------------------------------------------------------------------------------------------|-----------------|------|
| F002              | Acceleration time 1                       | 0.01 to 3600.00                                                                            | 10.00           | s    |
| F202              | *2nd acceleration time 1                  |                                                                                            |                 |      |
| F302              | *3rd acceleration time 1                  |                                                                                            |                 |      |
| F003              | Deceleration time 1                       |                                                                                            |                 |      |
| F203              | *2nd deceleration time 1                  |                                                                                            |                 |      |
| F303              | *3rd deceleration time 1                  |                                                                                            |                 |      |
| P031              | Acceleration/deceleration time input type | 00: OPE (Digital Operator)<br>01: Option 1<br>02: Option 2<br>03: EzSQ (Drive Programming) | 00              | —    |
| Related functions |                                           | A004, A204, A304, P031, C001 to C008                                                       |                 |      |

\* To switch to 2nd/3rd acceleration time 1 or 2nd/3rd deceleration time 1, allocate 08 (SET)/17 (SET3) to the desired multi-function input and then turn it on.

- The set time here indicates the acceleration/deceleration time from 0 Hz to the maximum frequency.



- When the LAD cancel (LAC) function is selected in the multi-function input selection and the signal is turned on, the acceleration/deceleration time is ignored, and the output frequency instantaneously follows the reference frequency.
- To switch between the 1st/2nd/3rd acceleration times or between the 1st/2nd/3rd deceleration times, allocate 08 (SET)/17 (SET3) to the desired multi-function input (refer to "Multi-function Input Selection" (page 4-79)), and use the SET/SET3.
- You can set the acceleration/deceleration time via (1) the Digital Operator, (2) optional board 1, or (3) optional board 2.
- Even if a short acceleration/deceleration time is set, the actual time cannot be shorter than the minimum acceleration/deceleration time that is determined by the mechanical inertia moment and the motor torque. If you set a time shorter than the minimum time, an overcurrent/overvoltage trip may occur.

Acceleration Time  $T_s$

$$T_s = \frac{(J_L + J_M) \times N_M}{9.55 \times (T_s - T_L)}$$

Deceleration Time  $T_B$

$$T_B = \frac{(J_L + J_M) \times N_M}{9.55 \times (T_B + T_L)}$$

$J_L$ : Inertia moment of the load converted to the motor shaft [kg·m<sup>2</sup>]

$J_M$ : Inertia moment of the motor [kg·m<sup>2</sup>]

$N_M$ : Motor rotation speed [r/min]

$T_s$ : Max. acceleration torque with the Inverter driving [N·m]

$T_B$ : Max. deceleration torque with the Inverter driving [N·m]

$T_L$ : Required driving torque [N·m]

For short-time deceleration, use a braking unit (optional).

## Operator Rotation Direction Selection

- Select the rotation direction applied to the RUN command via the Digital Operator.
- This is disabled at terminals.

| Parameter No. | Function name                         | Data                                   | Default setting | Unit |
|---------------|---------------------------------------|----------------------------------------|-----------------|------|
| F004          | Operator rotation direction selection | 00: FWD (Forward)<br>01: REV (Reverse) | 00              | —    |



## &lt;Group A: Standard Function Parameters&gt;

## Frequency Reference Selection

Select the method for using the frequency reference.

| Parameter No.     | Function name                 | Data                                                                                                                                                                                                                                                              | Default setting | Unit |
|-------------------|-------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|------|
| A001              | Frequency reference selection | 00: VR (Digital Operator (FREQ adjuster))<br>01: Terminal<br>02: Digital Operator (F001)<br>03: RS485 (ModBus communication)<br>04: Option 1<br>05: Option 2<br>06: Pulse train frequency<br>07: EzSQ (Drive Programming)<br>10: (Math) Operation function result | 01              | —    |
| Related functions |                               | A005, A141 to A143, A145, A146                                                                                                                                                                                                                                    |                 |      |

| Data | Frequency reference source                                                                         |
|------|----------------------------------------------------------------------------------------------------|
| 00   | Set a frequency with the FREQ adjuster on the Digital Operator. (Enabled when 3G3AX-OP01 is used.) |
| 01   | Set a frequency via terminals. (O-L, OI-L, O2-L)                                                   |
| 02   | Set a frequency via the Digital Operator (F001).                                                   |
| 03   | Set a frequency through the ModBus communication.                                                  |
| 04   | Set a frequency via the PCB mounted to option port 1.                                              |
| 05   | Set a frequency via the PCB mounted to option port 2.                                              |
| 06   | Set a frequency as a pulse train by using 3G3AX-PG01.                                              |
| 07   | Drive Programming                                                                                  |
| 10   | The operation result of the frequency operation function is defined as a frequency reference.      |

## RUN Command Selection

Select the method for using the RUN/STOP command.

| Parameter No.     | Function name         | Data                                                                                                            | Default setting | Unit |
|-------------------|-----------------------|-----------------------------------------------------------------------------------------------------------------|-----------------|------|
| A002              | RUN command selection | 01: Terminal<br>02: Digital Operator (F001)<br>03: RS485 (ModBus communication)<br>04: Option 1<br>05: Option 2 | 01              | —    |
| Related functions |                       | F004, C001 to C008, C019                                                                                        |                 |      |

| Data | RUN command source                                                                                                                           |
|------|----------------------------------------------------------------------------------------------------------------------------------------------|
| 01   | Turn on/off the FW or RV allocated to terminals.<br>The STOP command is activated if both Forward/Reverse commands are input simultaneously. |
| 02   | Use the STOP/RESET key on the Digital Operator.                                                                                              |
| 03   | Use the ModBus communication.                                                                                                                |
| 04   | Use option board 1.                                                                                                                          |
| 05   | Use option board 2.                                                                                                                          |

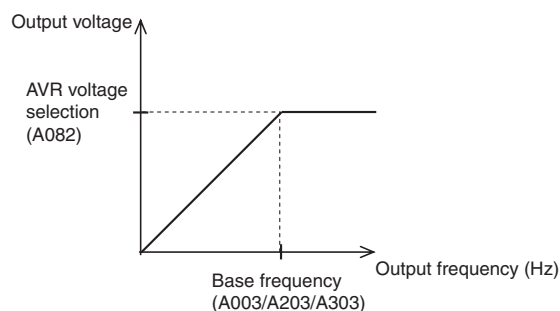
## Base Frequency

- Match the Inverter output (frequency/voltage) to the motor rating. Be careful, especially if you set a base frequency below 50 Hz. Otherwise, the motor may burn out.

| Parameter No.     | Function name       | Data                            | Default setting | Unit |
|-------------------|---------------------|---------------------------------|-----------------|------|
| A003              | Base frequency      | 30 to Max. frequency [A004]     | 50              | Hz   |
| A203              | *2nd base frequency | 30 to 2nd max. frequency [A204] |                 |      |
| A303              | *3rd base frequency | 30 to 3rd max. frequency [A304] |                 |      |
| Related functions |                     | A004, A204, A304, A081, A082    |                 |      |

\* To switch to the 2nd/3rd control, allocate 08 (SET)/17 (SET3) to the desired multi-function input and then turn it on.

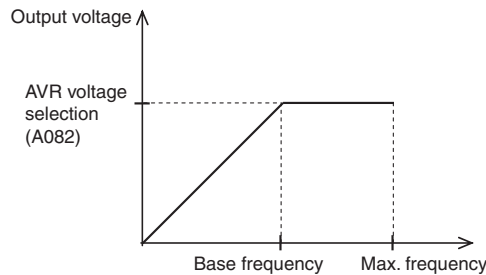
- For the base frequency and motor voltage selections, match the Inverter output (frequency/voltage) to the motor rating.



- If you apply a base frequency of over 60 Hz, a special motor is required. This may require the Inverter to increase its capacity to accommodate a different applicable motor.
- Set the motor voltage selection according to the motor specifications. If the voltage exceeds the specified level, the motor may burn out.

## Maximum Frequency

- Set the maximum value of the output frequency.
- The value set here is the maximum value (e.g., 10 V in the range from 0 to 10 V) of the external analog input (frequency reference).
- The maximum Inverter output voltage from base to maximum frequencies is the voltage set in AVR voltage selection A082.
- The Inverter cannot output voltage beyond that of the incoming voltage.



| Parameter No.     | Function name          | Data                         | Default setting | Unit |
|-------------------|------------------------|------------------------------|-----------------|------|
| A004              | Maximum frequency      | 30 to 400                    | 50              | Hz   |
| A204              | *2nd maximum frequency |                              |                 |      |
| A304              | *3rd maximum frequency |                              |                 |      |
| Related functions |                        | A003, A203, A303, A081, A082 |                 |      |

\* To switch to the 2nd/3rd control, allocate 08 (SET)/17 (SET3) to the desired multi-function input and then turn it on.

## Analog Input (O, O2, OI)

- The Inverter has three types of external analog input terminals.

O-L terminal: 0 to 10 V (voltage input)  
 OI-L terminal: 4 to 20 mA (current input)  
 O2-L terminal: -10 to 10 V (voltage input)

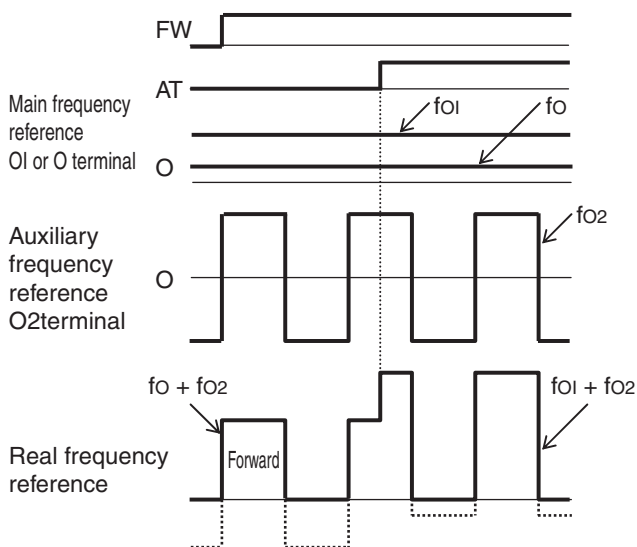
- Below are the settings for this function.

| Parameter No.     | Function name  | Data                                                                                                                                                                                                                                                                                                                                                                                                                      | Default setting | Unit |
|-------------------|----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|------|
| A005              | O/OI selection | 00: [O]/[O2] Switches between O/OI terminal AT<br>01: [O]/[O2] Switches between O/O2 terminal AT<br>02: [O]/VR Switches between O/FREQ adjuster via terminal AT (Enabled only when 3G3AX-OP01 is used.)<br>03: [OI]/VR Switches between OI/FREQ adjuster via terminal AT (Enabled only when 3G3AX-OP01 is used.)<br>04: [O2]/VR Switches between O2/FREQ adjuster via terminal AT (Enabled only when 3G3AX-OP01 is used.) | 00              | —    |
| A006              | O2 selection   | 00: [O2] only<br>01: [O/OI-P] Auxiliary frequency reference (not reversible)<br>02: [O/OI-PM] Auxiliary frequency reference (reversible)<br>03: [OFF] O2 disabled                                                                                                                                                                                                                                                         | 03              | —    |
| Related functions |                | A005, A006, C001 to C008                                                                                                                                                                                                                                                                                                                                                                                                  |                 |      |

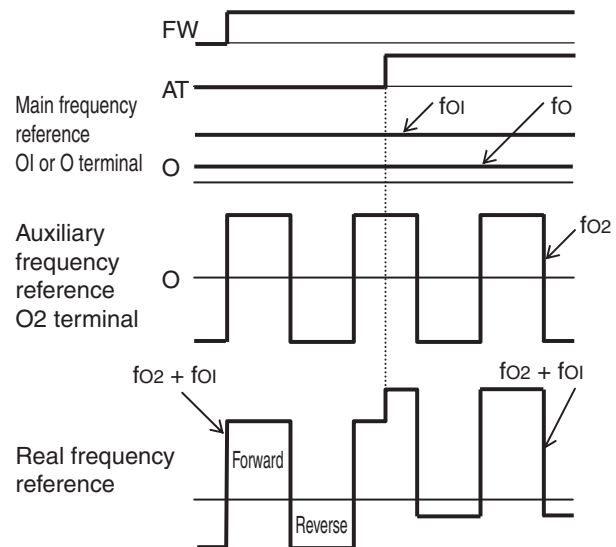
- The frequency reference and reversibility depend on whether "16" (AT) is allocated to a multi-function input, and depend on the combination of A005 and A006, as shown below.  
If the frequency reference is "reversible", the motor runs in the reverse direction when "main frequency reference + auxiliary frequency reference" is less than zero, even if the FW (Forward) terminal is ON. Also, note that the motor may run in the reverse direction, resulting in prolonged acceleration time or other phenomena, if the voltage fluctuates around 0 V even with the O2 terminal not connected.

|                                                 | A006   | A005           | AT terminal | Main frequency reference               | Auxiliary frequency reference (O2-L terminal) | Reversibility  |
|-------------------------------------------------|--------|----------------|-------------|----------------------------------------|-----------------------------------------------|----------------|
| With AT allocated to a multi-function input     | 00, 03 | 00             | OFF         | O-L terminal                           | Disabled                                      | Not reversible |
|                                                 |        |                | ON          | OI-L terminal                          | Disabled                                      |                |
|                                                 |        | 01             | OFF         | O-L terminal                           | Disabled                                      | Reversible     |
|                                                 |        |                | ON          | O2-L terminal                          | Disabled                                      |                |
|                                                 | 01     | 00 (Example 1) | OFF         | O-L terminal                           | Enabled                                       | Not reversible |
|                                                 |        |                | ON          | OI-L terminal                          | Enabled                                       |                |
|                                                 |        | 01             | OFF         | O-L terminal                           | Enabled                                       | Reversible     |
|                                                 |        |                | ON          | O2-L terminal                          | Disabled                                      |                |
|                                                 | 02     | 00 (Example 2) | OFF         | O-L terminal                           | Enabled                                       | Reversible     |
|                                                 |        |                | ON          | OI-L terminal                          | Enabled                                       |                |
|                                                 |        | 01             | OFF         | O-L terminal                           | Enabled                                       |                |
|                                                 |        |                | ON          | O2-L terminal                          | Disabled                                      |                |
| With AT NOT allocated to a multi-function input | 00     | —              | —           | O2-L terminal                          | Disabled                                      | Reversible     |
|                                                 | 01     | —              | —           | Addition of the O-L and OI-L terminals | Enabled                                       | Not reversible |
|                                                 | 02     | —              | —           | Addition of the O-L and OI-L terminals | Enabled                                       | Reversible     |
|                                                 | 03     | —              | —           | Addition of the O-L and OI-L terminals | Disabled                                      | Not reversible |

(Example 1) Not reversible



(Example 2) Reversible



## External Frequency (Voltage/Current) Adjustment

- External analog input (frequency reference)

O-L terminal: 0 to 10 V (voltage input)

OI-L terminal: 4 to 20 mA (current input)

O2-L terminal: -10 to 10 V (voltage input)

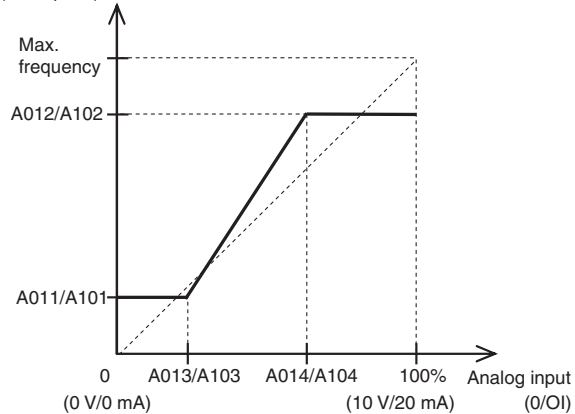
Also set an output frequency for the FREQ adjuster on the Digital Operator.

### ■ Adjusting the O2-L and OI-L Terminals

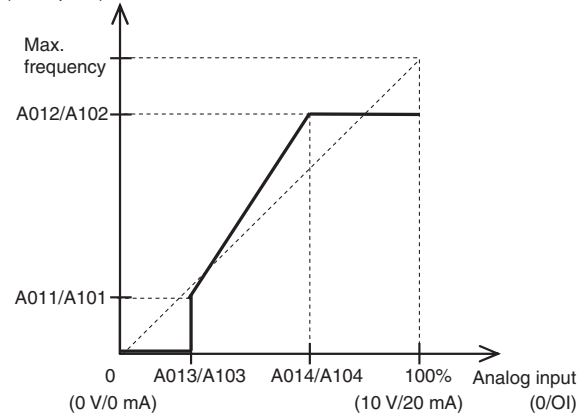
| Parameter No.     | Function name        | Data                                                                                                         | Default setting | Unit |
|-------------------|----------------------|--------------------------------------------------------------------------------------------------------------|-----------------|------|
| A011<br>A101      | O/OI start frequency | 0.00 to 400.0<br>(Set a start/end frequency.)                                                                | 0.00            | Hz   |
| A012<br>A102      | O/OI end frequency   |                                                                                                              |                 |      |
| A013<br>A103      | O/OI start ratio     | 0 to 100<br>(Set a start/end ratio relative to an external frequency reference of 0 to 10 V and 4 to 20 mA.) | 0               | %    |
| A014<br>A104      | O/OI end ratio       |                                                                                                              | 20              |      |
| A015<br>A105      | O/OI start selection |                                                                                                              | 100             |      |
| A015<br>A105      | O/OI start selection | 00: External start frequency (A011 set value)<br>01: 0 Hz                                                    | 01              | —    |
| A015<br>A105      | O/OI start selection |                                                                                                              | 00              |      |
| Related functions |                      | A003, A203, A303, A081, A082                                                                                 |                 |      |

- To input voltage ranging from 0 to 5 V on the OI-L terminal, set A014 to 50%.

(Example 1) A015/A105: 00



(Example 2) A015/A105: 01



## ■ Adjusting the O2-L Terminal

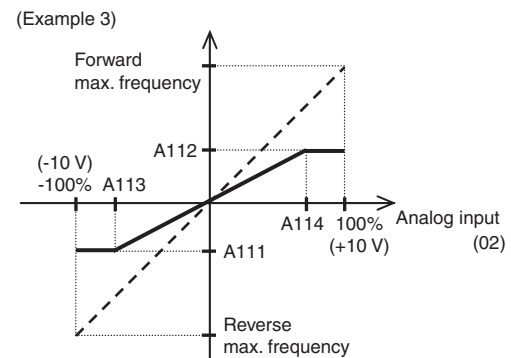
| Parameter No.     | Function name      | Data                                                                                                       | Default setting | Unit |
|-------------------|--------------------|------------------------------------------------------------------------------------------------------------|-----------------|------|
| A111              | O2 start frequency | -400.00 to 400.00<br>(Set a start frequency.)                                                              | 0.00            | Hz   |
| A112              | O2 end frequency   | -400.00 to 400.00<br>(Set an end frequency.)                                                               | 0.00            |      |
| A113              | O2 start ratio     | -100 to O2 end ratio:<br>(Set a start ratio relative to an external frequency reference of -10 to 10 V. *) | -100            | %    |
| A114              | O2 end ratio       | O2 start ratio to 100:<br>(Set an end ratio relative to an external frequency reference of -10 to 10 V. *) | 100             |      |
| Related functions |                    | A003, A203, A303, A081, A082                                                                               |                 |      |

\* Below is the ratio from -10 to 10 V.

-10 to 0 V: -100% to 0%

0 to 10 V: 0% to 100%

- For example, to input voltage ranging from -5 to 5 V on the O2-L terminal, set A113 to -50%, and A114 to 50%.



## O, O2, OI Sampling

- You can set the built-in filter applied to frequency setting signals of the external voltage/current input.

| Parameter No.     | Function name      | Data                                                     | Default setting | Unit |
|-------------------|--------------------|----------------------------------------------------------|-----------------|------|
| A016              | O, O2, OI sampling | 1 to 30<br>31 (with 500 ms filter +/- 0.1 Hz hysteresis) | 31              | —    |
| Related functions |                    | A011 to A016, C001 to C008                               |                 |      |

- Helps remove noise in the frequency setting circuit.
- Set a larger data value if stable operation cannot be secured because of noise.  
Note that the larger the data value is, the slower the response time. This parameter specifies a filter time constant for a set value of 1 to 30 ( $\times 2$  ms).
- When "31." is selected, a filter time constant of 500 ms and a hysteresis of  $\pm 0.1$  Hz are set. (Factory default)

## Multi-step Speed Operation Function

- You can set RUN speeds using codes and switch between the set speeds via the terminal.
- For multi-step speed operation, you can select either 4-terminal binary operation (with 16 steps max.) or 7-terminal bit operation (with 8 steps max.).

| Parameter No. | Function name                       | Data                                                                                         | Default setting | Unit |
|---------------|-------------------------------------|----------------------------------------------------------------------------------------------|-----------------|------|
| A019          | Multi-step speed selection          | 00: Binary: 16-step selection with 4 terminals<br>01: Bit: 8-step selection with 7 terminals | 00              | —    |
| A020          | Multi-step speed reference 0        | 0.0/Starting frequency to<br>Max. frequency                                                  | 6.00            | Hz   |
| A220          | *2nd multi-step speed reference 0   |                                                                                              |                 |      |
| A320          | *3rd multi-step speed reference 0   |                                                                                              |                 |      |
| A021          | Multi-step speed reference 1        |                                                                                              | 0.00            |      |
| A022          | Multi-step speed reference 2        |                                                                                              |                 |      |
| A023          | Multi-step speed reference 3        |                                                                                              |                 |      |
| A024          | Multi-step speed reference 4        |                                                                                              |                 |      |
| A025          | Multi-step speed reference 5        |                                                                                              |                 |      |
| A026          | Multi-step speed reference 6        |                                                                                              |                 |      |
| A027          | Multi-step speed reference 7        |                                                                                              |                 |      |
| A028 to A035  | Multi-step speed references 8 to 15 |                                                                                              |                 |      |

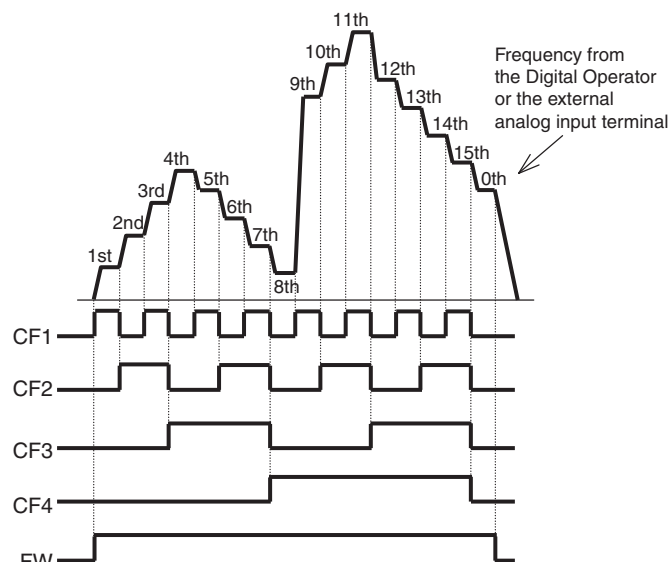
\* To switch to the 2nd/3rd control, allocate 08 (SET)/17 (SET3) to the desired multi-function input and then turn it on.

- During multi-step speed operation, if frequency reference selection A001 is set to the terminal (01), and the external analog input (O, O2, OI) setting mode based on a combination of O/OI selection A005, O2 selection A006, and the AT terminal is set to "reversible", the RUN command is inverted when "main frequency reference + auxiliary frequency reference" is less than zero.

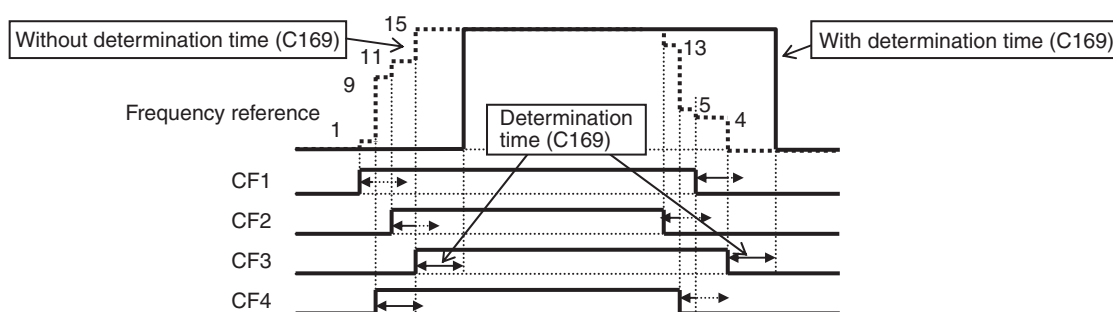
## Binary Operation

- By allocating 02 to 05 (CF1 to CF4) to any of multi-function inputs 1 to 8 (C001 to C008), you can select from multi-step speeds 0 to 15.
- Use A021 to A035 (multi-step speeds 1 to 15) to set frequencies for speeds 1 to 15.
- When the Digital Operator is selected as the frequency reference, speed 0 is set with A020/A220/A320 or F001 (refer to page 4-8). When the control circuit terminal block is selected, speed 0 is set with terminals O, O2, and OI.

| Multi-step speeds | CF4 | CF3 | CF2 | CF1 |
|-------------------|-----|-----|-----|-----|
| 0th               | OFF | OFF | OFF | OFF |
| 1st               |     |     | ON  | ON  |
| 2nd               |     | ON  | OFF | OFF |
| 3rd               |     |     | ON  | ON  |
| 4th               |     | OFF | OFF | OFF |
| 5th               |     |     | ON  | ON  |
| 6th               | ON  | ON  | OFF | OFF |
| 7th               |     |     | ON  | ON  |
| 8th               |     | OFF | OFF | OFF |
| 9th               |     |     | ON  | ON  |
| 10th              |     | ON  | OFF | OFF |
| 11th              |     |     | ON  | ON  |
| 12th              |     | OFF | OFF | OFF |
| 13th              |     |     | ON  | ON  |
| 14th              |     | ON  | OFF | OFF |
| 15th              |     |     | ON  | ON  |



- For multi-step speed binary operation, you can set the wait time until which the terminal input is determined in multi-step speed/position determination time C169. This prevents the transition status before the input determination from being applied.
- If no input is made after the time set in C169, the data is determined.  
(Note that the longer the determination time, the slower the input response.)



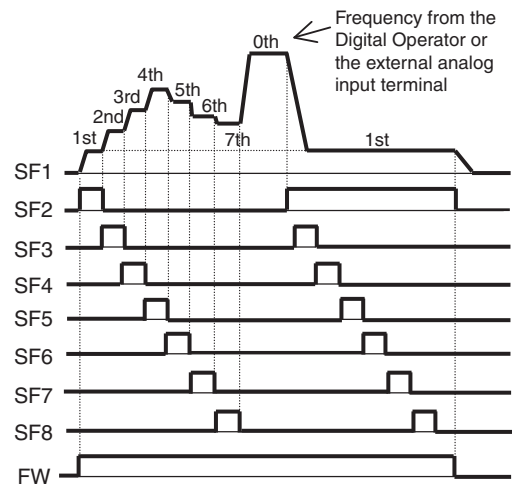


## ■Bit Operation

- By allocating 32 to 38 (SF1 to SF7) to any of multi-function inputs selection 1 to 8 (C001 to C008), you can select from multi-step speeds 0 to 7.
- For SF1 to SF7 frequency settings, set multi-step speeds 1 to 7 (A021 to A027).

| Multi-step speeds | SF7 | SF6 | SF5 | SF4 | SF3 | SF2 | SF1 |
|-------------------|-----|-----|-----|-----|-----|-----|-----|
| 0th               | OFF | OFF | OFF | OFF | OFF | OFF | OFF |
| 1st               | x   | x   | x   | x   | x   | x   | ON  |
| 2nd               | x   | x   | x   | x   | x   | ON  | OFF |
| 3rd               | x   | x   | x   | x   | ON  | OFF | OFF |
| 4th               | x   | x   | x   | ON  | OFF | OFF | OFF |
| 5th               | x   | x   | ON  | OFF | OFF | OFF | OFF |
| 6th               | x   | ON  | OFF | OFF | OFF | OFF | OFF |
| 7th               | ON  | OFF | OFF | OFF | OFF | OFF | OFF |

- When several terminals are simultaneously turned on, priority is given to the terminal with the smallest number.  
The x mark in the above table indicates that speed is selected regardless of ON/OFF status.



## Jogging Operation Function

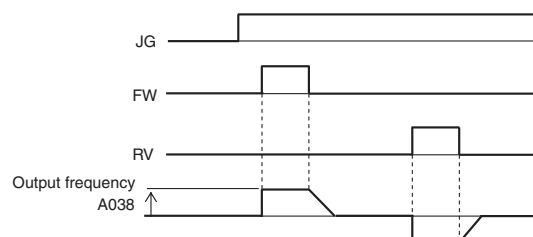
- The motor rotates while this function is turned on.

| Parameter No. | Function name          | Data                                                                                                                                                                                                                                                                                                                                                                                                                                        | Default setting | Unit |
|---------------|------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|------|
| A038          | Jogging frequency      | 0.00/Starting frequency to 9.99                                                                                                                                                                                                                                                                                                                                                                                                             | 6.00            | Hz   |
| A039          | Jogging stop selection | 00: FRS (Free running on jogging stop/ Disabled in operation)<br>01: DEC (Deceleration stop on jogging stop/ Disabled in operation)<br>02: DB (DC injection braking on jogging stop/ Disabled in operation*)<br>03: FRS (RUN) (Free running on jogging stop/ Enabled in operation)<br>04: DEC (RUN) (Deceleration stop on jogging stop/ Enabled in operation)<br>05: DB (RUN) (DC injection braking on jogging stop/ Enabled in operation*) | 04              | —    |

\* When jogging stop selection A039 is set to "02" or "05", the DC injection braking settings are required. (Refer to page 4-24.)

- Allocate 06 (JG) to the desired multi-function input.

## ■Jogging Frequency

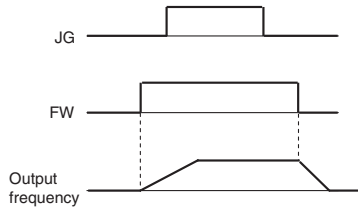


- Setting a high jogging frequency causes the Inverter to easily trip. Adjust the set value of jogging frequency A038 to prevent the Inverter from tripping.

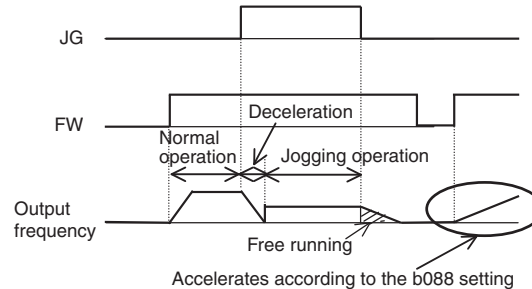
## ■ Jogging Stop Selection

Note: To perform the jogging operation, turn on the JG terminal before the FW or RV terminal.  
(Do the same if the RUN command source is set to the Digital Operator.)

(Example 1)



(Example 2)



With jogging stop selection A039 set to "00", "01", or "02", jogging does not function if the FW signal is turned on first.

With A039 set to "03", "04", or "05", jogging functions even if the FW signal is turned on first. However, if the JG signal is turned off before the FW signal, the motor coasts to a free running stop.

## Torque Boost

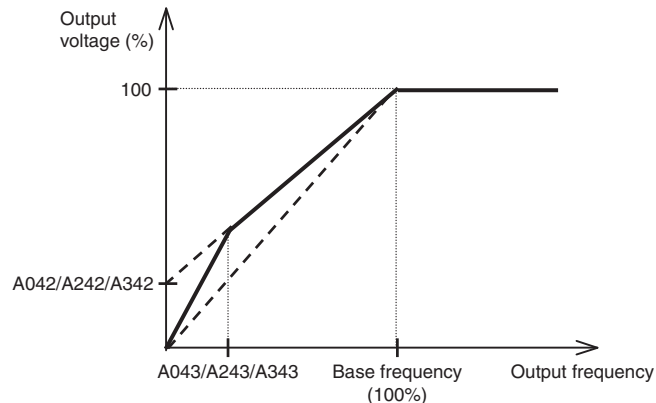
- Compensates for the voltage drop caused by the primary resistance of the motor, or by wiring to suppress torque reduction at a low speed range.
- To select the automatic torque boost for A041/A241, set motor capacity selection H003/H203 and motor pole number selection H004/H204 according to your motor.

| Parameter No. | Function name                      | Data                                                              | Default setting | Unit |
|---------------|------------------------------------|-------------------------------------------------------------------|-----------------|------|
| A041          | Torque boost selection             | 00: Manual torque boost<br>01: Automatic torque boost             | 00              | —    |
| A241          | *2nd torque boost selection        |                                                                   |                 |      |
| A042          | Manual torque boost voltage        | 0.0 to 20.0<br>(Ratio to the value of AVR voltage selection A082) | 1.0             | %    |
| A242          | *2nd manual torque boost voltage   |                                                                   |                 |      |
| A342          | *3rd manual torque boost voltage   |                                                                   |                 |      |
| A043          | Manual torque boost frequency      | 0.0 to 50.0<br>(Ratio to base frequency)                          | 5.0             | %    |
| A243          | *2nd manual torque boost frequency |                                                                   |                 |      |
| A343          | *3rd manual torque boost frequency |                                                                   |                 |      |
| H003          | Motor capacity selection           | 0.20 to 160.0<br>(Ratio to base frequency)                        | Factory default | kW   |
| H203          | *2nd motor capacity selection      |                                                                   |                 |      |
| H004          | Motor pole number selection        | 2/4/6/8/10                                                        | 4               | Pole |
| H204          | *2nd motor pole number selection   |                                                                   |                 |      |

\* To switch to the 2nd/3rd control, allocate 08 (SET)/17 (SET3) to the desired multi-function input and then turn it on.

## ■ Manual Torque Boost

- Outputs the voltage set in A042/A242/A342 or A043/A243/A343.
- In A042/A242/A342, set a ratio based on the voltage set in the motor voltage selection as 100%.



- If you raise the set value of the manual torque boost, be careful about motor overexcitation. Otherwise, the motor may burn out.
- In manual torque boost frequency A043/A243/A343, set a ratio based on the base frequency as 100%.

## ■ Automatic Torque Boost

- If the automatic torque boost is selected in the torque boost selection (A041/A241: 01), it operates to adjust the output frequency and voltage automatically, depending on the load level. (In actual control, the automatic torque boost is used along with the manual torque boost.)
- To select the automatic torque boost, set motor capacity selection H003/H203 and motor pole number selection H004/H204 correctly according to your motor.
- To avoid a possible overcurrent trip during deceleration, set the AVR selection to "Always ON" (A081: 00).
- If the automatic torque boost cannot provide the desired characteristics, adjust each item, as shown in the following table.

| Phenomenon                                                             | Adjusting method                                                                | Adjustment item |
|------------------------------------------------------------------------|---------------------------------------------------------------------------------|-----------------|
| Insufficient torque at low speed<br>(Motor does not run at low speed.) | Gradually increase the voltage setting of the manual torque boost.              | A042/A242       |
|                                                                        | Gradually increase the slip compensation gain of the automatic torque boost.    | A047/A247       |
|                                                                        | Gradually increase the voltage compensation gain of the automatic torque boost. | A046/A246       |
|                                                                        | Reduce the set value of the carrier frequency.                                  | b083            |
| Rotation speed lowers when load is applied.                            | Gradually increase the slip compensation gain of the automatic torque boost.    | A047/A247       |
| Rotation speed increases when load is applied.                         | Gradually reduce the slip compensation gain of the automatic torque boost.      | A047/A247       |
| Overcurrent trip occurs when load is applied.                          | Gradually reduce the voltage compensation gain of the automatic torque boost.   | A046/A246       |
|                                                                        | Gradually reduce the slip compensation gain of the automatic torque boost.      | A047/A247       |
|                                                                        | Gradually reduce the voltage setting of the manual torque boost.                | A042/A242       |

## Control Method (V/f Characteristics)

You can set V/f characteristics (output voltage/output frequency).

| Parameter No.     | Function name                      | Data                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Default setting | Unit |
|-------------------|------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|------|
| A044              | V/f characteristics selection      | <b>Heavy duty</b><br>00: VC (Constant torque characteristics)<br>01: VP (Special reduced torque characteristics)<br>02: Free V/f (characteristics)<br>(Only A044/A244 can be set.)<br>03: SLV (Sensorless vector control)<br>(Only A044/A244 can be set.* <sup>1</sup> )<br>04: 0SLV (0-Hz sensorless vector control)<br>(Only A044/A244 can be set.* <sup>2</sup> )<br>05: V2 (Sensor vector control)<br>(Only A044/A244 can be set.)<br><b>Normal duty</b><br>00: VC (Constant torque characteristics)<br>01: VP (Special reduced torque characteristics)<br>02: Free V/f (characteristics)<br>03: SLV (Sensorless vector control) | 00              | —    |
| A244              | *2nd V/f characteristics selection |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                 |      |
| A344              | *3rd V/f characteristics selection |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                 |      |
| Related functions |                                    | A046, A246, A047, A247, A082, H003, H203, H004, H204                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                 |      |

\* To switch to the 2nd/3rd control, allocate 08 (SET)/17 (SET3) to the desired multi-function input and then turn it on.

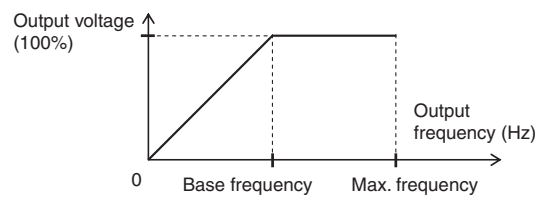
\*1. Refer to "Sensorless Vector Control" (page 4-116).

\*2. Refer to "0-Hz Sensorless Vector Control" (page 4-117).

### ■ Constant Torque Characteristics (VC)

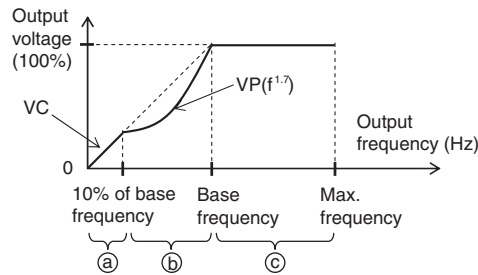
Output voltage is proportional to output frequency.

While proportional from 0 Hz to base frequency, the output voltage is constant from base to maximum frequencies.



## ■Special Reduced Torque Characteristics (Special VP)

Suitable for a fan or pump that requires torque in a low speed range. These have VC characteristics only for low deceleration in reduced torque characteristics.



Period a: Provides constant torque characteristics within a range from 0 Hz to 10% of the base frequency.

(Example) If the base frequency is 50 Hz, the Inverter provides constant torque characteristics within a range from 0 to 5 Hz.

Period b: Provides reduced torque characteristics within a range from 10% to 100% of the base frequency.

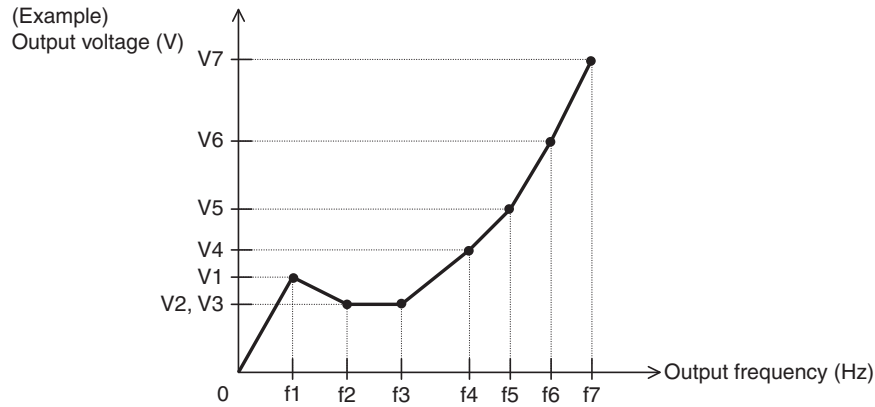
The Inverter outputs voltage based on a curve of the 1.7th power of the frequency.

Period c: Provides constant voltage characteristics within a range from the base frequency to the maximum frequency.

## ■Free V/f Setting

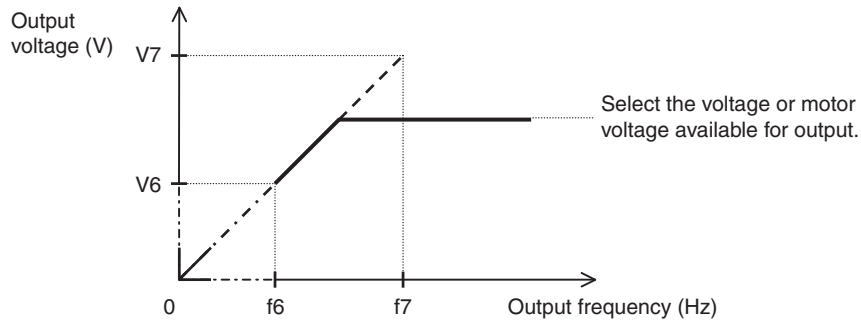
- You can set desired V/f characteristics by setting 7 points of voltage and frequency. (b100 to b113)
- The free V/f frequencies should always be  $1 \leq 2 \leq 3 \leq 4 \leq 5 \leq 6 \leq 7$ .  
All the default settings are 0 Hz. You must set Free V/f setting 7 first. (Operation is disabled by factory default.)
- If the free V/f setting is enabled, the functions of torque boost A041/A241, base frequency A003/A203/A303, and maximum frequency A004/A204/A304 are disabled. (Free V/f frequency 7 is regarded as the maximum frequency.)

| Parameter No.     | Function name        | Data                      | Description                                 | Default setting | Unit |
|-------------------|----------------------|---------------------------|---------------------------------------------|-----------------|------|
| b100              | Free V/f frequency 1 | 0 to Free V/f frequency 2 | Set frequencies for each break point.       | 0               | Hz   |
| b102              | Free V/f frequency 2 | 0 to Free V/f frequency 3 |                                             |                 |      |
| b104              | Free V/f frequency 3 | 0 to Free V/f frequency 4 |                                             |                 |      |
| b106              | Free V/f frequency 4 | 0 to Free V/f frequency 5 |                                             |                 |      |
| b108              | Free V/f frequency 5 | 0 to Free V/f frequency 6 |                                             |                 |      |
| b110              | Free V/f frequency 6 | 0 to Free V/f frequency 7 |                                             |                 |      |
| b112              | Free V/f frequency 7 | 0 to 400                  |                                             |                 |      |
| b101              | Free V/f voltage 1   | 0.0 to 800.0              | Set output voltages for each break point. * | 0.0             | V    |
| b103              | Free V/f voltage 2   |                           |                                             |                 |      |
| b105              | Free V/f voltage 3   |                           |                                             |                 |      |
| b107              | Free V/f voltage 4   |                           |                                             |                 |      |
| b109              | Free V/f voltage 5   |                           |                                             |                 |      |
| b111              | Free V/f voltage 6   |                           |                                             |                 |      |
| b113              | Free V/f voltage 7   |                           |                                             |                 |      |
| Related functions |                      | A044, A244, A344          |                                             |                 |      |



\* Even if free V/f voltages 1 to 7 are set to 800 V, the Inverter cannot output voltage higher than the input voltage or the value of the motor voltage selection.

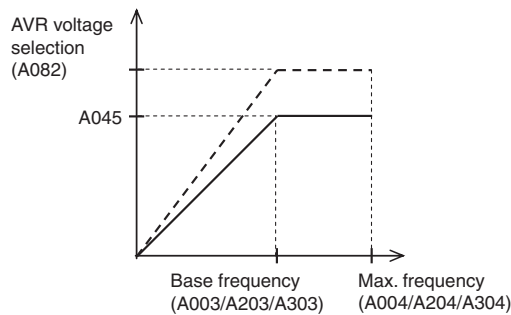
Use thorough caution to verify that the output characteristic setting is proper. An improper setting causes overcurrent during acceleration or deceleration, or vibration of the motor and/or machine.



## Output Voltage Gain

- Changes the Inverter output voltage, based on the voltage selected in AVR voltage selection A082 as 100%.
- You can avoid motor hunting by reducing the output voltage gain.

| Parameter No.     | Function name       | Data      | Default setting | Unit |
|-------------------|---------------------|-----------|-----------------|------|
| A045              | Output voltage gain | 20 to 100 | 100             | %    |
| Related functions |                     | A082      |                 |      |



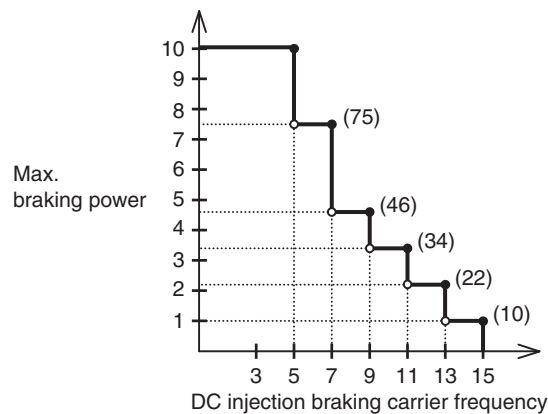
## DC Injection Braking

- DC injection braking is applied to the motor depending on the motor load.
  - Two methods are available for DC injection braking: One is the external method via the multi-function input terminal; the other is the internal method performed automatically to start/stop the motor.
- Even if DC injection braking is used, however, the motor may not stop depending on the moment of inertia of the motor load.

| Parameter No.     | Function name                          | Data                                                                                       | Default setting | Unit |
|-------------------|----------------------------------------|--------------------------------------------------------------------------------------------|-----------------|------|
| A051              | DC injection braking selection         | 00: OFF (Disabled)<br>01: ON (Enabled)<br>02: ON (FQ) (Frequency control [A052 set value]) | 00              | —    |
| A052              | DC injection braking frequency         | 0.00 to 400.00                                                                             | 0.50            | Hz   |
| A053              | DC injection braking delay time        | 0.0 to 5.0                                                                                 | 0.0             | s    |
| A054              | DC injection braking power             | 0 to 100 (0.4 to 55 kW)                                                                    | 50              | %    |
|                   |                                        | 0 to 80 (75 to 132 kW)                                                                     | 40              |      |
| A055              | DC injection braking time              | 0.0 to 60.0                                                                                | 0.5             | s    |
| A056              | DC injection braking method selection  | 00: Edge operation<br>01: Level operation                                                  | 01              | —    |
| A057              | Startup DC injection braking power     | 0 to 100 (0.4 to 55 kW)                                                                    | 0               | %    |
|                   |                                        | 0 to 80 (75 to 132 kW)                                                                     | 0               |      |
| A058              | Startup DC injection braking time      | 0.0 to 60.0                                                                                | 0.0             | s    |
| A059              | DC injection braking carrier frequency | 0.5 to 15.0 (0.4 to 55 kW)                                                                 | 5.0             | Hz   |
|                   |                                        | 0.5 to 10.0 (75 to 132 kW)                                                                 | 3.0             |      |
| Related functions |                                        | C001 to C008                                                                               |                 |      |

## ■DC Injection Braking Carrier Frequency

You can set a DC injection braking carrier frequency in A059. Note that setting a 5 kHz or higher frequency automatically reduces the braking power. Refer to the following figure (DC injection braking power limit).



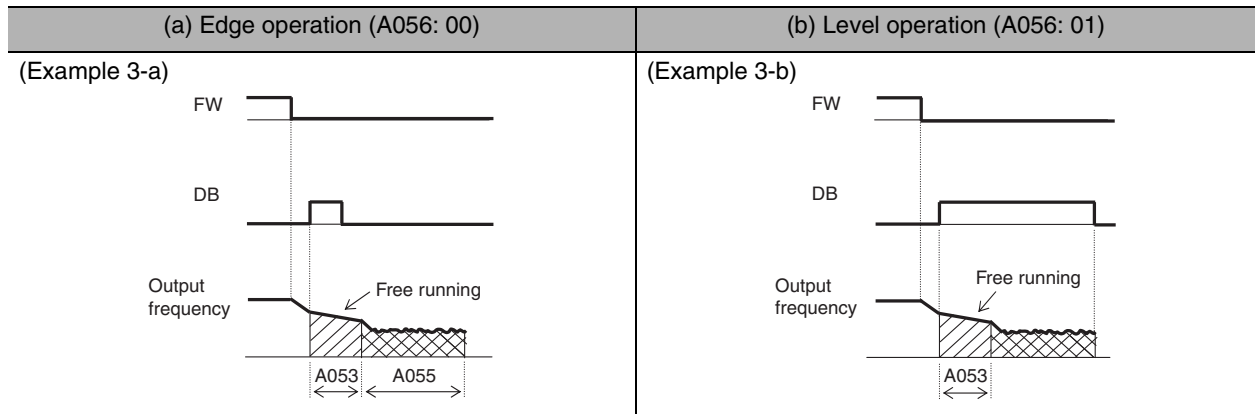
DC Injection Braking Power Limit

## ■External DC Injection Braking

- Allocate 07 (DB) to any of multi-function inputs C001 to C008.
- DC injection braking can be applied by turning on/off the DB terminal, regardless of DC injection braking selection A051.
- Set a braking power level in DC injection braking power A054.
- If DC injection braking delay time A053 is set, the Inverter output is shut off during the set time period and the motor goes into free-run status. After the set time elapses, DC injection braking starts.
- Set DC injection braking time A055 via the Digital Operator or the DB terminal while taking into account motor heat generation.
- Perform each setting according to your system after setting DC injection braking method selection A056.

| (a) Edge operation (A056: 00) | (b) Level operation (A056: 01) |
|-------------------------------|--------------------------------|
| <p>(Example 1-a)</p>          | <p>(Example 1-b)</p>           |
| <p>(Example 2-a)</p>          | <p>(Example 2-b)</p>           |



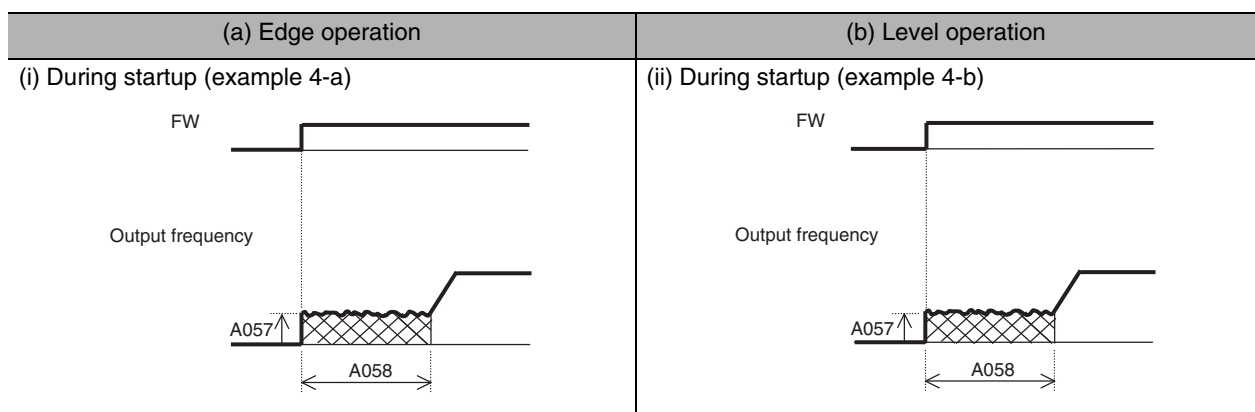


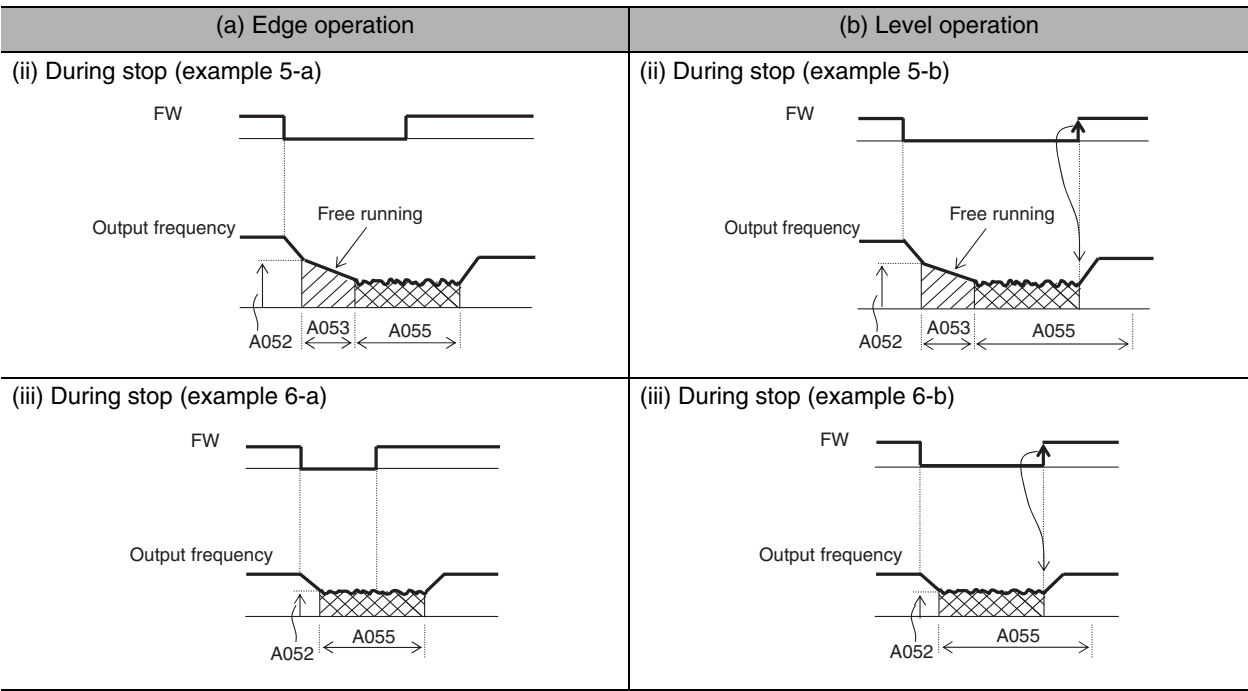
### ■ Internal DC Injection Braking (A051: 01)

- DC injection braking is applied without terminal operation at start/stop of the Inverter. To use internal DC injection braking, set DC injection braking selection A051 to 01.
- Set the startup DC injection braking power in A057. In A058, set the startup DC injection braking time, regardless of the edge or level operation. (Example 4-a), (Example 4-b)
- Set DC injection braking power A054 to define the braking power other than at startup.
- Set the DC injection braking starting frequency in DC injection braking frequency A052.
- Once DC injection braking delay time A053 is set, the Inverter stops output when the frequency reaches the A052 value after the RUN command (FW) has been turned off. During the set time in A053, the motor remains in free-run status. After the set time in A053, DC injection braking starts.
- Edge and Level operations for internal DC injection braking work differently when the RUN command switches from STOP to RUN.

**Edge operation:** Giving priority to DC injection braking time A055, performs DC injection braking for the set time in A055. DC injection braking operates for the set time in A055 when the output frequency reaches the set value in A052 after the RUN command (FW) is turned off. Even if the RUN command is turned on during DC injection braking, the latter is effective during the set time in A055. (Example 5-a), (Example 6-a)

**Level operation:** Giving priority to the RUN command, shifts to normal operation, ignoring DC injection braking time A055. When the RUN command is turned on during DC injection braking, returns to normal operation, ignoring the set time in A055. (Example 5-b), (Example 6-b)



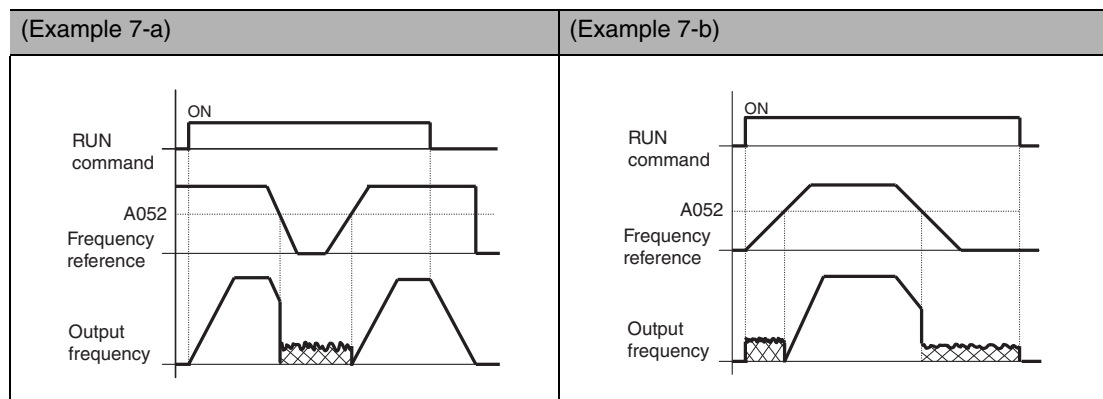


4

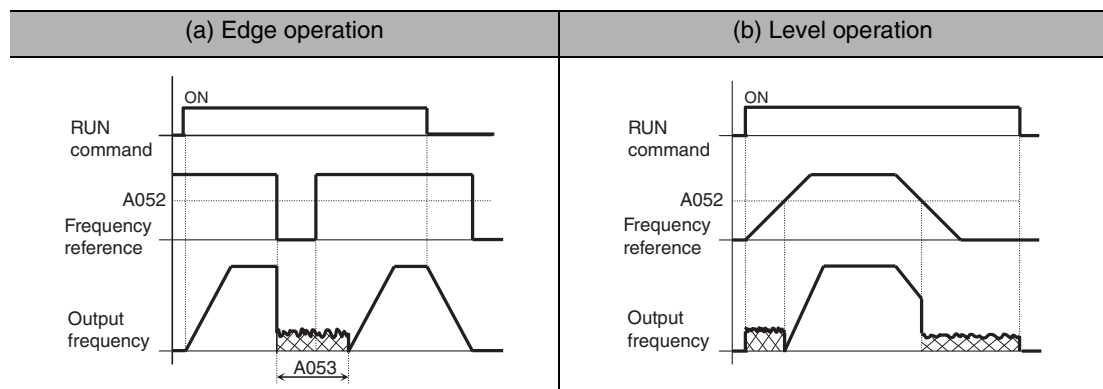
Functions

### ■ Internal DC Injection Braking (Operates Only at the Set Frequency) (A051: 02)

- DC injection braking can be applied when the output frequency becomes lower than the DC injection braking frequency (A052).
- Neither (2) external nor (3) internal DC injection braking is available while this function is selected.
- Operates only when the RUN command is turned on.
- DC injection braking starts when both the reference and current frequencies become lower than A052. (Example 7-a)
- When the reference frequency exceeds the A052 set value by 2 Hz or more, DC injection braking is released and the output returns to normal. (Example 7-a)
- If the reference frequency is "0" when the operation starts with analog input, the initial operation is DC injection braking because both the reference and current frequencies are "0". (Example 7-b)
- If the RUN command is turned on with the frequency reference established (or a value larger than the A052 setting is input), the initial operation is set to normal output.



- The operation to return to normal varies depending on the setting of DC injection braking power A054.



## Frequency Limit

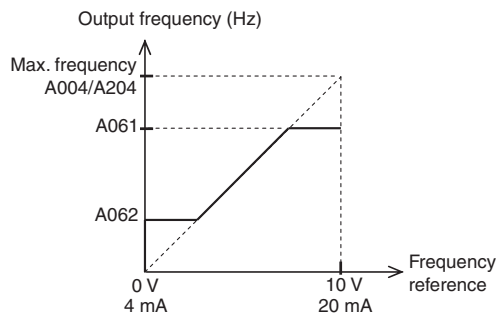
- You can set both the upper/lower limits to the output frequency.

| Parameter No.     | Function name              | Data                                                              | Default setting | Unit |
|-------------------|----------------------------|-------------------------------------------------------------------|-----------------|------|
| A061              | Frequency upper limit      | 0.0/Frequency lower limit [A062] to Max. frequency [A004]         | 0.00            | Hz   |
| A261              | *2nd frequency upper limit | 0.0/2nd frequency lower limit [A262] to 2nd max. frequency [A204] | 0.00            |      |
| A062              | Frequency lower limit      | 0.0/Starting frequency to Frequency upper limit [A061]            | 0.00            |      |
| A262              | *2nd frequency lower limit | 0.0/Starting frequency to 2nd frequency upper limit [A261]        | 0.00            |      |
| Related functions |                            | C001 to C008                                                      |                 |      |

\* To switch to the 2nd/3rd control, allocate 08 (SET)/17 (SET3) to the desired multi-function input and then turn it on.

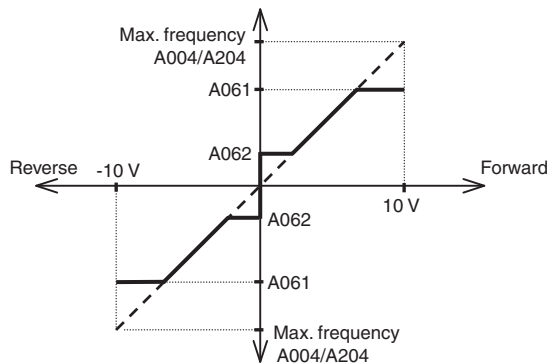
- Does not accept any frequency reference beyond the upper/lower limits.
- Set the upper limit first. Make sure that the upper limit (A061/A261) is larger than the lower limit (A062/A262).
- Make sure that the upper and lower limiter settings do not exceed the maximum frequency (A004/A204).
- Make sure that the output frequency (F001) and multi-step speeds 1 to 15 (A021 to A035) are not lower than the lower limit setting and not higher than the upper limit setting.
- Neither limit works if set to 0 Hz.
- Disabled when the 3rd control is selected.

### ■ When Using O-L and OI-L



- Once the lower limit is set, the Inverter outputs the frequency (A062) set for the lower limit, if 0 V (4 mA) is input to the frequency reference.

### ■ When Using O2-L



- When the lower limit is used for the O2 input, the rotation at 0 V is fixed to A062 for either forward or reverse rotation, as described below.

(a) When the RUN command is set to the terminal (A002: 01)

| Terminal | Rotation when O2 = 0 V    |
|----------|---------------------------|
| FW (ON)  | A062 for forward rotation |
| RV (ON)  | A062 for reverse rotation |

(a) When the RUN command is set to the Digital Operator (A002: 02)

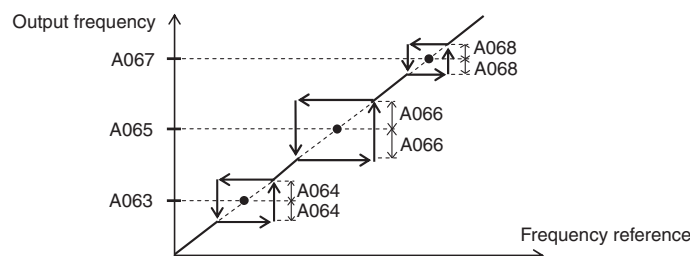
| F004 | Rotation when O2 = 0 V    |
|------|---------------------------|
| 00   | A062 for forward rotation |
| 01   | A062 for reverse rotation |

## Frequency Jump Function

- The frequency jump function helps avoid resonant points of loaded machines.

| Parameter No.        | Function name                                                              | Data           | Default setting | Unit |
|----------------------|----------------------------------------------------------------------------|----------------|-----------------|------|
| A063<br>A065<br>A067 | Jump frequency 1<br>Jump frequency 2<br>Jump frequency 3                   | 0.00 to 400.00 | 0.00            | Hz   |
| A064<br>A066<br>A068 | Jump frequency width 1<br>Jump frequency width 2<br>Jump frequency width 3 | 0.00 to 10.00  | 0.50            |      |
| Related functions    |                                                                            | C001 to C008   |                 |      |

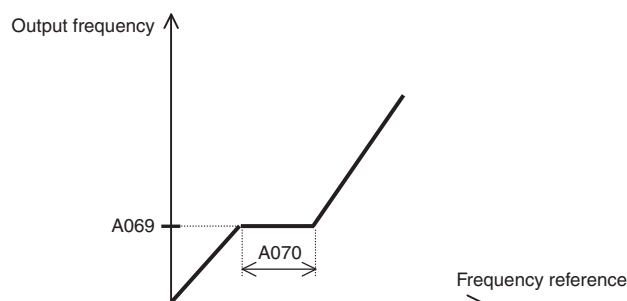
- You cannot set output frequencies within a jump frequency setting range, where the frequency jump function avoids steady operation.
  - The output frequency fluctuates continuously according to the acceleration/deceleration time during both actions.
- You can set up to three points for the jump frequency.



## Acceleration Stop Function

- When the moment of inertia of a machine load is large, this function delays acceleration until the motor starting slip is reduced.
- Use this function, if an overcurrent trip occurs during startup.
- Does not depend on acceleration pattern selection A097, and works with all acceleration patterns.

| Parameter No. | Function name               | Data           | Default setting | Unit |
|---------------|-----------------------------|----------------|-----------------|------|
| A069          | Acceleration stop frequency | 0.00 to 400.00 | 0.00            | Hz   |
| A070          | Acceleration stop time      | 0.0 to 60.0    | 0.0             | s    |



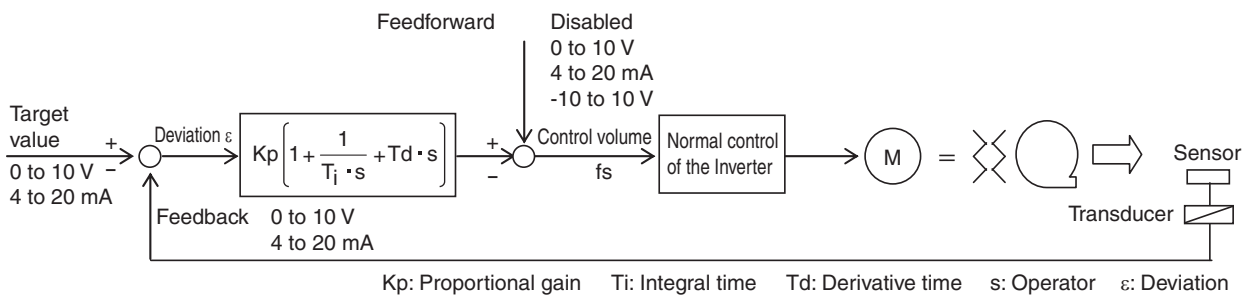
## PID Function

- This function enables process control of such elements as flow rate, air volume, and pressure.

| Parameter No.     | Function name                 | Data                                                                                                                             | Default setting | Unit |
|-------------------|-------------------------------|----------------------------------------------------------------------------------------------------------------------------------|-----------------|------|
| A071              | PID selection                 | 00: OFF (Disabled)<br>01: ON (+) (Enabled)<br>02: ON (+/-) (Reverse output enabled)                                              | 00              | —    |
| A072              | PID P gain                    | 0.2 to 5.0                                                                                                                       | 1.0             | —    |
| A073              | PID I gain                    | 0.0 to 3600.0                                                                                                                    | 1.0             | s    |
| A074              | PID D gain                    | 0.00 to 100.00                                                                                                                   | 0.00            | s    |
| A075              | PID scale                     | 0.01 to 99.99                                                                                                                    | 1.00            | Time |
| A076              | PID feedback selection        | 00: OI<br>01: O<br>02: Modbus (RS485 communication)<br>03: Pulse (Pulse train frequency)<br>10: Math (Operation function output) | 00              | —    |
| A077              | Reverse PID function          | 00: OFF (Deviation = Target value - Feedback value)<br>01: ON (Deviation = Feedback value - Target value)                        | 00              | —    |
| A078              | PID output limit function     | 0.0 to 100.0                                                                                                                     | 0.0             | %    |
| A079              | PID feedforward selection     | 00: Disabled<br>01: O<br>02: OI<br>03: O2                                                                                        | 00              | —    |
| C044              | PID deviation excessive level | 0.0 to 100.0                                                                                                                     | 3.0             | %    |
| C052              | PID FB upper limit            | 0.0 to 100.0                                                                                                                     | 100.0           | %    |
| C053              | PID FB lower limit            |                                                                                                                                  | 0.0             | %    |
| Related functions |                               | d004, A001, A005, A006, C001 to C008, C021 to C025                                                                               |                 |      |

- To use this function, set A071 to "01" or "02".
- You can disable the PID operation in progress using an external signal.  
To use this function, allocate "23" (PID: PID disabled) to any of the multi-function inputs. While the PID terminal is turned on, the Inverter disables the PID function and outputs normally.
- You can limit the PID output under various conditions.

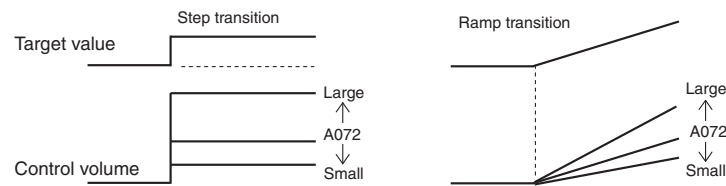
### Basic Structure of PID Control (Example)



## ■PID Operation

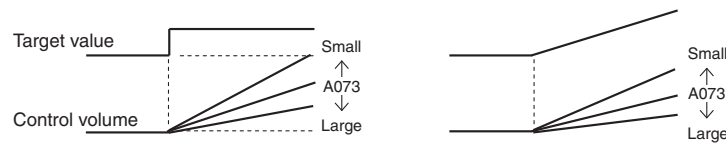
### P Operation

- Operation where the control volume is proportional to the target value



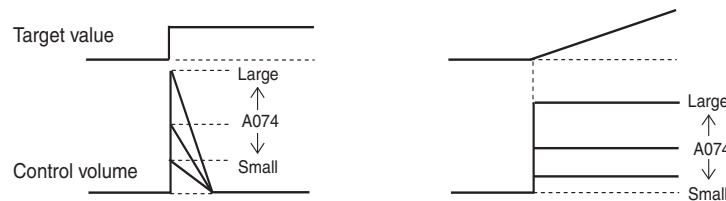
### I Operation

- Operation where the control volume increases linearly according to time



### D Operation

- Operation where the control volume is proportional to the variation ratio of the target value



- PI operation is the combination of the above P and I operations; PD is P and D operations; PID is P, I and D operations.

## ■Feedback Selection

- Select a terminal used for feedback signals in PID feedback selection A076.
- The target value depends on the terminal selected in frequency reference selection A001 other than that in A076.  
When A001 is set to "01" (terminal), the setting of O/OI selection A005 is disabled.
- When analog input is selected for PID feedback and A001 is set to "01" (terminal), the PID target value is selected depending on the A006 set value, as shown in the following table.

| PID feedback selection (A076) |                           | PID target value         |           |                      |           |
|-------------------------------|---------------------------|--------------------------|-----------|----------------------|-----------|
|                               |                           | A006 = 00                | A006 = 01 | A006 = 02            | A006 = 03 |
| 00 (OI-L)                     |                           | O + O2 (Not reversible)  |           | O + O2 (Reversible)  | O         |
| 01 (O-L)                      |                           | OI + O2 (Not reversible) |           | OI + O2 (Reversible) | OI        |
| 10<br>(operation result)      | OI included in operands   | O + O2 (Not reversible)  |           | O + O2 (Reversible)  | O         |
|                               | O included in operands    | OI + O2 (Not reversible) |           | OI + O2 (Reversible) | OI        |
|                               | OI and O are the operands | O2 (Reversible)          |           |                      |           |

- To select RS485 for PID feedback, transfer data as described below.

## &lt;ASCII (C078 = 00)&gt;

Transfer data using "command 01". To transfer feedback data, set the most significant byte of frequency data to "1".

(Example) To send 5 Hz:

Transmission data is "set value  $\times$  100" and expressed in 6 bytes → "000500"

Set the most significant byte to "1". → "100500"

ASCII conversion → "31 30 30 35 30 30"

Note: With ASCII data, the set value is frequency (Hz).

## &lt;ModBus-RTU (C078 = 01)&gt;

Write data in holding register address 0006h. (100% = 10000)

| Register No. | Function name | Function code | R/W | Monitor data and setting parameters | Data resolution |
|--------------|---------------|---------------|-----|-------------------------------------|-----------------|
| 0006h        | PID feedback  | —             | R/W | 0 to 10000                          | 0.01 [%]        |

Note: You can read and write data. However, you can read data only when ModBus-RTU is selected for the PID feedback. Data cannot be read under other settings.

- If "03" (pulse train input) is set for PID feedback A076, the Inverter obtains a percent conversion result (100% at max. frequency) as a feedback value, relative to the input pulse train frequency value (Hz).

### ■ Feedforward Selection

- Select a terminal used for feedforward signals in PID feedforward selection A079.
- The A079 setting is enabled even if the terminal selected in A079 is duplicated with the terminal selected for target value or feedback value input.
- If A079 is set to "disabled", feedforward control is disabled.

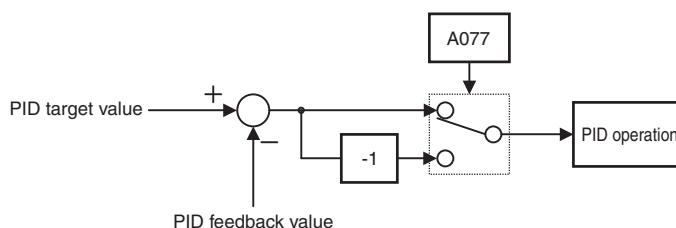
### ■ Reverse PID Function

Depending on the sensor characteristics, the polarity of deviation between the target and feedback values may not match the Inverter's command. In this case, you can invert the deviation polarity by setting A077 to "01".

(Example) To control a refrigerator compressor:

If the specified temperature range of a temperature sensor is -20°C to 100°C at 0 to 10 (V), the target value is 0°C, and the current temperature is 10°C, the Inverter reduces the frequency under normal PID control since the feedback value is higher than the target value.

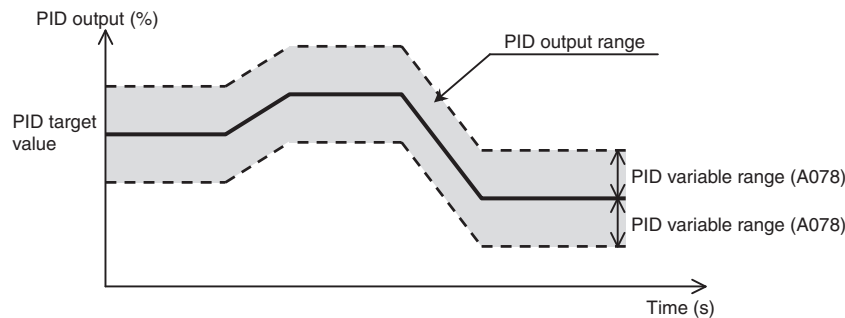
→ Set A077 to "01" so that the Inverter increases the frequency.





### ■PID Output Limit Function

- This function limits PID output within a variable range relative to the target value.
- To use this function, set PID output limit function A078. The output frequency will be limited within a range of "target value  $\pm$  (A078)", with the maximum frequency defined as 100%.
- With A078 set to 0.0, this function is disabled.



### ■PID Reverse Output

- When a PID operation result is a negative value under normal PID control, the frequency reference to the Inverter is limited at 0 Hz. However, if PID selection A071 is set to "02" (reverse output enabled), reverse output can be provided for the Inverter when the PID operation result is a negative value.
- When A071 = 02, the above-mentioned PID variable range limit function and the PID output stop function are disabled.

### ■PID Gain Adjustment

- If a stable response cannot be obtained in PID function operation, adjust each gain as follows according to the situation.
 

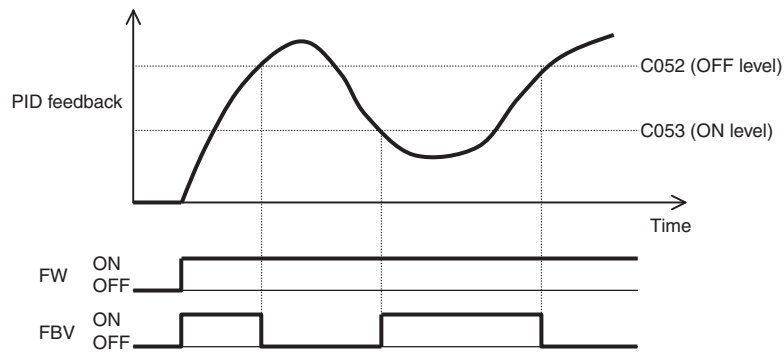
|                                                                      |                      |
|----------------------------------------------------------------------|----------------------|
| • Feedback value variation is slow when the target value is changed. | → Raise P gain A072. |
| • The feedback value changes fast but isn't stable.                  | → Lower P gain A072. |
| • The target and feedback values wouldn't match smoothly.            | → Lower I gain A073. |
| • The feedback value fluctuates unstably.                            | → Raise I gain A073. |
| • Response is slow even with P gain raised.                          | → Raise D gain A074. |
| • With P gain raised, the feedback value vibrates and isn't stable.  | → Lower D gain A074. |

### ■Excessive Deviation/Output

- You can set PID deviation excessive level C044 during PID control. With this function allocated, the multi-function output terminal is turned on when the PID deviation  $\varepsilon$  reaches the set level in C044.
- C044 can be set from 0 to 100. The setting corresponds to the range of 0 to the maximum target value.
- Allocate 04 (OD) to any of multi-function output terminals C021 to C025 or relay output terminal C026.

### ■Feedback Comparison Signal

- If a PID feedback value is out of the specified range, it can be output to a multi-function output terminal.
- Allocate 31 (FBV) to any of multi-function output terminals C021 to C025 or relay output terminal C026.



### ■ PID Feedback Value Monitor

- You can monitor the PID feedback value.
- The monitor value is displayed as the product of the feedback value and PID scale A075.  
"Monitor display" = "Feedback value (%)" × "A075 setting"

### ■ PID Integral Reset

- Clears the integral value of PID operation.
- Allocate 24 (PIDC) to any of multi-function inputs C001 to C008.
- Clears the integral value every time the PIDC terminal is turned on.  
Do not turn on the PIDC terminal during PID operation to avoid a possible overcurrent trip.  
Turn on the PIDC terminal after turning off PID operation.

## AVR Function

- This function outputs voltage to the motor correctly even if the incoming voltage to the Inverter fluctuates. With this function, output voltage to the motor is based on the voltage set in the motor voltage selection.

| Parameter No.     | Function name         | Data                                                                     | Default setting | Unit |
|-------------------|-----------------------|--------------------------------------------------------------------------|-----------------|------|
| A081              | AVR selection         | 00: Always ON<br>01: Always OFF<br>02: OFF during deceleration           | 02              | —    |
| A082              | AVR voltage selection | 200-V class: 200/215/220/230/240<br>400-V class: 380/400/415/440/460/480 | 200/400         | —    |
| Related functions |                       | d004, A001, A005                                                         |                 |      |

- With A081 (AVR selection), set whether to enable or disable this function.
- Note that the Inverter cannot output voltage beyond that of the incoming voltage.
- To avoid a possible overcurrent trip during deceleration, set the AVR selection to "Always ON" (A081: 00).

| Parameter No. | Data | Description             | Note                                                                                                                                                                                               |
|---------------|------|-------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| A081          | 00   | Always ON               | Enabled during acceleration, constant speed, and deceleration.                                                                                                                                     |
|               | 01   | Always OFF              | Disabled during acceleration, constant speed, and deceleration.                                                                                                                                    |
|               | 02   | OFF during deceleration | Disabled only during deceleration in order to reduce the energy regenerated to the Inverter by increasing the motor loss. This will avoid a possible trip due to regeneration during deceleration. |

## Automatic Energy-saving Operation Function

- This function automatically minimizes the Inverter output power during constant speed operation, and is suitable for load with reduced torque characteristics (e.g. fan, pump).

| Parameter No. | Function name                                  | Data                                                                           | Default setting | Unit |
|---------------|------------------------------------------------|--------------------------------------------------------------------------------|-----------------|------|
| A085          | RUN mode selection                             | 00: Normal operation<br>01: Energy-saving operation<br>02: Automatic operation | 00              | —    |
| A086          | Energy-saving response/<br>accuracy adjustment | 0.0 to 100.0                                                                   | 50.0            | %    |

- To operate with this function, set RUN mode selection A085 to "01".  
You can adjust the response and accuracy with energy-saving response/accuracy adjustment A086.
- Controls the output power at a comparatively slow rate. Should rapid load fluctuation like impact load occur, the motor may stall, resulting in an overcurrent trip.

| Parameter No. | Function name                                  | Data              | Response          | Accuracy         |
|---------------|------------------------------------------------|-------------------|-------------------|------------------|
| A086          | Energy-saving response/<br>accuracy adjustment | 0.0<br>↕<br>100.0 | Slow<br>↕<br>Fast | High<br>↕<br>Low |

## Automatic Optimum Acceleration/Deceleration

- The automatic acceleration/deceleration function eliminates the need for acceleration/deceleration settings during Inverter operation.

| Parameter No.     | Function name      | Data                                                                           | Default setting | Unit |
|-------------------|--------------------|--------------------------------------------------------------------------------|-----------------|------|
| A085              | RUN mode selection | 00: Normal operation<br>01: Energy-saving operation<br>02: Automatic operation | 00              | —    |
| Related functions |                    | A044, A244, A344, b021, b024, b022, b025                                       |                 |      |

- Conventionally, the user had to set an Inverter acceleration/deceleration time depending on the actual load conditions. However, this function can automatically set an acceleration/deceleration time, making full use of the Inverter's capacity.  
The acceleration time is a time during which acceleration is performed within a current value set in the overload limit parameter (when the overload limit function is enabled), or within approx. 150% of the rated current (when the overload limit function is disabled). The deceleration time is a time during which deceleration is performed within approx. 150% of the rated current value, or within a DC voltage in the Inverter circuit of approx. 370 V (200V-class) or approx. 740 V (400 V-class). Thus, the Inverter enables real-time response to a change in applied load and inertia, and sets acceleration/deceleration time automatically.

- Note the following before use:

- Note 1: This function is not suitable for a machine that needs a fixed acceleration/deceleration time. Acceleration/deceleration time varies depending on applied load and inertia.
- Note 2: If the machine inertia exceeds approx. 20 times that of the motor shaft, the Inverter may trip. In this case, reduce the carrier frequency.
- Note 3: Acceleration/deceleration time varies depending on fluctuations in current value, even with the same motor.
- Note 4: The automatic optimum acceleration/deceleration setting is enabled only during V/f control. When sensorless vector control is selected, the Inverter performs normal operation.

Note 5: If the jogging operation is performed when the automatic operation is selected, the Inverter performs automatic acceleration, which is different from normal jogging operation.

Note 6: When the applied load is larger than the rating, deceleration time may be prolonged.

Note 7: If acceleration and deceleration are frequently repeated, the Inverter may trip.

Note 8: When the internal braking circuit is used, or when the regenerative braking unit is externally installed, the motor cannot stop within the specified deceleration time because of braking resistance. In this case, do not use the automatic optimum acceleration/deceleration function.

Note 9: When using a lower rank motor size than specified for the Inverter, enable the overload limit function (b021), and set the overload limit level (b022) to 1.5 times the rated current of the motor.

## 4

## 2-step Acceleration/Deceleration Function

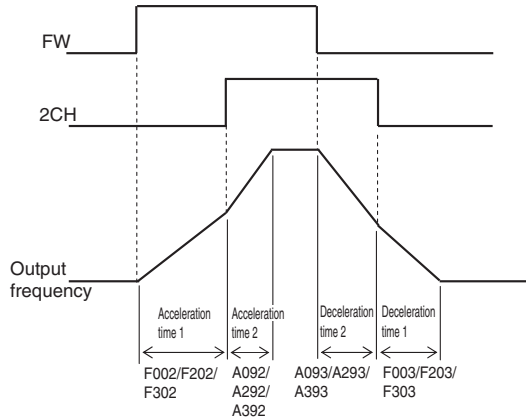
•By setting this function, you can change the acceleration/deceleration time during acceleration/deceleration.

| Parameter No.     | Function name                                       | Data                                                                                                                                                                                                       | Default setting | Unit |
|-------------------|-----------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|------|
| A092              | Acceleration time 2                                 | 0.01 to 3600.00                                                                                                                                                                                            | 10.00           | s    |
| A292              | *2nd acceleration time 2                            |                                                                                                                                                                                                            |                 | s    |
| A392              | *3rd acceleration time 2                            |                                                                                                                                                                                                            |                 | s    |
| A093              | Deceleration time 2                                 | 0.01 to 3600.00                                                                                                                                                                                            | 10.00           | s    |
| A293              | *2nd deceleration time 2                            |                                                                                                                                                                                                            |                 | s    |
| A393              | *3rd deceleration time 2                            |                                                                                                                                                                                                            |                 | s    |
| A094              | 2-step acceleration/<br>deceleration selection      | 00: 2CH-Terminal (Switched via multi-<br>function input 09 (example 1)<br>01: Preset FQ (Switched by setting)<br>(example 2)<br>02: FWD-REV (Enabled only when<br>switching forward/reverse<br>(example 3) | 00              | —    |
| A294              | *2nd 2-step acceleration/<br>deceleration selection |                                                                                                                                                                                                            |                 |      |
| A095              | 2-step acceleration<br>frequency                    | 0.00 to 400.00                                                                                                                                                                                             | 0.00            | Hz   |
| A295              | *2nd 2-step acceleration<br>frequency               |                                                                                                                                                                                                            |                 |      |
| A096              | 2-step deceleration<br>frequency                    | 0.00 to 400.00                                                                                                                                                                                             | 0.00            | Hz   |
| A296              | *2nd 2-step deceleration<br>frequency               |                                                                                                                                                                                                            |                 |      |
| Related functions |                                                     | F002, F202, F302, F003, F203, F303, C001 to C008                                                                                                                                                           |                 |      |

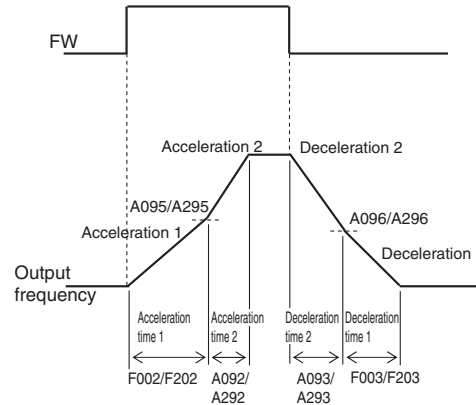
\* To switch to the 2nd/3rd control, allocate 08 (SET)/17 (SET3) to the desired multi-function input and then turn it on.

- Select an acceleration/deceleration time switching method from the following three:
  - Switching via a multi-function input
  - Automatic switching at a specified frequency
  - Automatic switching only when switching between forward/reverse
 If the 3rd control function is selected, however, switching by the 2-step acceleration/deceleration frequency is disabled.
- To switch via a multi-function input, allocate 09 (2CH) to any of C001 to C008.

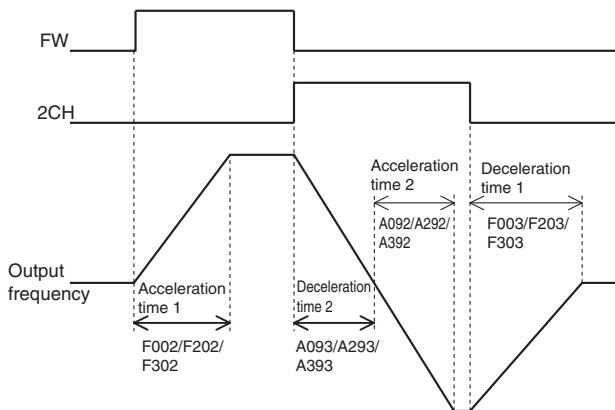
(Example 1) When A094/A294 is set to 00



(Example 2) When A094/A294 is set to 01



(Example 3) When A094/A294 is set to 02



## Acceleration/Deceleration Pattern

- Acceleration/deceleration pattern can be set for each system.

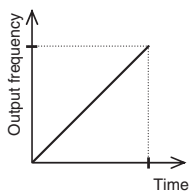
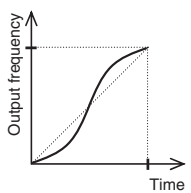
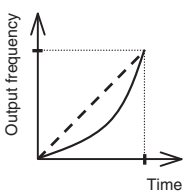
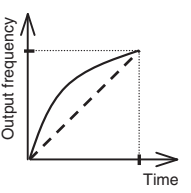
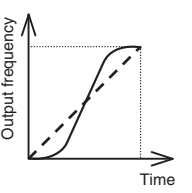
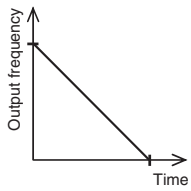
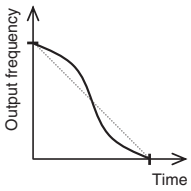
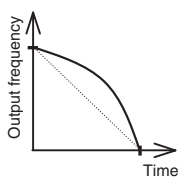
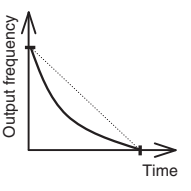
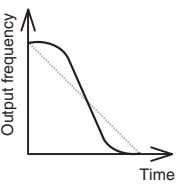
| Parameter No. | Function name                  | Data                                    | Default setting | Unit |
|---------------|--------------------------------|-----------------------------------------|-----------------|------|
| A097          | Acceleration pattern selection | 00: Line<br>01: S-curve<br>02: U-curve  | 01              | —    |
| A098          | Deceleration pattern selection | 03: inv. U curve<br>04: EL-S curve      |                 |      |
| A131          | Acceleration curve parameter   | 01 (small curve) to<br>10 (large curve) | 02              | —    |
| A132          | Deceleration curve parameter   |                                         |                 |      |

| Parameter No. | Function name                          | Data    | Default setting | Unit |
|---------------|----------------------------------------|---------|-----------------|------|
| A150          | EL-S-curve ratio 1 during acceleration | 0 to 50 | 10              | %    |
| A151          | EL-S-curve ratio 2 during acceleration |         |                 |      |
| A152          | EL-S-curve ratio 1 during deceleration | 0 to 50 | 10              | %    |
| A153          | EL-S-curve ratio 2 during deceleration |         |                 |      |

- To select an acceleration or deceleration pattern, use A097 or A098, respectively.
- You can set acceleration and deceleration patterns individually.
- If any item other than "Line" (A097/A098 = 00) is selected for the acceleration/deceleration pattern, the acceleration/deceleration time is prolonged when this function is used with analog input (A001 = 01).

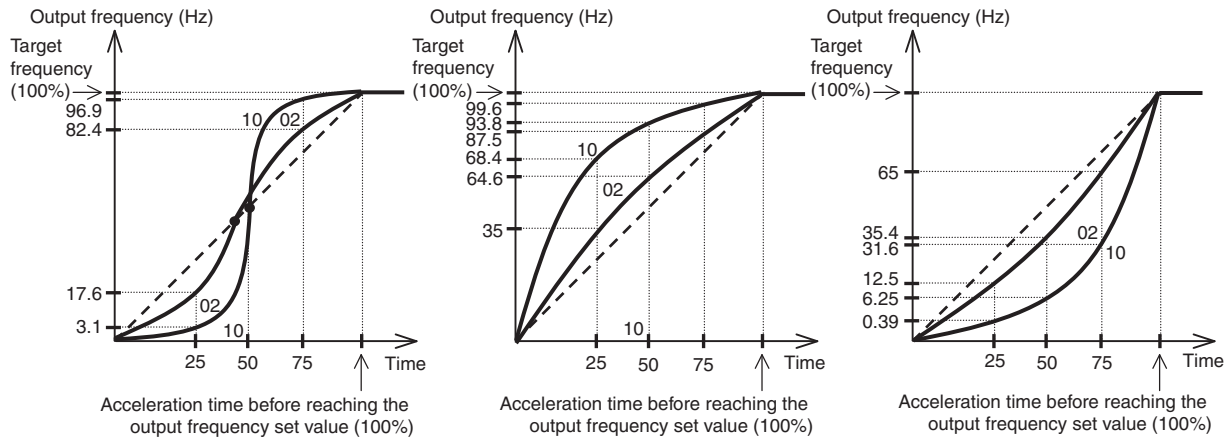
### ■ Pattern Selection

Select an acceleration/deceleration pattern with reference to the following table.

| Parameter No.          | Set values                                                                                       |                                                                                       |                                                                                        |                                                                                                          |                                                                                       |
|------------------------|--------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
|                        | 00                                                                                               | 01                                                                                    | 02                                                                                     | 03                                                                                                       | 04                                                                                    |
|                        | Line                                                                                             | S shape                                                                               | U shape                                                                                | Inverted U shape                                                                                         | EL-S shape                                                                            |
| A097<br>(Acceleration) |                |     |      |                       |   |
| A098<br>(Deceleration) |               |    |     |                      |  |
| Description            | Accelerates/<br>Decelerates<br>linearly before<br>reaching the set<br>output frequency<br>value. | Helps prevent the<br>collapse of cargo<br>on the elevating<br>machine or<br>conveyor. | Helps with tension control and roll break<br>prevention (for a winding machine, etc.). | Provides shockless<br>start/stop as with<br>the S pattern, but<br>the intermediate<br>section is linear. |                                                                                       |

## ■ Pattern Curve Parameter (Curve Factor)

- Determine a curve factor with reference to the figures below.

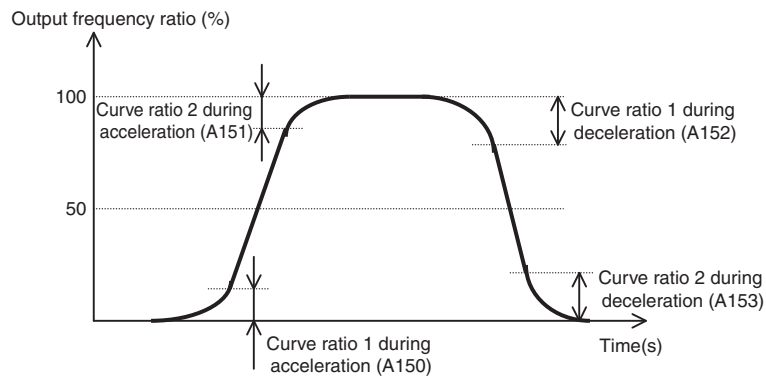


- The S pattern has an intermediate section where acceleration/deceleration time is shortened.
- If LAD cancel (LAC) is selected for a multi-function input and that input is turned on, the acceleration/deceleration pattern is ignored, and the output frequency instantaneously follows the reference frequency.

## ■ EL-S Curve Ratio

If the EL-S pattern is used, you can set a curve ratio (A151 to A153) individually for acceleration and deceleration.

If all settings are "50 (%)", the Inverter operates in the same manner as with the S curve.



## Operation Frequency Function

- Two systems of frequency reference operation results are available for the frequency reference and PID feedback value.

| Parameter No.     | Function name                       | Data                                                                                                                                          | Default setting | Unit |
|-------------------|-------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|-----------------|------|
| A141              | Operation frequency input A setting | 00: Operator (Digital Operator (F001)) (A020/A220/A320)<br>01: VR (Digital Operator (FREQ adjuster)) (Enabled when 3G3AX-OP01 is used.)       | 02              | —    |
| A142              | Operation frequency input B setting | 02: O (Input O)<br>03: OI (Input OI)<br>04: Modbus (RS485 communication)<br>05: Option 1<br>06: Option 2<br>07: Pulse (Pulse train frequency) | 03              | —    |
| A143              | Operator selection                  | 00: ADD (Addition (A + B))<br>01: SUB (Subtraction (A - B))<br>02: MUL (Multiplication (A × B))                                               | 00              | —    |
| Related functions |                                     | A001 = 10, A076 = 10                                                                                                                          |                 |      |

Note 1: When this function is enabled, the Up/Down function cannot be used. In addition, frequency cannot be changed through key operations from output frequency monitor d001, frequency conversion monitor d007, or output frequency setting F001.

Note 2: The same setting is available in A141 and A142.

- To use this function as a frequency reference, set frequency reference selection A001 to "10".
- To use this function as a PID feedback, set PID feedback selection A076 to "10".

## Frequency Addition Function

- The value set in frequency addition amount A145 can be added to or subtracted from the selected frequency reference value.
- To use this function, allocate 50 (ADD) to any of the multi-function inputs.  
The A145 value is added or subtracted with the ADD terminal turned on.

| Parameter No.     | Function name                | Data                                                                                                | Default setting | Unit |
|-------------------|------------------------------|-----------------------------------------------------------------------------------------------------|-----------------|------|
| A145              | Frequency addition amount    | 0.00 to 400.00                                                                                      | 0.00            | Hz   |
| A146              | Frequency addition direction | 00: ADD (Add A145 value to output frequency)<br>01: SUB (Subtract A145 value from output frequency) | 00              | —    |
| Related functions |                              | C001 to C008, ADD input                                                                             |                 |      |

Note 1: If the sign of the frequency reference is changed ((-) → (+), or (+) → (-)) as a result of operation, the rotation direction will be inverted.

Note 2: When the PID function is used, the frequency addition function is enabled for a PID target value.  
(Note that A145 is displayed in % (in increments of 0.01%).)



## &lt;Group B: Detailed Function Parameters&gt;

## Momentary Power Interruption/Trip Retry (Restart)

## ■ Restart During Momentary Power Interruption

- You can set whether the Inverter trips or retries (restarts) when a momentary power interruption or undervoltage occurs.
- If the retry function is selected in retry selection b001, the Inverter retries for the number of times set in b005 (for momentary power interruption) or b009 (for undervoltage), and trips on the next time.  
(Under the limitless retry setting, the Inverter doesn't trip.)
- You can use b004 to select whether the Inverter trips or not when a momentary power interruption or undervoltage occurs during stop.
- When selecting the retry function, set retry condition b008 according to your system.
- If undervoltage is retained for 40 seconds even during retry operation, it results in E09 (undervoltage trip).

| Parameter No. | Function name                                                                         | Data                                                                                                                                                                                                                                                                            | Default setting | Unit |
|---------------|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|------|
| b001          | Retry selection <sup>*4 *6</sup>                                                      | 00: TRIP (Alarm)<br>01: 0 Hz start<br>02: f-match (Frequency matching start) (example 1) <sup>*3</sup><br>03: f-match Trip (Trip after frequency matching deceleration stop) <sup>*1 *3</sup><br>04: Actv. f-match (Active Frequency Matching restart (example 1) <sup>*3</sup> | 00              | —    |
| b002          | Allowable momentary power interruption time                                           | 0.3 to 25.0:<br>If the momentary power interruption is within the set time, the Inverter follows the setting in b001.                                                                                                                                                           | 1.0             | s    |
| b003          | Retry wait time                                                                       | 0.3 to 100.0<br>Time before restart                                                                                                                                                                                                                                             | 1.0             | s    |
| b004          | Momentary power interruption/undervoltage trip during stop selection <sup>*2 *4</sup> | 00: OFF (Disabled)<br>01: ON (Enabled)<br>02: Decel-OFF (Disabled during stop and deceleration stop)                                                                                                                                                                            | 00              | —    |
| b005          | Momentary power interruption retry time selection                                     | 00: 16 times<br>01: No limit                                                                                                                                                                                                                                                    | 00              | —    |
| b007          | Frequency matching lower limit frequency setting                                      | 0.00 to 400.00<br>When the motor free-running frequency falls below this lower limit frequency, the Inverter restarts at 0 Hz (examples 3 and 4)                                                                                                                                | 0.00            | Hz   |
| b008          | Trip retry selection <sup>*7</sup>                                                    | 00: TRIP (Alarm)<br>01: 0 Hz start<br>02: f-match (Frequency matching start)<br>03: f-match Trip (Trip after frequency matching deceleration stop)<br>04: Actv. f-match (Active Frequency Matching restart)                                                                     | 00              | —    |
| b009          | Undervoltage retry time selection                                                     | 00: 16 times<br>01: No limit                                                                                                                                                                                                                                                    | 00              | —    |
| b010          | Overvoltage/overcurrent retry time selection                                          | 1 to 3<br>Select the number of retry times in the event of overvoltage/overcurrent <sup>*5</sup>                                                                                                                                                                                | 3               | Time |
| b011          | Trip retry wait time                                                                  | 0.3 to 100.0<br>Time before restart                                                                                                                                                                                                                                             | 1.0             | s    |

| Parameter No.     | Function name                                           | Data                                                                                                                                                                                   | Default setting | Unit |
|-------------------|---------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|------|
| b028              | Active Frequency Matching restart level                 | 0.20 × Rated current to 2.00 × Rated current (0.4 to 55 kW)<br>0.20 × Rated current to 1.80 × Rated current (75 to 132 kW)<br>Current limit level at Active Frequency Matching restart | Rated current   | A    |
| b029              | Active Frequency Matching restart parameter             | 0.10 to 30.00<br>Frequency reduction time at Active Frequency Matching restart                                                                                                         | 0.50            | s    |
| b030              | Starting frequency at Active Frequency Matching restart | 00: Off FQ (Frequency at interruption)<br>01: Max.FQ (Max. Frequency)<br>02: Set FQ (Set Frequency)                                                                                    | 00              | —    |
| Related functions |                                                         | C021 to C025, C026                                                                                                                                                                     |                 |      |

- \*1. If an overvoltage/overcurrent trip occurs during deceleration, momentary power interruption error E16 appears, and the motor goes into free-run status. In this case, increase the deceleration time.
- \*2. When direct current (P-N) is supplied to control power supply terminal Ro-To, the Inverter may detect undervoltage at power interruption and then trip. If there is any problem with your system, set "00" or "02".
- \*3. The Inverter may start at 0 Hz if:  
The output frequency is equal to or lower than 1/2 of the base frequency  
The motor induction voltage quickly attenuates
- \*4. Even if retry selection b001 is set to "Retry" (01 to 03) and selection of momentary power interruption/undervoltage trip during stop b004 is set to "Disabled" (00 or 02), the Inverter trips when the actual momentary power interruption time exceeds the allowable momentary power interruption time. (Example 2)
- \*5. Even if the trip retry operation is selected, the Inverter trips if the cause of the trip is not remedied after the retry wait time (b003) elapses. In this case, increase the retry wait time.
- \*6. Even if the retry operation is selected, the Inverter trips when undervoltage remains for 40 seconds or longer.
- \*7. If frequency matching start or Active Frequency Matching restart is selected for retry operation, the Inverter abruptly restarts at power-on, by alarm reset or retry start.

- Below is the timing chart for frequency matching start (retry selection b001 = 02).

Note that the Inverter switches, regardless of settings, to the initial state when the power supply is turned on in the case of a complete power discharge.

t0: Momentary power interruption time

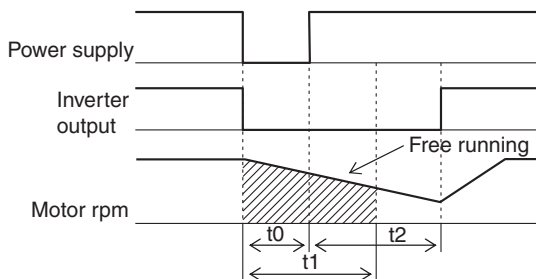
t1: Allowable momentary power interruption time (b002)

t2: Retry wait time (b003)

(Example 1)

Duration of momentary power interruption

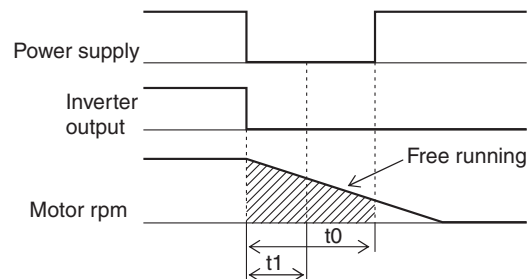
< Allowable duration of momentary power interruption (b002)



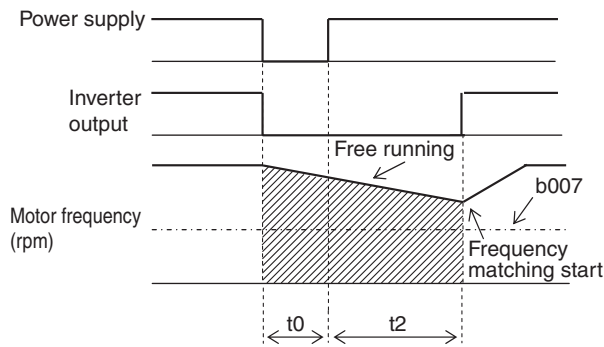
(Example 2)

Duration of momentary power interruption

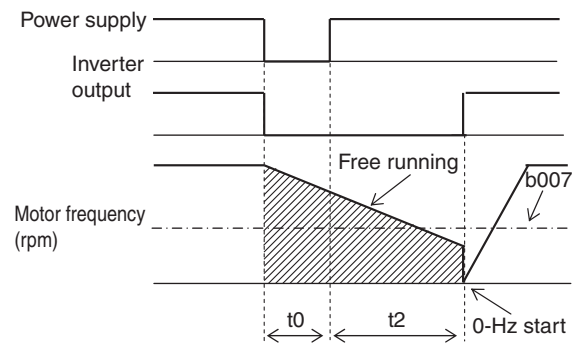
> Allowable duration of momentary power interruption (b002)



(Example 3) Motor frequency (rpm) &gt; b007

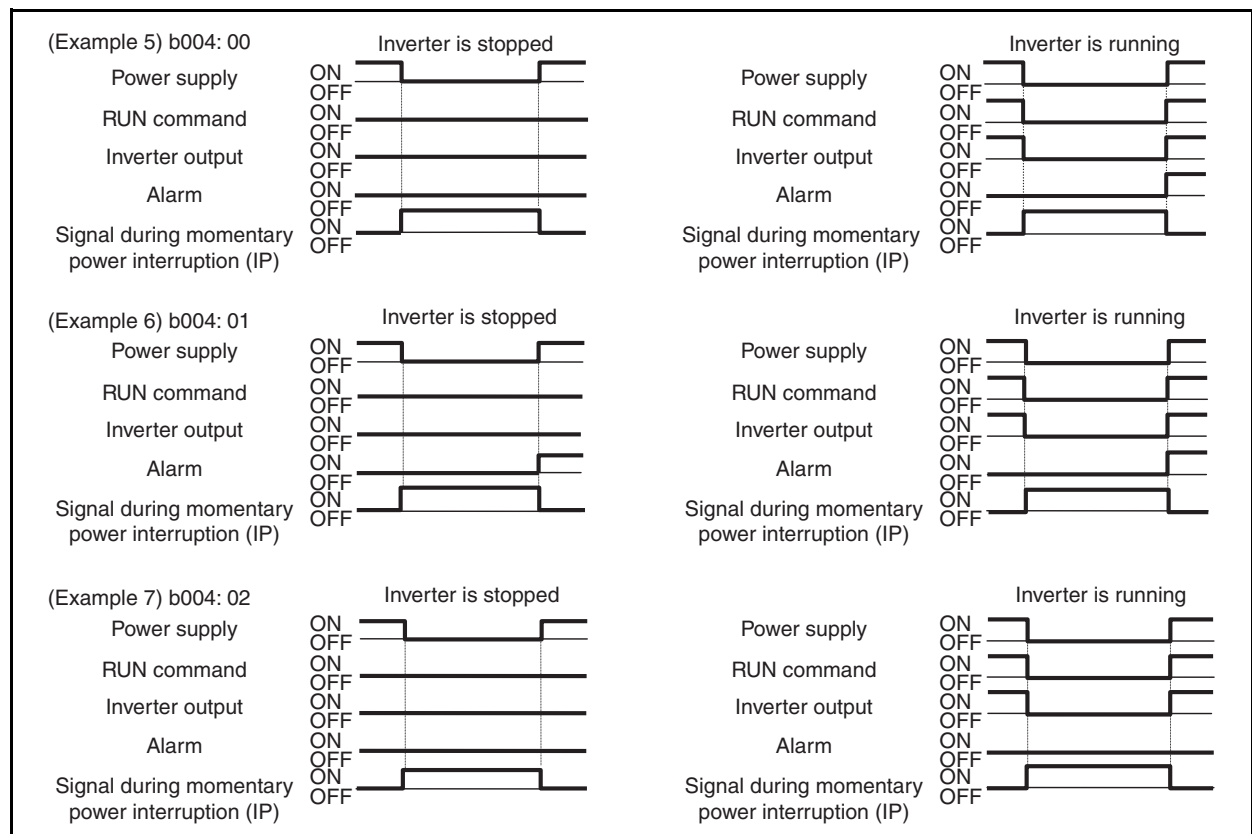


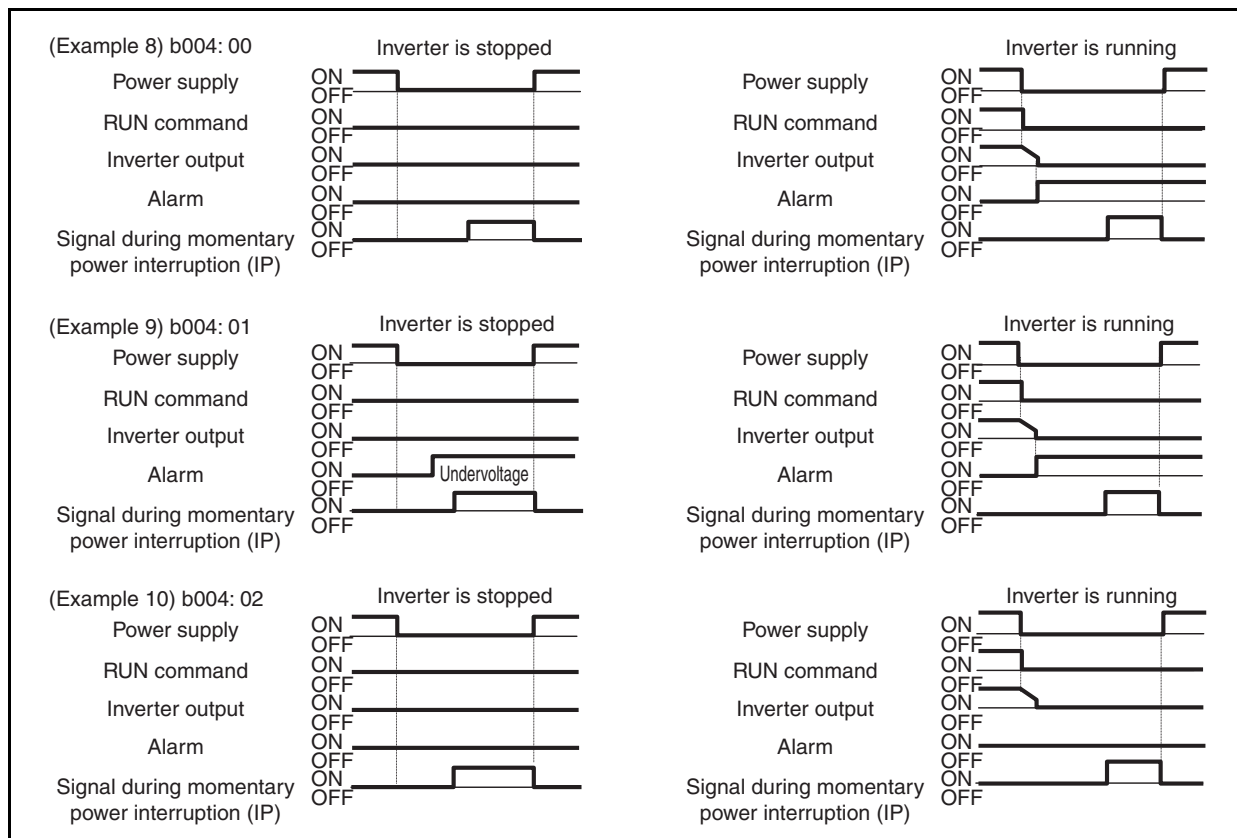
(Example 4) Motor frequency (rpm) &lt; b007



### ■ Alarm Output for Momentary Power Interruption/Undervoltage During Stop

- Use b004 to select whether to enable an alarm output in case of momentary power interruption or undervoltage.
  - An alarm output continues while Inverter control power supply remains.
- Alarm output for momentary power interruption/undervoltage during stop  
Standard (examples 5 to 7)  
Operation where DC (P-N) is supplied to control power supply terminal Ro-To (examples 8 to 10)





Note 1: You can allocate the momentary power interruption signal (IP: 08) and the undervoltage signal (UV: 09) to any of multi-function output terminals 11 to 15 selection (C021 to C025) or the relay output terminal (C026).

Note 2: If power interruption is retained for 1 second or longer, refer to the reset description ("Reset" (page 4-87)).

## Restarting Procedure

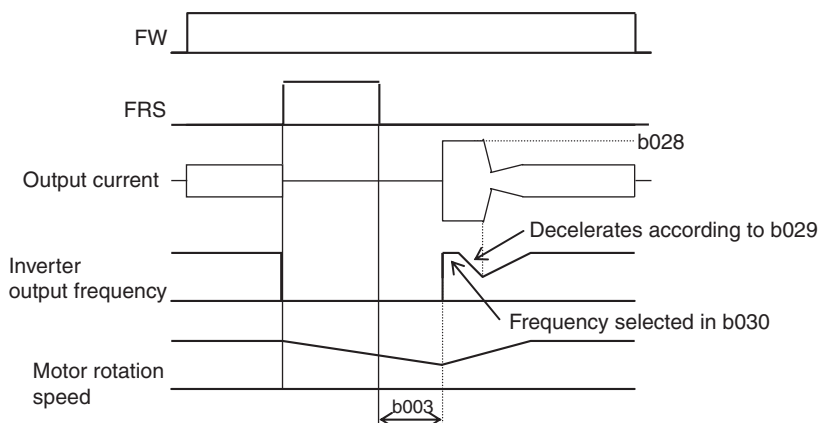
### •Frequency matching restart

This method restarts the Inverter by detecting frequency and rotation direction based on the motor's residual voltage.

### •Active Frequency Matching restart

The Inverter starts output at the frequency set in starting frequency selection b030, and searches for a point where frequency and voltage are balanced to restart the Inverter, while holding current at the Active Frequency Matching restart level (b028).

If the Inverter trips with this method, reduce the b028 set value.



## Input Power Supply Phase Loss Protection Function Selection

- This function outputs an alarm when the Inverter's input power supply has phase loss.

| Parameter No. | Function name                         | Data                                   | Default setting | Unit |
|---------------|---------------------------------------|----------------------------------------|-----------------|------|
| b006          | Input phase loss protection selection | 00: OFF (Disabled)<br>01: ON (Enabled) | 01              | —    |

Phase loss may cause the Inverter to fail, as follows:

- The main capacitor ripple current increases, resulting in remarkable reduction in the capacitor's service life.
- When load is applied, the Inverter's internal converter or thyristor may be damaged.

## Electronic Thermal Function

- Causes a trip to protect the motor from overheating. Set this according to the motor rated current.
- Provides the most appropriate protection characteristics, taking into account the decline of the motor cooling capability at a low speed.
- Outputs an alarm signal before an electronic thermal trip.
- Rated values will be affected by the HD, ND selection.

| Parameter No.     | Function name                                     | Data                                                                                                                               | Default setting | Unit |
|-------------------|---------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------|-----------------|------|
| b012              | Electronic thermal level                          | 0.20 × Rated current to 1.00 × Rated current                                                                                       | Rated current   | A    |
| b212              | *2nd electronic thermal level                     |                                                                                                                                    |                 |      |
| b312              | *3rd electronic thermal level                     |                                                                                                                                    |                 |      |
| b013              | Electronic thermal characteristics selection      | 00: Reduced TRQ (Reduced torque characteristics)<br>01: Const TRQ (Constant torque characteristics)<br>02: Free set (Free setting) | 00              | —    |
| b213              | *2nd electronic thermal characteristics selection |                                                                                                                                    |                 |      |
| b313              | *3rd electronic thermal characteristics selection |                                                                                                                                    |                 |      |
| b015              | Free setting, electronic thermal frequency 1      | 0.00 to 400.00                                                                                                                     | 0.00            | Hz   |
| b017              | Free setting, electronic thermal frequency 2      |                                                                                                                                    |                 |      |
| b019              | Free setting, electronic thermal frequency 3      |                                                                                                                                    |                 |      |
| b016              | Free setting, electronic thermal current 1        | 0.0 to Rated current                                                                                                               | 0.0             | A    |
| b018              | Free setting, electronic thermal current 2        |                                                                                                                                    |                 |      |
| b020              | Free setting, electronic thermal current 3        |                                                                                                                                    |                 |      |
| C061              | Thermal warning level                             | 0 to 100 <sup>*1</sup>                                                                                                             | 80              | %    |
| Related functions |                                                   | C021 to C025, C026                                                                                                                 |                 |      |

\* To switch to the 2nd/3rd control, allocate 08 (SET)/17 (SET3) to the desired multi-function input and then turn it on.

\*1. Set a percentage relative to the electronic thermal multiplication value. When the value reaches 100%, an overload trip (E05) occurs.

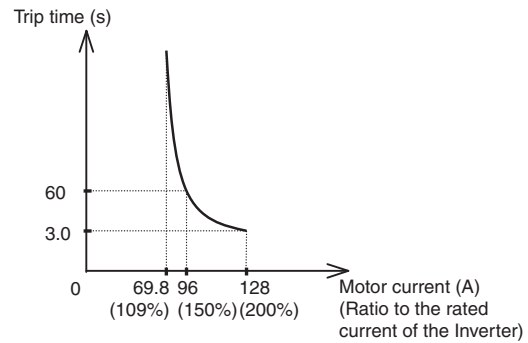
## ■ Electronic Thermal Level (Motor Protection Level)

(Example) 3G3RX-A2150

Rated current: 64 A

Setting range: 12.8 A (20%) to 64.0 A (100%)

- The graph on the right shows the time limit characteristics with the electronic thermal level (b012) set to 64 A.



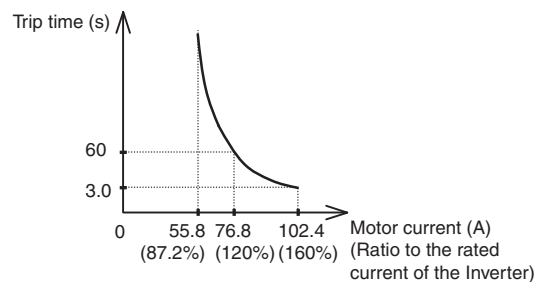
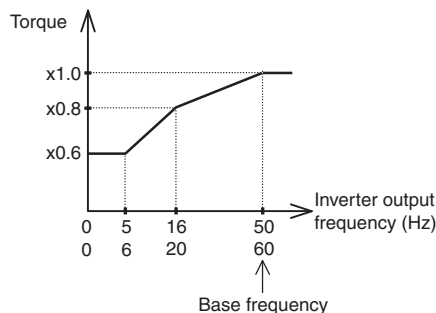
## ■ Electronic Thermal Characteristics

- The frequency characteristics are integrated with the above b012/b212/b312 set values.
- A general-purpose motor requires reduced load (current) because the lower the output frequency is, the lower the cooling capability of its self-cooling fan.
- The reduced torque characteristics are designed to fit the heat radiation of a general-purpose motor.

### Reduced Torque Characteristics

Multiplied by the time limit characteristics set in b012/b212/b312 for each frequency.

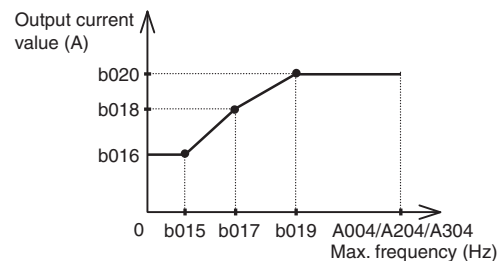
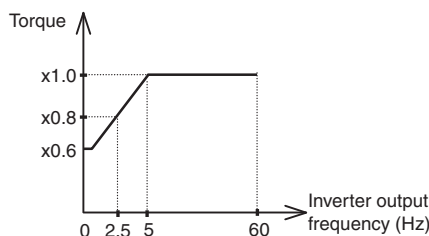
(Example) 3G3RX-A2150 (Rated current: 64 A), b012 = 64 (A), Base frequency = 60 Hz, Output frequency = 20 Hz



### Constant Torque Characteristics

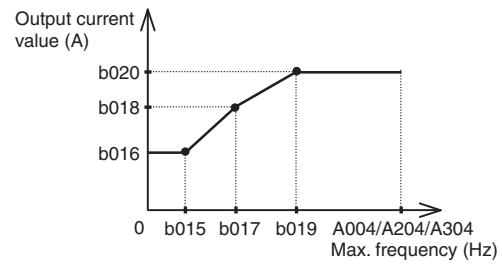
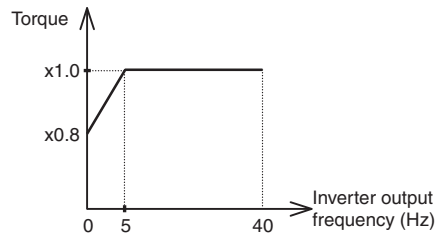
Do not skip this setting when using a constant torque motor.

(Example) 3G3RX-A2150 (Rated current: 64 A), b012 = 64 (A), Output frequency = 2.5 Hz

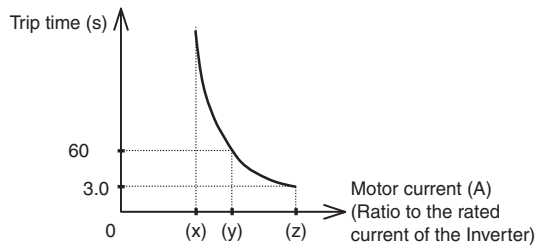


## Free Setting

To protect the motor according to load, you can freely set the electronic thermal characteristics. Below is the setting range.



(Example) Output frequency = b017



(x):  $(b018/\text{Rated current}) \times 109\%$   
 (y):  $(b018/\text{Rated current}) \times 150\%$   
 (z):  $(b018/\text{Rated current}) \times 200\%$

## Thermal Warning

- This function outputs an alarm signal before electronic thermal overhear protection is activated. The warning level can be set in C061.
- Allocate 13 (THM) to any of multi-function output terminals 11 to 15 (C021 to C025) or the relay output terminal (C026).

## Overload Limit/Overload Warning

This function helps prevent an overcurrent trip due to rapid load fluctuation in acceleration or constant speed operation.

| Parameter No.     | Function name                          | Data                                                                                                                                                                                                                                        | Default setting         | Unit |
|-------------------|----------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|------|
| b021              | Overload limit selection               | 00: OFF (Disabled)                                                                                                                                                                                                                          | 01                      | —    |
| b024              | Overload limit selection 2             | 01: ON-Acc/Cnst (Enabled in acceleration/<br>constant speed operation)<br>02: ON-Cnst (Enabled in constant speed<br>operation)<br>03: ON-A/C(R) (Enabled in acceleration/<br>constant speed operation (accelerates<br>during regeneration)) | 01                      | —    |
| b022              | Overload limit level                   | 0.20 × Rated current to 2.00 × Rated<br>current (0.4 to 55 kW)                                                                                                                                                                              | 1.50 × Rated<br>current | A    |
| b025              | Overload limit level 2                 | 0.20 × Rated current to 1.80 × Rated<br>current (75 to 132 kW)                                                                                                                                                                              | 1.50 × Rated<br>current | A    |
| b023              | Overload limit parameter               | 0.10 to 30.00                                                                                                                                                                                                                               | 1.00                    | s    |
| b026              | Overload limit parameter 2             |                                                                                                                                                                                                                                             | 1.00                    | s    |
| C040              | Overload warning signal<br>output mode | 00: ACC/DEC/CST (Enabled during<br>acceleration/deceleration/constant<br>speed)<br>01: Const (Enabled only during constant<br>speed)                                                                                                        | 01                      | —    |
| C041              | Overload warning level                 | 0.0: Does not operate.<br>0.1 × Rated current to 2.00 × Rated current<br>(0.4 to 55 kW)                                                                                                                                                     | Rated current           | A    |
| C111              | Overload warning level 2               | 0.1 × Rated current to 1.80 × Rated current<br>(75 to 132 kW)<br>(Outputs OL and OL2 signals when<br>reaching the overload warning level.)                                                                                                  | Rated current           |      |
| Related functions |                                        | C001 to C008, C021 to C025, C026                                                                                                                                                                                                            |                         |      |

### ■ Overload Limit

- The Inverter monitors the motor current during acceleration or constant speed operation in order to lower output frequency automatically according to the overload limit parameter once the motor current reaches the overload limit.
- This function prevents an overcurrent trip caused by excessive moment of inertia during acceleration, or caused by rapid load fluctuations during constant speed operation.
- You can set two types of overload limit functions in b021/b022/b023 and b024/b025/b026.
- To switch between b021/b022/b023 and b024/b025/b026, allocate 39 (OLR) to a multi-function input and then turn it on/off.
- The overload limit level sets a current value for this function to work.
- The overload limit parameter sets a time of deceleration from the maximum frequency to 0 Hz.
- When this function operates, the acceleration time becomes longer than the set time.
- If "sensorless vector control", "0-Hz sensorless vector control", or "sensor vector control" is selected as the control method (V/f characteristics) (refer to "Control Method (V/f Characteristics)" (page 4-21)), and "03" is selected for b021/b024, the frequency increases when a current exceeding the overload limit level flows during regenerative operation.
- If overload limit parameter b023/b026 is set too short, an overvoltage trip may occur because of regenerative energy from the motor caused by automatic deceleration of this function even during acceleration.
- Make the following adjustments if this function operates before the frequency reaches the target value during acceleration.

Increase the acceleration time. (Refer to "Acceleration/Deceleration Time" (page 4-8).)

Increase the torque boost. (Refer to "Torque Boost" (page 4-19).)

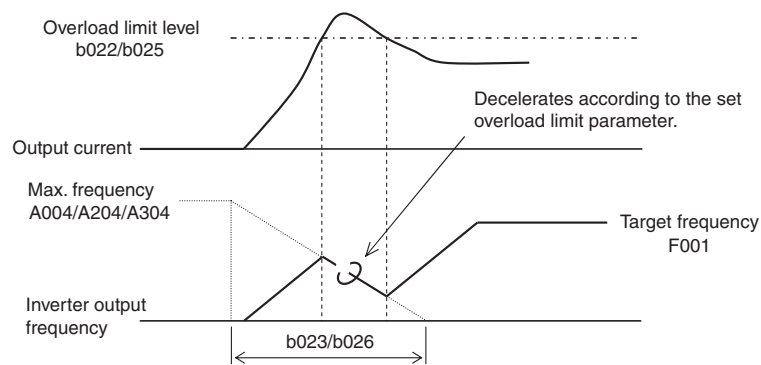
www.nicsanat.com

021-87700210



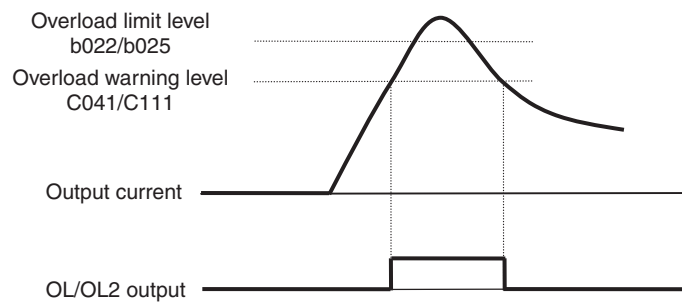


Increase the overload limit level (b022/b025).



## ■ Overload Warning

- If the applied load is large, the Inverter can output an overload warning signal before an overload trip occurs. This helps prevent mechanical damage due to an overload in the carrier machine, or an operation line stop due to overload protection of the Inverter.
- Allocate "03" (OL) or "26" (OL2) to any of multi-function output terminals 11 to 15 (C021 to C025) or the relay output terminal (C026). (Two types of overload warning signals are available for output.)

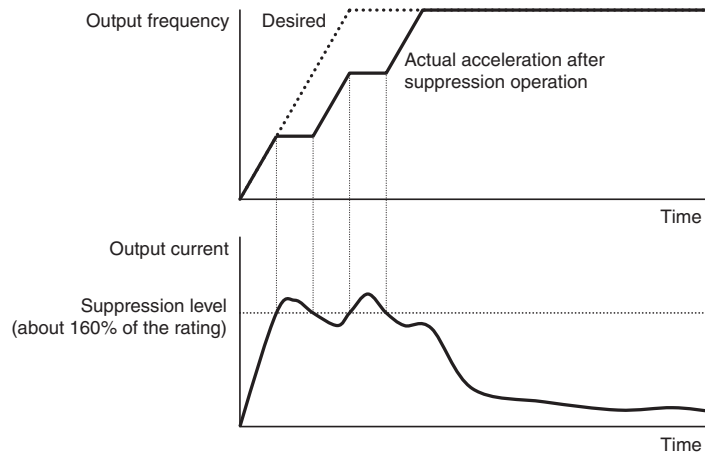


## Overcurrent Suppression Function

- This function suppresses overcurrent caused by a steep current rise in rapid acceleration.
- You can set whether to enable or disable this function with b027.

| Parameter No. | Function name                    | Data                                   | Default setting | Unit |
|---------------|----------------------------------|----------------------------------------|-----------------|------|
| b027          | Overcurrent suppression function | 00: OFF (Disabled)<br>01: ON (Enabled) | 00              | —    |

Note: If you use the Inverter with an elevating machine, disable this function. Otherwise, the machine may slide down.



## Soft Lock Function

- You can set whether to enable or disable the writing of various code data. This helps prevent data rewriting due to erroneous operation.

| Parameter No.     | Function name       | Data                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Default setting | Unit |
|-------------------|---------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|------|
| b031              | Soft lock selection | 00: Lock (SFT) (Data other than b031 cannot be changed when terminal SFT is ON)<br>01: Only FQ (SET) (Data other than b031 and specified frequency parameter cannot be changed when terminal SFT is ON)<br>02: Lock (Data other than b031 cannot be changed)<br>03: Only FQ (Data other than b031 and specified frequency parameter cannot be changed)<br>10: RUN chg mode (Data other than parameters changeable during operation cannot be changed) | 01              | —    |
| Related functions |                     | C001 to C008, SFT input                                                                                                                                                                                                                                                                                                                                                                                                                               |                 |      |

- Select the soft lock setting and performing method from the above table.
- To use a multi-function input terminal, allocate 15 (SFT) to any of multi-function inputs 1 to 8 (C001 to C008).

## RUN Time/Power ON Time Exceeded

- If the total RUN time of the Inverter exceeds the time set in ON time setting b034, a RUN/Power ON 'time exceeded' (RNT/ONT) signal is output.

| Parameter No.     | Function name                  | Data                           | Default setting | Unit |
|-------------------|--------------------------------|--------------------------------|-----------------|------|
| b034              | RUN time/Power ON time setting | 0 to 65535                     | 0               | —    |
| Related functions |                                | C021 to C025, C026, d016, d017 |                 |      |

### ■ RUN Time Exceeded (RNT)

- Allocate 11 (RNT) to any of multi-function output terminals 11 to 15 (C021 to C025) or the relay output terminal (C026).
- Set a time in RUN time/Power ON time setting b034.

### ■ Power ON Time Exceeded (ONT)

- Allocate 12 (ONT) to any of multi-function output terminals 11 to 15 (C021 to C025) or the relay output terminal (C026).
- Set a time in RUN time/Power ON time setting b034.

## Rotation Direction Limit Selection

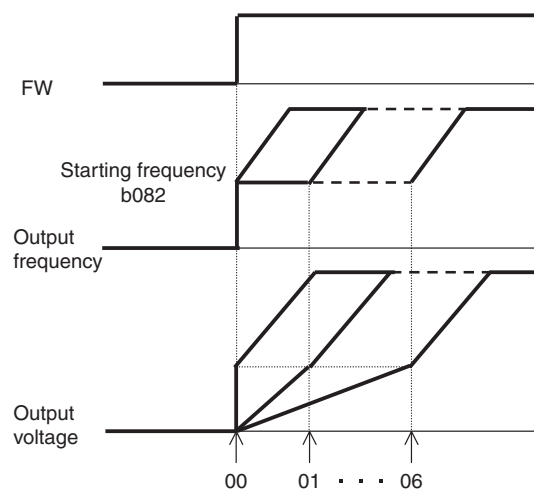
- Limits motor rotation directions.
- Enabled in either "control circuit terminal block" or "Digital Operator" control mode.

| Parameter No. | Function name                      | Data                                                                                                                 | Default setting | Unit |
|---------------|------------------------------------|----------------------------------------------------------------------------------------------------------------------|-----------------|------|
| b035          | Rotation direction limit selection | 00: FREE (Forward and Reverse are enabled)<br>01: FWD (Only Forward is enabled)<br>02: REV (Only Reverse is enabled) | 00              | —    |

## Reduced Voltage Startup Selection

- Slowly increases voltage during motor startup.
- To increase torque during startup, reduce the set value of reduced voltage startup selection b036. Note that if the value is too small, the motor starts in full-voltage starting mode, possibly resulting in an overcurrent trip.

| Parameter No.     | Function name                     | Data                                                                                                                  | Default setting | Unit |
|-------------------|-----------------------------------|-----------------------------------------------------------------------------------------------------------------------|-----------------|------|
| b036              | Reduced voltage startup selection | 00: Reduced voltage startup disabled<br>01 to 255:<br>01: Short (approx. 6 ms)<br>↕   ↕<br>255: Long (approx. 1.53 s) | 6               | —    |
| Related functions |                                   | b082                                                                                                                  |                 |      |



## Display Selection

- You can change the items to be displayed on the Digital Operator.

| Parameter No. | Function name     | Data                                                                                                                                                                          | Default setting | Unit |
|---------------|-------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|------|
| b037          | Display selection | 00: All (Complete display)<br>01: Utilized (Individual display of functions)<br>02: User (User setting)<br>03: Only FQ (Data comparison display)<br>04: Basic (Basic display) | 00              | —    |
| U001 to U012  | User selection    | __no: No allocation<br>d001 to P196: Select the code you want to display. (Among all codes)                                                                                   | no              | —    |

## ■ Individual Display of Functions

- If a specific function is not selected, its relevant parameter is not displayed.
- For details on the display requirements, refer to the following table.

| No. | Display requirements                           | Parameters displayed when the requirements are met                                                                        |
|-----|------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------|
| 1   | A001 = 01                                      | A005, A006, A011 to A016, A101, A102<br>A111 to A114, C081 to C083, C121 to C123                                          |
| 2   | A001 = 10                                      | A141 to A143                                                                                                              |
| 3   | A002 = 01, 03, 04, 05                          | b087                                                                                                                      |
| 4   | A017 = 01                                      | d025 to d027, P100 to P131 (Note that P100 to P131 cannot be used.)                                                       |
| 5   | A041 = 01                                      | A046, A047                                                                                                                |
| 6   | A044 = 00, 01                                  | A041, A042, A043                                                                                                          |
| 7   | A044 = 03, 04, 05                              | H002, H005, H050                                                                                                          |
| 8   | A044 = 04                                      | H060, H061                                                                                                                |
| 9   | A044 = 03, 04, 05, and<br>H002 = 00            | H020 to H024                                                                                                              |
| 10  | A044 = 03, 04, 05, and<br>H002 = 01, 02        | H030 to H034                                                                                                              |
| 11  | Either of A044 or A244 = 03, 04, 05            | d008 to d010, d012, b040 to b046, H001, H070 to H073                                                                      |
| 12  | Either of A044 or A244 = 02                    | b100 to b113                                                                                                              |
| 13  | A051 = 01, 02                                  | A052, A056 to A058                                                                                                        |
| 14  | A051 = 01, 02                                  | A053 to A055, A059                                                                                                        |
| 15  | A071 = 01, 02                                  | d004, A005, A006, A011 to A016, A072 to A078<br>A101, A102, A111 to A114, C044, C052, C053, C081 to C083,<br>C121 to C123 |
| 16  | A076 = 10                                      | A141 to A143                                                                                                              |
| 17  | A094 = 01, 02                                  | A095, A096                                                                                                                |
| 18  | A097 = 01, 02, 03, 04                          | A131                                                                                                                      |
| 19  | A097 = 01, 02, 03, 04                          | A132                                                                                                                      |
| 20  | Any of b012, b212, and b312 = 02               | b015 to b020                                                                                                              |
| 21  | b021 = 01, 02, 03                              | b022, b023                                                                                                                |
| 22  | b024 = 01, 02, 03                              | b025, b026                                                                                                                |
| 23  | b050 = 01                                      | b051 to b054                                                                                                              |
| 24  | b095 = 01, 02                                  | b090, b096                                                                                                                |
| 25  | b098 = 01, 02                                  | b099, C085                                                                                                                |
| 26  | b120 = 01                                      | b121 to b127                                                                                                              |
| 27  | Any of C001 to C008 = 05, and<br>A019 = 00     | A028 to A035                                                                                                              |
| 28  | Any of C001 to C008 = 06                       | A038, A039                                                                                                                |
| 29  | Any of C001 to C008 = 07                       | A053 to A055, A059                                                                                                        |
| 30  | Any of C001 to C008 = 08                       | F202, F203, A203, A204, A220, A244, A246, A247, A261, A262,<br>A292, A293, A294, b212, b213, H203, H204, H206             |
| 31  | Any of C001 to C008 = 08, and<br>A041 = 01     | A246, A247                                                                                                                |
| 32  | Any of C001 to C008 = 08, and<br>A244 = 00, 01 | A241, A242, A243                                                                                                          |

| No. | Display requirements                                       | Parameters displayed when the requirements are met                     |
|-----|------------------------------------------------------------|------------------------------------------------------------------------|
| 33  | Any of C001 to C008 = 08, and A244 = 03, 04                | H202, H205, H250, H251, H252                                           |
| 34  | Any of C001 to C008 = 08, and A244 = 04                    | H260, H261                                                             |
| 35  | Any of C001 to C008 = 08, A244 = 03, 04, and H202 = 00     | H220 to H224                                                           |
| 36  | Any of C001 to C008 = 08, A244 = 03, 04, and H202 = 01, 02 | H230 to H234                                                           |
| 37  | Any of C001 to C008 = 08, and A094 = 01, 02                | A295, A296                                                             |
| 38  | Any of C001 to C008 = 11                                   | b088                                                                   |
| 39  | Any of C001 to C008 = 17                                   | F302, F303, A303, A304, A320, A342, A343, A392, A393, b312, b313, H306 |
| 40  | Any of C001 to C008 = 18                                   | C102                                                                   |
| 41  | Any of C001 to C008 = 27, 28, 29                           | C101                                                                   |
| 42  | Any of C021 to C026 = 03                                   | C040, C041                                                             |
| 43  | Any of C021 to C026 = 26                                   | C040, C111                                                             |
| 44  | Any of C021 to C026 = 02, 06                               | C042, C043                                                             |
| 45  | Any of C021 to C026 = 07                                   | C055 to C058                                                           |
| 46  | Any of C021 to C026 = 21                                   | C063                                                                   |
| 47  | Any of C021 to C026 = 24, 25                               | C045, C046                                                             |
| 48  | Any of C021 to C026 = 33                                   | C142 to C144                                                           |
| 49  | Any of C021 to C026 = 34                                   | C145 to C147                                                           |
| 50  | Any of C021 to C026 = 35                                   | C148 to C150                                                           |
| 51  | Any of C021 to C026 = 36                                   | C151 to C153                                                           |
| 52  | Any of C021 to C026 = 37                                   | C154 to C156                                                           |
| 53  | Any of C021 to C026 = 38                                   | C157 to C159                                                           |
| 54  | Any of C021 to C026 = 42                                   | C064                                                                   |

### ■ User Setting

- Displays only the parameters optionally set in U001 to U012.
- In addition to U001 to U012, d001, F001 and b037 are displayed.

### ■ Data Comparison Display

- Displays only the parameters changed from the factory default.  
Note that analog input adjustments C081, C082, C083, C121, C122, and C123, and thermistor adjustment C085 are not displayed.
- All monitors (d\*\*\*) and F001 are displayed.

## ■ Basic Display

- Displays basic parameters.
- Below are the parameters displayed when this function is enabled.

| No.               | Data         | Function name                         | No.          | Data | Function name                                                 |
|-------------------|--------------|---------------------------------------|--------------|------|---------------------------------------------------------------|
| 1                 | d001 to d104 | Monitor display                       | 16           | A045 | Output voltage gain                                           |
| 2                 | F001         | Output frequency setting/monitor      | 17           | A085 | RUN mode selection                                            |
| 3                 | F002         | Acceleration time 1                   | 18           | b001 | Retry selection                                               |
| 4                 | F003         | Deceleration time 1                   | 19           | b002 | Allowable momentary power interruption time                   |
| 5                 | F004         | Operator rotation direction selection | 20           | b008 | Trip retry selection                                          |
| 6                 | A001         | Frequency reference selection         | 21           | b011 | Trip retry wait time                                          |
| 7                 | A002         | RUN command selection                 | 22           | b037 | Display selection                                             |
| 8                 | A003         | Base frequency                        | 23           | b083 | Carrier frequency                                             |
| 9                 | A004         | Maximum frequency                     | 24           | b084 | Initialization selection                                      |
| 10                | A005         | O/OI selection                        | 25           | b130 | Overvoltage protection function selection during deceleration |
| 11                | A020         | Multi-step speed reference 0          | 26           | b131 | Overvoltage protection level during deceleration              |
| 12                | A021         | Multi-step speed reference 1          | 27           | C021 | Multi-function output terminal 11 selection                   |
| 13                | A022         | Multi-step speed reference 2          | 28           | C022 | Multi-function output terminal 12 selection                   |
| 14                | A023         | Multi-step speed reference 3          | 29           | C036 | Relay output (AL2, AL1) contact                               |
| 15                | A044         | V/f characteristics selection         |              |      |                                                               |
| Related functions |              |                                       | U001 to U012 |      |                                                               |

## Initial Screen Selection (Initial Screen at Power-ON)

You can select the Digital Operator screen to be displayed at power-on among the following items.  
(By factory default, "01" (d001) is selected.)

| Parameter No. | Function name            | Data       | Default setting | Unit |
|---------------|--------------------------|------------|-----------------|------|
| b038          | Initial screen selection | 000 to 202 | 001             | —    |

Note: With "00" (screen on which the Enter key was last pressed) selected, if the last screen is other than d\*\*\* or F\*\*\*, the entrance (\*---) of each group is displayed.

(Example) When the power is turned off and then on after a change in the A020 setting, "A---" is displayed.

## User Parameter Automatic Setting Function

- When user parameter automatic setting function b039 is set to "01" (enabled), the parameters subjected to a data change are automatically stored in sequence (from U001 to U012). This data can be used as changed data.
- The screen information is stored when the Enter key is pressed. The monitor screens (d\*\*\*) are also stored in the same manner.
- U001 is the most recent parameter, and U012 is the oldest.
- The same parameter cannot be stored. If the number of parameters stored exceeds 12, the oldest data (U012) is erased.

| Parameter No.     | Function name                                       | Data                                   | Default setting | Unit |
|-------------------|-----------------------------------------------------|----------------------------------------|-----------------|------|
| b039              | User parameter automatic setting function selection | 00: OFF (Disabled)<br>01: ON (Enabled) | 00              | —    |
| Related functions |                                                     | U001 to U012                           |                 |      |

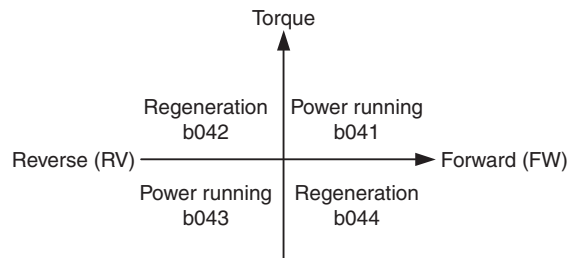
## Torque Limit Function

- This function limits motor output torque when "03" (sensorless vector control), "04" (0-Hz sensorless vector control), or "05" (sensor vector control) is selected in control method A044/A244.

| Parameter No.     | Function name                                                | Data                                                                                                                                               | Default setting | Unit |
|-------------------|--------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|------|
| A044/A244         | V/f characteristics selection                                | 03: SLV (Sensorless vector control)<br>04: 0SLV (0-Hz sensorless vector control)<br>05: V2 (Sensor vector control)                                 | 00              | —    |
| b040              | Torque limit selection                                       | 00: 4-quadrant (Four-quadrant separate setting)<br>01: TRQ input (Terminal switch)<br>02: [O] input (Analog input)<br>03: Option 1<br>04: Option 2 | 00              | —    |
| b041              | Torque limit 1<br>(Four-quadrant mode forward power running) | 0 to 200 (0.4 to 55 kW)<br>0 to 180 (75 to 132 kW)<br>no (Torque limit disabled)<br>Forward power running under four-quadrant separate setting     | 150             | %    |
| b042              | Torque limit 2<br>(Four-quadrant mode reverse regeneration)  | 0 to 200 (0.4 to 55 kW)<br>0 to 180 (75 to 132 kW)<br>no (Torque limit disabled)<br>Reverse regeneration under four-quadrant separate setting      | 150             | %    |
| b043              | Torque limit 3<br>(Four-quadrant mode reverse power running) | 0 to 200 (0.4 to 55 kW)<br>0 to 180 (75 to 132 kW)<br>no (Torque limit disabled)<br>Reverse power running under four-quadrant separate setting     | 150             | %    |
| b044              | Torque limit 4<br>(Four-quadrant mode forward regeneration)  | 0 to 200 (0.4 to 55 kW)<br>0 to 180 (75 to 132 kW)<br>no (Torque limit disabled)<br>Forward regeneration under four-quadrant separate setting      | 150             | %    |
| C001 to C008      | Multi-function inputs 1 to 8 selection                       | 40: TL (Torque limit enabled)<br>41: TRQ1 (Torque limit switching 1)<br>42: TRQ2 (Torque limit switching 2)                                        | —               | —    |
| C021 to C025      | Multi-function output terminal 11 to 15 selection            | 10: TRQ (Torque limit)                                                                                                                             | —               | —    |
| Related functions |                                                              | A044, A244, C001 to C008                                                                                                                           |                 |      |



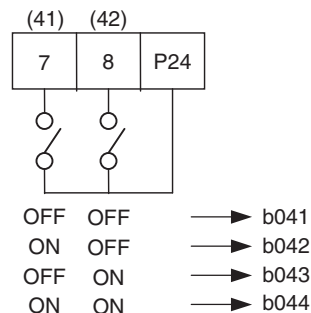
- You can select any of the following four torque limit functions from torque limit selection b040.
  - <Four-quadrant separate setting mode>  
Sets torque limits 1 to 4 (b041 to b044) for four quadrants (forward power running, regeneration, reverse power running, and regeneration).
  - <Terminal switching mode>  
Switches over torque limits 1 to 4 (b041 to b044), depending on combinations of torque limit switchings 1 and 2 (TRQ1 and TRQ2) allocated to multi-function inputs. Selected torque limit values are enabled for all operation modes.
  - <Analog input mode>  
Sets a torque limit value depending on the voltage applied to terminal O2 on the control terminal block. 0 to 10 V correspond to torque limit values of 0% to 200%. Selected torque limit values are enabled for all operation modes.
  - <Option (option 1, option 2) mode>  
Enabled when an optional 3G3AX-DI01 board is used. For details, refer to the optional board instruction manual.
- If the torque limit enable function (TL) is set for a multi-function input, the torque limit function set in b040 is enabled only when TL is turned on. When TL is off, the torque limit setting is disabled, and the maximum value is defined as the torque limit value. Unless the torque limit enable function (TL) is set for a multi-function input, the torque limit function set in torque limit selection b040 is always enabled.
- With this function, the torque limit value is set with the Inverter's maximum output current as 200%. This means output torque varies depending on the combination of motors. Note that the torque limit value is not the absolute one.
- When the torque limit signal is selected in the multi-function output selection, the torque limit signal is turned on when the above torque limit function is activated.
- The following figure shows torque limits 1 to 4 with "00" (four-quadrant separate setting) selected in torque limit selection b040.



- The following figure shows torque limits 1 to 4 with "01" (terminal switching) selected in torque limit selection b040. They can be switched with torque limit switchings 1 and 2 allocated to multi-function inputs.

(Example) When torque limit switching 1 (41) and torque limit switching 2 (42) are allocated to multi-function input terminals 7 and 8, respectively

Multi-function input terminals



- To use the torque limit function in a low speed range, also use the overload limit function.

## Reverse Rotation Prevention Function

- This function is enabled when "03" (sensorless vector control), "04" (0-Hz sensorless vector control), or "05" (sensor vector control) is selected in control method A044/A244.
- Because of the Inverter's control characteristics, the Inverter may output a rotation signal in the direction opposite to that of the RUN command (e.g. in a low-speed range). If the motor's reverse rotation may cause a problem (e.g. damage to the machine driven by the motor), set reverse rotation prevention selection b046 to "enabled".

| Parameter No. | Function name                         | Data                                                                                                               | Default setting | Unit |
|---------------|---------------------------------------|--------------------------------------------------------------------------------------------------------------------|-----------------|------|
| A044/A244     | V/f characteristics selection         | 03: SLV (Sensorless vector control)<br>04: 0SLV (0-Hz sensorless vector control)<br>05: V2 (Sensor vector control) | 00              | —    |
| b046          | Reverse rotation prevention selection | 00: OFF (Disabled)<br>01: ON (Enabled)                                                                             | 00              | —    |

## Torque LADSTOP Function

- If "03" (sensorless vector control), "04" (0-Hz sensorless vector control), or "05" (sensor vector control) is selected in control method A004/A244, this function temporarily stops the frequency deceleration function (LAD) when the torque limit function is activated.

| Parameter No. | Function name                                                | Data                                                                                                                                               | Default setting | Unit |
|---------------|--------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|------|
| A044/A244     | V/f characteristics selection                                | 03: SLV (Sensorless vector control)<br>04: 0SLV (0-Hz sensorless vector control)<br>05: V2 (Sensor vector control)                                 | 00              | —    |
| b040          | Torque limit selection                                       | 00: 4-quadrant (Four-quadrant separate setting)<br>01: TRQ input (Terminal switch)<br>02: [O] input (Analog input)<br>03: Option 1<br>04: Option 2 | 00              | —    |
| b041          | Torque limit 1<br>(Four-quadrant mode forward power running) | 0 to 200 (0.4 to 55 kW)<br>0 to 180 (75 to 132 kW)<br>no (Torque limit disabled)<br>Forward power running under four-quadrant separate setting     | 150             | %    |
| b042          | Torque limit 2<br>(Four-quadrant mode reverse regeneration)  | 0 to 200 (0.4 to 55 kW)<br>0 to 180 (75 to 132 kW)<br>no (Torque limit disabled)<br>Reverse regeneration under four-quadrant separate setting      |                 |      |
| b043          | Torque limit 3<br>(Four-quadrant mode reverse power running) | 0 to 200 (0.4 to 55 kW)<br>0 to 180 (75 to 132 kW)<br>no (Torque limit disabled)<br>Reverse power running under four-quadrant separate setting     |                 |      |
| b044          | Torque limit 4<br>(Four-quadrant mode forward regeneration)  | 0 to 200 (0.4 to 55 kW)<br>0 to 180 (75 to 132 kW)<br>no (Torque limit disabled)<br>Forward regeneration under four-quadrant separate setting      |                 |      |
| b045          | Torque LADSTOP selection                                     | 00: OFF (Disabled)<br>01: ON (Enabled)                                                                                                             | 00              | —    |
| C001 to C008  | Multi-function inputs 1 to 8 selection                       | 40: TL (Torque limit enabled)<br>41: TRQ1 (Torque limit switching 1)<br>42: TRQ2 (Torque limit switching 2)                                        | —               | —    |



## Dual Rating Selection

- Ratings of the inverter are switched to Heavy Duty (CT) and Normal Duty (VT) and it enables it. The ratings current value changes by switching Heavy Duty (CT) and Normal Duty (VT).
- The method of switching a Heavy Duty and a Normal Duty is done by Heavy Duty/Normal Duty selection (b049) in the operator.

| Parameter No. | Function name       | Data                                                 | Default setting | Unit |
|---------------|---------------------|------------------------------------------------------|-----------------|------|
| b049          | Dual Rate Selection | 00: CT (Constant torque)<br>01: VT (Variable torque) | 00              | —    |

- In the Normal Duty (VT), there is the item which is not displayed in the parameter of the operator.

| Parameter No. | Function name                              | Function code | Function name                                              |
|---------------|--------------------------------------------|---------------|------------------------------------------------------------|
| d008          | Real frequency monitor                     | P024          | Position bias amount                                       |
| d009          | Torque reference monitor                   | P025          | Secondary resistance compensation enable/disable selection |
| d010          | Torque bias monitor                        | P026          | Overspeed error detection level                            |
| d029          | Positioning command monitor                | P027          | Speed deviation error detection level                      |
| d030          | Current position monitor                   | P028          | Motor gear ratio numerator                                 |
| b120          | Brake control enable                       | P029          | Motor gear ratio denominator                               |
| b121          | Brake wait time for release                | P032          | Orientation stop position input type                       |
| b122          | Brake wait time for acceleration           | P033          | Torque reference input selection                           |
| b123          | Brake wait time fot stopping               | P034          | Torque reference setting                                   |
| b124          | Brake wait time for confirmation           | P035          | Polarity selection at torque reference via O2              |
| b125          | Brake release frequency                    | P036          | Torque bias mode                                           |
| b126          | Brake release current                      | P037          | Torque bias value                                          |
| b127          | Brake input frequency                      | P038          | Torque bias polarity selection                             |
| H060          | Limit at 0 Hz                              | P039          | Speed limit value in torque control (forward)              |
| H260          | *2nd limit at 0 Hz                         | P040          | Speed limit value in torque control (reverse)              |
| H061          | Boost amount at SLV startup, 0 Hz          | P060          | Multi-step position command 0                              |
| H261          | *2nd boost amount at SLV startup, 0 Hz     | P061          | Multi-step position command 1                              |
| P011          | Encoder pulses                             | P062          | Multi-step position command 2                              |
| P012          | V2 control mode selection                  | P063          | Multi-step position command 3                              |
| P013          | Pulse train mode selection                 | P064          | Multi-step position command 4                              |
| P014          | Orientation stop position                  | P065          | Multi-step position command 5                              |
| P015          | Orientation speed setting                  | P066          | Multi-step position command 6                              |
| P016          | Orientation direction setting              | P067          | Multi-step position command 7                              |
| P017          | Position ready range setting               | P068          | Zero return mode                                           |
| P018          | Position ready delay time setting          | P069          | Zero return direction selection                            |
| P019          | Electronic gear setting position selection | P070          | Low-speed return frequency                                 |
| P020          | Electronic gear ratio numerator            | P071          | High-speed zero return frequency                           |
| P021          | Electronic gear ratio denominator          | P072          | Position range specification (forward)                     |
| P022          | Position control feedforward gain          | P073          | Position range specification (reverse)                     |
| P023          | Position loop gain                         | P074          | Teaching selection                                         |

- In the Normal Duty (VT), there is an item limited in the parameter of the operator by the setting range.

| Function code | Function name                                             |
|---------------|-----------------------------------------------------------|
| A044/A244     | 1st/2nd V/f characteristics selection                     |
| A054          | DC injection braking power                                |
| A057          | Startup DC injection braking power                        |
| A059          | DC injection braking carrier frequency                    |
| A085          | RUN mode selection                                        |
| b022          | Overload limit level                                      |
| b025          | Overload limit level 2                                    |
| b028          | Active Frequency Matching restart level                   |
| b041          | Torque limit 1 (Four-quadrant mode forward power running) |
| b042          | Torque limit 2 (Four-quadrant mode reverse regeneration)  |
| b043          | Torque limit 3 (Four-quadrant mode reverse power running) |
| b044          | Torque limit 4 (Four-quadrant mode forward regeneration)  |
| b083          | Carrier frequency                                         |
| C030          | Digital current monitor reference value                   |
| C039          | Light load detection level                                |
| C041          | Overload warning level                                    |
| C055          | Overtorque level (Forward power running)                  |
| C056          | Overtorque level (Reverse regeneration)                   |
| C057          | Overtorque level (Reverse power running)                  |
| C058          | Overtorque level (Forward regeneration)                   |
| C111          | Overload warning level 2                                  |

- In the Normal Duty (VT), these terminals are not available.
- Intelligent input terminal that cannot set Normal Duty.

| Code     | Intelligent input terminal name               |
|----------|-----------------------------------------------|
| 44: BOK  | Brake confirmation                            |
| 45: ORT  | Orientation                                   |
| 47: PCLR | Position deviation error                      |
| 48: STAT | Pulse train position command input permission |
| 52: ATR  | Torque command input permission               |
| 54: SON  | Servo ON                                      |
| 55: FOC  | Preliminary excitation                        |
| 66: CP1  | Position command selection 1                  |
| 67: CP2  | Position command selection 2                  |
| 68: CP3  | Position command selection 3                  |
| 69: ORL  | Zero return limit signal                      |
| 70: ORG  | Zero return startup signal                    |
| 71: FOT  | Forward driving stop                          |
| 72: ROT  | Reverse driving stop                          |
| 73: SPD  | Speed/Position switching                      |

- Intelligent output terminal that cannot set Normal Duty.

| Code    | Intelligent output terminal name |
|---------|----------------------------------|
| 19: BRK | Brake release                    |
| 20: BER | Brake error                      |
| 22: DSE | Excessive speed deviation        |
| 23: POK | Position ready                   |

- When the parameter becomes outside a set range when changing to Heavy Duty -> Normal Duty, it changes to an initial value.
- An initial value of the following parameters is different in Heavy Duty ratings and Normal Duty ratings. When Heavy Duty/Normal Duty is changed with b049, items other than H003/H203 are changed to an initial value.

| Name                                   | Func. code            | HD                                                                                                                                                       |                              | ND                                                                |                              |
|----------------------------------------|-----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|-------------------------------------------------------------------|------------------------------|
|                                        |                       | Range                                                                                                                                                    | Initial data                 | Range                                                             | Initial data                 |
| V/f characteristics selection          | A044<br>A244<br>A344* | 00: VC (Const. torque)<br>01: VP (Reduced torque)<br>02: Free V/F<br>03: SLV (sensorless vector)<br>04: 0SLV (0-Hz sensorless)<br>05: V2 (Sensor vector) | 00: Const. torque            | 00: VC (Const. torque)<br>01: VP (Reduced torque)<br>02: Free V/F | 00: Const. torque            |
| DC injection braking power             | A054                  | 0 to 100 (%) 0.4 to 55kW<br>0 to 80 (%) 75 to 132kW                                                                                                      | 50% 0.4-55kW<br>40% 75-132kW | 0 to 70 (%) 0.4 to 55kW<br>0 to 50 (%) 75 to 132kW                | 50% 0.4-55kW<br>40% 75-132kW |
| Startup DC injection braking power     | A057                  | 0 to 100 (%) 0.4 to 55kW<br>0 to 80 (%) 75 to 132kW                                                                                                      | 0 (%)                        | 0 to 70 (%) 0.4 to 55kW<br>0 to 50 (%) 75 to 132kW                | 0 (%)                        |
| DC injection braking carrier frequency | A059                  | 0.5 to 15.0 (kHz) 0.4-55kW<br>0.5 to 10.0 (kHz) 75-132kW                                                                                                 | 5.0 (kHz)<br>0.4-55kW        | 0.5 to 12.0 (kHz) 0.4-55kW<br>0.5 to 8.0 (kHz) 75-132kW           | 3.0 (kHz)                    |
| Electronic thermal level               | b012                  | (0.20 to 1.00) x Rated current                                                                                                                           | Rated current (A)            | (0.20 to 1.00) x Rated current                                    | Rated current (A)            |
| Overload limit level                   | b022/<br>b222         | (0.20 to 2.00) x Rated current (A) 0.4-55kW<br>(0.20 to 1.80) x Rated current (A) 75-132kW                                                               | 1.50 x Rated current (A)     | (0.20 to 1.50) x Rated current (A)                                | 1.20 x Rated current (A)     |
| Overload limit level 2                 | b025                  |                                                                                                                                                          |                              |                                                                   |                              |
| Carrier frequency                      | b083                  | 0.5 to 15.0 (kHz) 0.4-55kW<br>0.5 to 10.0 (kHz) 75-132kW                                                                                                 | 5.0 (kHz)<br>0.4-55 kW       | 0.5 to 10.0 (kHz) 0.4-55kW<br>0.5 to 8.0 (kHz) 75-132kW           | 3.0 (kHz)                    |
| Motor capacity selection               | H003/<br>H203         | 0.2 to 160 (kW)                                                                                                                                          | Depends on type              | 0.4 to 160 (kW)                                                   | One size up than HD          |

\* For the A344 parameter there are only two options available: 00 (VC) and 01 (VP).

## Momentary Power Interruption Non-stop Function

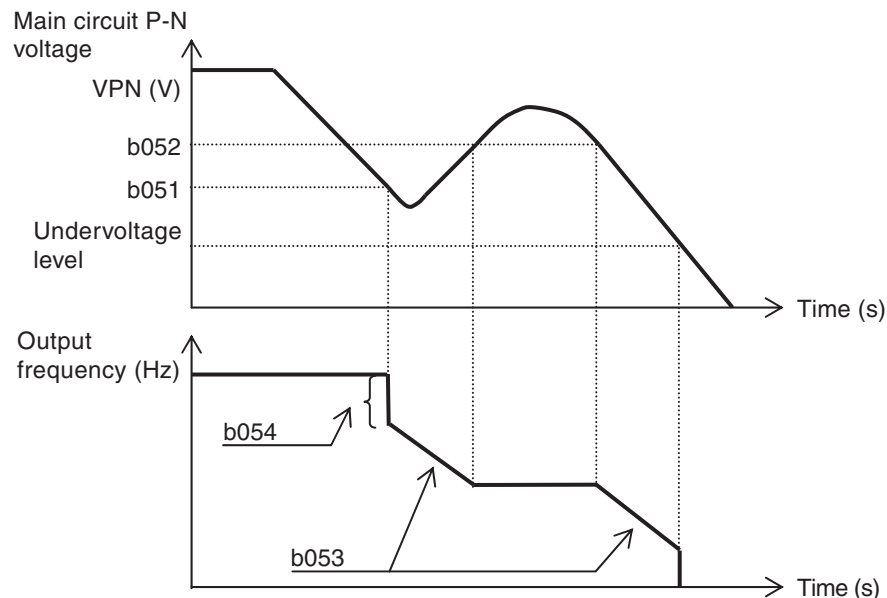
- After the power is shut off during operation, this function decelerates the Inverter to a stop while keeping the voltage below the overvoltage level.
- You can select from three modes in momentary power interruption non-stop selection b050.

| Parameter No. | Function name                                                                                              | Data                                                                                                                                                                           | Default setting | Unit |
|---------------|------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|------|
| b050          | Selection of non-stop function at momentary power interruption                                             | 00: OFF (Disabled)<br>01: V-Cnst (STOP) (Enabled (deceleration stop))<br>02: NS1 (Enabled (without recovery))* <sup>5</sup><br>03: NS2 (Enabled (with recovery))* <sup>5</sup> | 00              | —    |
| b051          | Starting voltage of non-stop function at momentary power interruption * <sup>4</sup>                       | 0.0 to 1000.0                                                                                                                                                                  | 220/440         | V    |
| b052          | Stop deceleration level of non-stop function at momentary power interruption * <sup>1</sup> * <sup>4</sup> | 0.0 to 1000.0                                                                                                                                                                  | 360/720         | V    |
| b053          | Deceleration time of non-stop function at momentary power interruption * <sup>3</sup>                      | 0.01 to 3600.00                                                                                                                                                                | 1.00            | s    |
| b054          | Deceleration starting width of non-stop function at momentary power interruption * <sup>3</sup>            | 0.00 to 10.00                                                                                                                                                                  | 0.00            | Hz   |
| b055          | Proportional gain setting of non-stop function at momentary power interruption                             | 0.00 to 2.55:<br>Proportional gain for DC voltage constant control<br>(b050 = 02, 03 only)                                                                                     | 0.20            | —    |
| b056          | Integral time setting of non-stop function at momentary power interruption                                 | 0.000 to 65.535:<br>Integral time for DC voltage constant control<br>(b050 = 02, 03 only)                                                                                      | 0.100           | s    |

## ■ Momentary Power Interruption Non-stop Deceleration Stop (b050 = 01)

- After the power is shut off during operation, this function decelerates the Inverter to a stop while keeping the voltage below the momentary power interruption non-stop deceleration level (b052).
- To use this function, remove the J51 connector cable connected between terminals Ro and To, and connect the cable from main terminal P to Ro, and from N to To. The cable size should be 0.75 mm<sup>2</sup> or larger.
- If the power is shut off during operation and the voltage falls below the momentary power interruption non-stop function starting voltage (b051), the frequency deceleration width decreases at the momentary power interruption non-stop deceleration starting width (b054), and then the Inverter decelerates for the momentary power interruption non-stop deceleration time (b053).
- If an overvoltage condition (momentary power interruption non-stop deceleration level b052 or higher) occurs because of regeneration during deceleration, the Inverter is kept in the LAD STOP status until the overvoltage condition is reset.

- \*1. When the momentary power interruption non-stop deceleration level (b052) < the momentary power interruption non-stop function starting voltage (b051), the Inverter performs this function by increasing the momentary power interruption non-stop deceleration level (b052) to the momentary power interruption non-stop function starting voltage (b051). (The set value will not be changed.)
- If b052 is lower than the incoming voltage or equivalent (DC voltage or equivalent after rectification [ $\text{incoming voltage} \times \sqrt{2}$ ]), the Inverter is brought into the LAD STOP status at power recovery during execution of this function, disabling deceleration. (The Inverter will accept neither a STOP command nor frequency reference change until operation is complete.) Make sure that the b052 setting is higher than the normal incoming voltage or equivalent.
- \*2. This function is not reset before the operation is complete and stopped. To run the Inverter after power recovery during this function, input the RUN command following the STOP command (RUN command OFF) after a stop condition.
- \*3. If the momentary power interruption non-stop deceleration starting width (b054) is too large, an overcurrent trip occurs because of rapid deceleration. If b054 is too small, or if the momentary power interruption non-stop deceleration time (b053) is too long, an undervoltage trip occurs because of insufficient regeneration power.



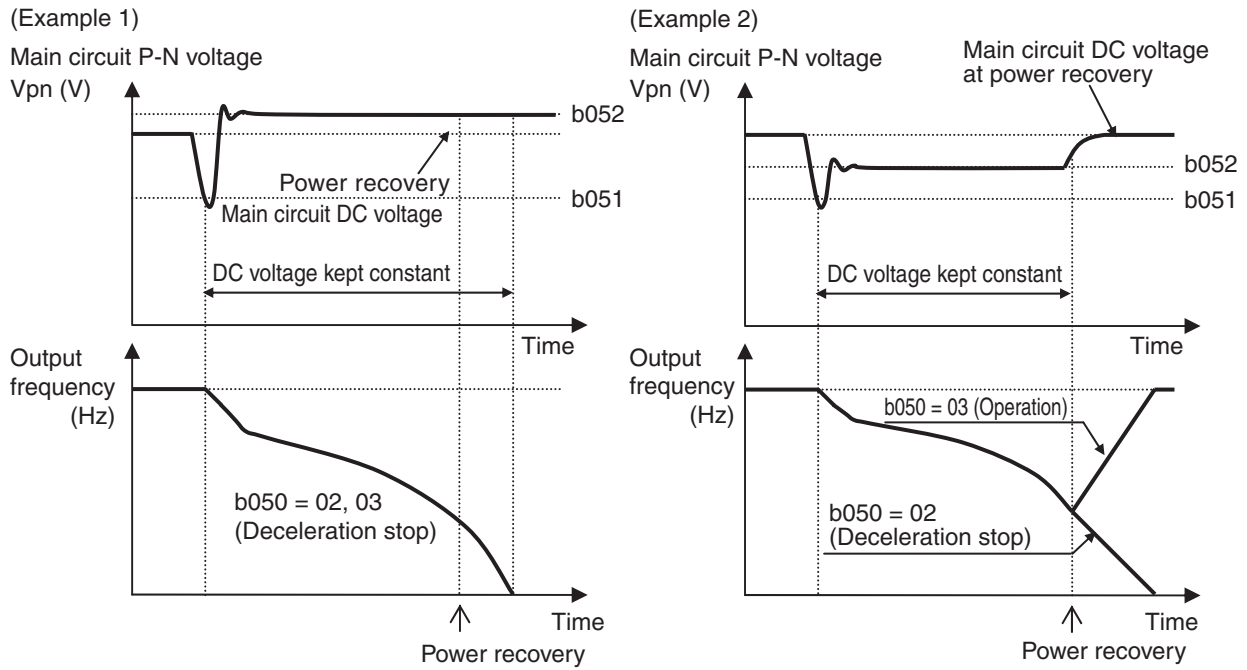
## ■ Momentary Power Interruption Non-stop DC Voltage Constant Control (b050 = 02: without recovery, b050 = 03: with recovery)

- If a momentary power interruption or main circuit DC voltage drop occurs during operation, the Inverter decelerates while keeping the main circuit DC voltage at the value set in momentary power interruption non-stop target voltage (OV-LADSTOP level) b052.
- This function is started when the following conditions are all satisfied:
  - b050 = "02" or "03"
  - The Inverter is running. (This function is disabled during trip/undervoltage/stop.)
  - The control power supply is momentarily interrupted, or the main circuit DC voltage falls below the momentary power interruption non-stop function starting voltage (b051)
- This function is enabled when the above starting conditions are satisfied, even if the J51 connector cable is disconnected from terminals Ro and To and is connected from main terminal P to Ro and from N and To, or even if the control power supply is separated from the main circuit power supply.
- If the time of momentary power interruption is short, the Inverter can continue to run without shutting off the output. However, if undervoltage occurs because of momentary power interruption, the Inverter immediately shuts off the output, and stops operating this function. The subsequent power recovery depends on the setting of retry selection b001.
- With b050 = 03, the Inverter can be restored to normal operation, if a momentary power interruption occurs and incoming voltage recovers before the output is shut off. Note that the Inverter may decelerate to a stop, depending on the b051 setting. Below are the details.

| b050                  | b051                                             | Operation                                                   |
|-----------------------|--------------------------------------------------|-------------------------------------------------------------|
| 02 (without recovery) | b052 > Main circuit DC voltage at power recovery | Deceleration stop (DC voltage constant control) (example 1) |
|                       | b052 < Main circuit DC voltage at power recovery | Deceleration stop (normal operation) (example 2)            |
| 03 (with recovery)    | b052 > Main circuit DC voltage at power recovery | Deceleration stop (DC voltage constant control) (example 1) |
|                       | b052 < Main circuit DC voltage at power recovery | Operation (normal operation) (example 2)                    |

- If operation of this function results in deceleration stop, the Inverter is forced to stop, even if the FW command is ON. To restart the Inverter, make sure that the incoming voltage has recovered, and input the FW command again.
- \*4. Make sure that the b051/b052 set values are larger than the undervoltage level (200-V class: 210 V, 400-V class: 410 V). If undervoltage occurs, this function is disabled. Make sure that b051 is smaller than b052. If the proportional gain setting (b055) is excessively increased when the difference between b051 and b052 is large, the Inverter may accelerate immediately after this function starts, resulting in overcurrent.
- \*5. When b050 = 02, 03, PI control works to keep the internal DC voltage constant.
- Though quicker response is expected with a larger proportional gain (b055), control tends to be divergent and may easily lead to a trip.
  - Response also becomes quicker with a shorter integral time (b056), but if too short, the same situation may occur.
  - If the proportional gain (b055) is too small, the voltage drops immediately after this function starts, resulting in an undervoltage trip.





Note: The main circuit DC voltage level, while the function is running, may fall below the b052 set value depending on the proportional gain and integral time settings.

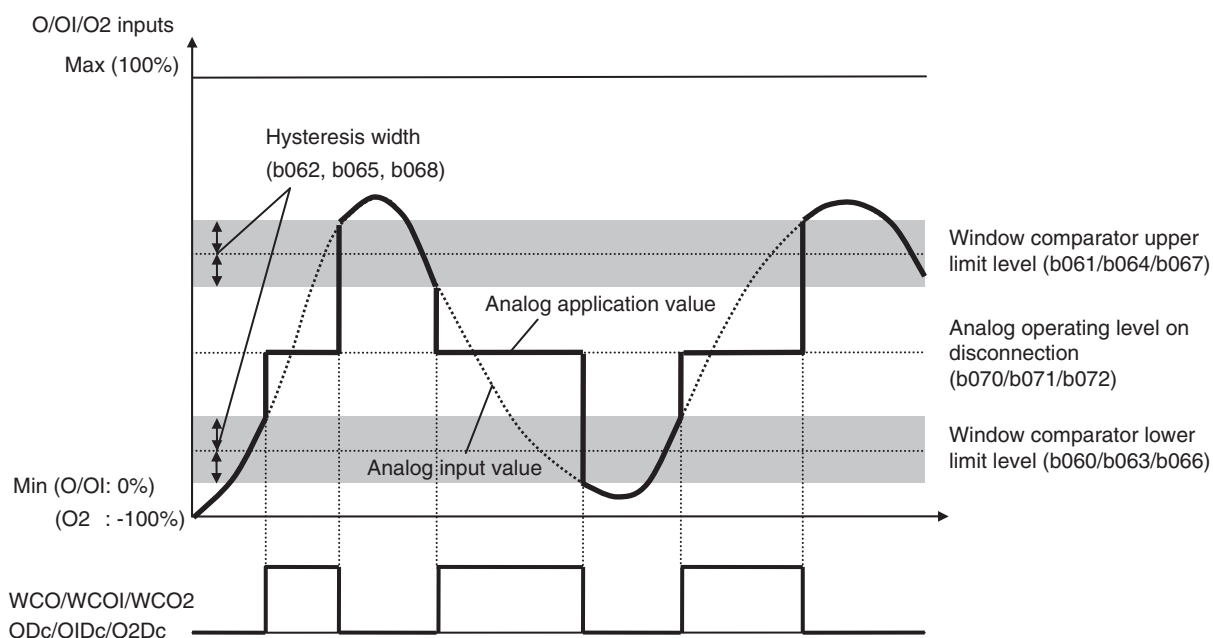
## Window Comparator (Disconnection Detection ODc/OIDc/O2Dc)

- The Inverter activates the window comparator output when the O/OI/O2 analog input value is within the upper and lower limit levels of the window comparator. This function allows you to monitor analog input based on the desired level (e.g. to detect a disconnection).

| Parameter No. | Function name                                      | Data                                                                                                                                       | Default setting | Unit |
|---------------|----------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|-----------------|------|
| C021 to C025  | Multi-function output terminals 11 to 15 selection | 27: ODc (analog O disconnection detection)<br>28: OIdc (analog OI disconnection detection)<br>29: O2Dc (analog O2 disconnection detection) | —               | —    |
| C026          | Relay output (AL2, AL1) function selection         | 54: WCO (window comparator O)<br>55: WCOI (window comparator OI)<br>56: WCO2 (window comparator O2)                                        | 05              | —    |
| b060 (O)      | Window comparator O/OI/O2 upper limit level        | Set an upper limit level.<br>Setting range: 0 to 100<br>Lower limit: Lower limit level + Hysteresis width × 2                              | 100             | %    |
| b063 (OI)     |                                                    |                                                                                                                                            |                 |      |
| b066 (O2)     |                                                    | Set an upper limit level.<br>Setting range: -100 to 100<br>Lower limit: Lower limit level + Hysteresis width × 2                           |                 |      |
| b061 (O)      | Window comparator O/OI/O2 lower limit level        | Set a lower limit level.<br>Setting range: 0 to 100<br>Upper limit: Upper limit level - Hysteresis width × 2                               | 0               | %    |
| b064 (OI)     |                                                    |                                                                                                                                            |                 |      |
| b067 (O2)     |                                                    | Set a lower limit level.<br>Setting range: -100 to 100<br>Upper limit: Upper limit level - Hysteresis width × 2                            |                 |      |

| Parameter No. | Function name                                      | Data                                                                                                                                               | Default setting | Unit |
|---------------|----------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|------|
| b062 (O)      | Window comparator<br>O/OI/O2 hysteresis width      | Set a hysteresis width for the upper and lower limit levels.<br>Setting range: 0 to 10<br>Upper limit: (Upper limit level - Lower limit level) × 2 | 0               | %    |
| b065 (OI)     |                                                    |                                                                                                                                                    |                 |      |
| b068 (O2)     |                                                    |                                                                                                                                                    |                 |      |
| b070 (O)      | Analog operation level at<br>O/OI/O2 disconnection | 0 to 100/no (ignored): Set an analog input application value used for WCO/WCOI/WCO2 (ODc/OIDc/O2Dc) output.                                        | no              | —    |
| b071 (OI)     |                                                    | -100 to 100/no (ignored): Set an analog input application value used for WCO/WCOI/WCO2 (ODc/OIDc/O2Dc) output.                                     |                 |      |
| b072 (O2)     |                                                    |                                                                                                                                                    |                 |      |

- You can set hysteresis widths for the window comparator upper and lower limit levels.
- You can set limit levels and a hysteresis width individually for O, OI, and O2 inputs.
- For the WCO/WCOI/WCO2 output, you can fix the analog input application value to the desired value. Set values in O/OI/O2 disconnection operation levels b070/b071/b072. If "no" is set, the analog input value is directly reflected.
- ODc/OIDc/O2Dc outputs are the same as WCO/WCOI/WCO2, respectively.

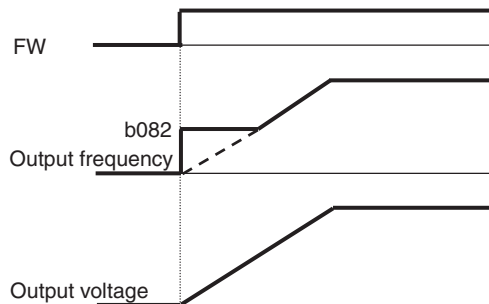


## Starting Frequency

- Set the frequency for starting Inverter output when the RUN signal is turned on.

| Parameter No. | Function name      | Data         | Default setting | Unit |
|---------------|--------------------|--------------|-----------------|------|
| b082          | Starting frequency | 0.10 to 9.99 | 0.50            | Hz   |

- Use mainly to adjust the starting torque.
- With starting frequency b082 set high, the starting current increases, possibly causing the current to exceed the overload limit and overcurrent protection to work to trip the Inverter.
- If "04" (OSLV: 0-Hz sensorless vector control) or "05" (V2: sensor vector control) is selected in control method selection A044, this function is disabled.



## Carrier Frequency

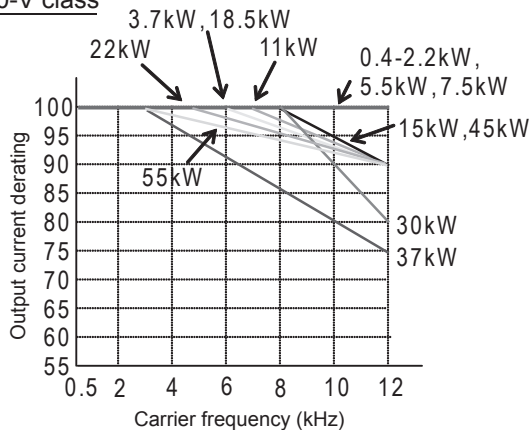
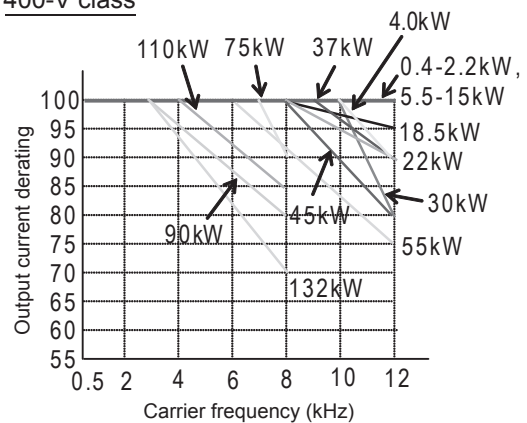
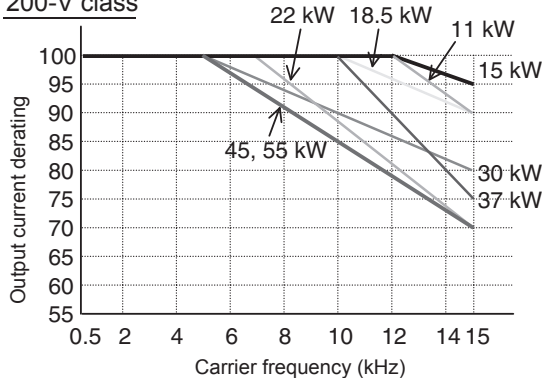
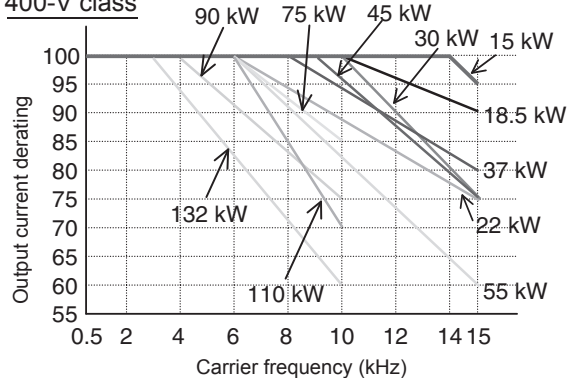
- You can change the PWM waveform carrier frequency output from the Inverter.

| Parameter No. | Function name     | Data (HD)                  | Data (ND)                  | Default setting | Unit |
|---------------|-------------------|----------------------------|----------------------------|-----------------|------|
| b083          | Carrier frequency | 0.5 to 15.0 (0.4 to 55 kW) | 0.5 to 12.0 (0.4 to 55 kW) | 5.0             | kHz  |
|               |                   | 0.5 to 10.0 (75 to 132 kW) | 0.5 to 8.0 (75 to 132 kW)  | 3.0             |      |

- With the carrier frequency set high, you can reduce metallic noise from the motor. However, this increases noise or leakage current from the Inverter.
- Helps avoid mechanical or motor resonance.
- The maximum carrier frequency varies depending on the capacity.  
To raise the carrier frequency (fc), derate the output current as shown in the following table.
- Set a derating output current value as electronic thermal level.  
(If the existing electronic thermal value is lower than the derating value, the above setting is not required.)
- To raise the carrier frequency, reduce the output current (or derate the rated current) as shown in the graph below.

| Voltage  | 200-V class   |                              |                              | 400-V class   |                                                      |                                                        |
|----------|---------------|------------------------------|------------------------------|---------------|------------------------------------------------------|--------------------------------------------------------|
| Capacity | Max. fc (kHz) | Derating at fc = 12 kHz (ND) | Derating at fc = 15 kHz (HD) | Max. fc (kHz) | Derating at fc = 12 kHz (8kHz for 75 to 132 kW) (ND) | Derating at fc = 15 kHz (10 kHz for 75 to 132 kW) (HD) |
| 0.4 kW   | 15            | 100%                         | 100%                         | 15            | 100%                                                 | 100%                                                   |
| 0.75 kW  | 15            | 100%                         | 100%                         | 15            | 100%                                                 | 100%                                                   |
| 1.5 kW   | 15            | 100%                         | 100%                         | 15            | 100%                                                 | 100%                                                   |
| 2.2 kW   | 15            | 100%                         | 100%                         | 15            | 100%                                                 | 100%                                                   |
| 3.7 kW   | 15            | 90%                          | 100%                         | 15            | 90%                                                  | 100%                                                   |
| 5.5 kW   | 15            | 100%                         | 100%                         | 15            | 100%                                                 | 100%                                                   |

| Voltage  | 200-V class   |                              |                              | 400-V class   |                                                      |                                                        |
|----------|---------------|------------------------------|------------------------------|---------------|------------------------------------------------------|--------------------------------------------------------|
| Capacity | Max. fc (kHz) | Derating at fc = 12 kHz (ND) | Derating at fc = 15 kHz (HD) | Max. fc (kHz) | Derating at fc = 12 kHz (8kHz for 75 to 132 kW) (ND) | Derating at fc = 15 kHz (10 kHz for 75 to 132 kW) (HD) |
| 7.5 kW   | 15            | 100%                         | 100%                         | 15            | 100%                                                 | 100%                                                   |
| 11 kW    | 12            | 90%                          | 90%                          | 15            | 100%                                                 | 100%                                                   |
| 15 kW    | 12            | 90%                          | 95%                          | 14            | 100%                                                 | 95%                                                    |
| 18.5 kW  | 10            | 90%                          | 90%                          | 10            | 95%                                                  | 90%                                                    |
| 22 kW    | 7             | 90%                          | 70%                          | 6             | 90%                                                  | 75%                                                    |
| 30 kW    | 5             | 80%                          | 80%                          | 10            | 80%                                                  | 75%                                                    |
| 37 kW    | 10            | 75%                          | 75%                          | 8             | 90%                                                  | 80%                                                    |
| 45 kW    | 5             | 90%                          | 70%                          | 9             | 80%                                                  | 75%                                                    |
| 55 kW    | 5             | 90%                          | 70%                          | 6             | 75%                                                  | 60%                                                    |
| 75 kW    | —             | —                            | —                            | 6             | 90%                                                  | 85%                                                    |
| 90 kW    | —             | —                            | —                            | 4             | 80%                                                  | 75%                                                    |
| 110 kW   | —             | —                            | —                            | 6             | 80%                                                  | 70%                                                    |
| 132 kW   | —             | —                            | —                            | 3             | 70%                                                  | 60%                                                    |

Normal duty200-V class400-V classHeavy duty200-V class400-V class

- If the above maximum rated carrier frequency and the derating value at 15 kHz are exceeded, the Inverter may be damaged and/or the service life may be shortened.

## Parameter Initialization

- You can initialize the rewritten set values and reset to the factory default.
- You can clear trip data.
- You cannot clear the P100 to P131 set values, RUN time, or power ON time.

| Parameter No. | Function name                      | Data                                                                                                                                                                                                                                                                         | Default setting | Unit |
|---------------|------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|------|
| b084          | Initialization selection           | 00: no (Clears the trip monitor)<br>01: Trip data (Initializes data)<br>02: Parameters (Clears the trip monitor and initializes data)<br>03: Trip+Param (Clears the trip monitor and parameters)<br>04: Trp+Prm+EzSQ (Clears the trip monitor, parameters and Drive program) | 00              | —    |
| b085          | Initialization parameter selection | 01<br>*Do not change.                                                                                                                                                                                                                                                        | 01              | —    |
| b180          | Initialize trigger                 | 00: No action<br>01: Initialize                                                                                                                                                                                                                                              | 00              | —    |

## STOP Key Selection

- When "control circuit terminal block" is selected for the RUN command, you can set whether the STOP/RESET key on the Digital Operator is used to activate the STOP command and trip reset operation.
- This setting is enabled when any item other than "02" (Digital Operator) is selected in RUN command selection A002. (Refer to "RUN Command Selection" (page 4-11).)  
If "02" (Digital Operator) is selected in A002, the STOP command and trip reset operation are enabled regardless of this setting.

| Parameter No. | Function name      | Data                                                                                 | Default setting | Unit |
|---------------|--------------------|--------------------------------------------------------------------------------------|-----------------|------|
| b087          | STOP key selection | 00: ON (Enabled)<br>01: OFF (Disabled)<br>02: Only RESET (Disabled only during stop) | 00              | —    |

| Data | STOP command via the STOP/RESET key on the Digital Operator | Trip reset operation via the STOP/RESET key on the Digital Operator |
|------|-------------------------------------------------------------|---------------------------------------------------------------------|
| 00   | Enabled                                                     | Enabled                                                             |
| 01   | Disabled                                                    | Disabled                                                            |
| 02   | Disabled                                                    | Enabled                                                             |

## Stop Selection

- You can set whether the Inverter decelerates to a stop for the set deceleration time or goes into free-run status, when the STOP command is input from the Digital Operator or the control circuit terminal block.

- If the RUN command is input again during free running, the Inverter restarts according to free-run stop selection b088. (Refer to "Free-run Stop Selection" (page 4-71).)

| Parameter No.     | Function name                                    | Data                                                                                                              | Default setting | Unit |
|-------------------|--------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|-----------------|------|
| b091              | Stop selection                                   | 00: Decel-Stop (Deceleration → Stop)<br>01: Free-RUN (Free-run stop)                                              | 00              | —    |
| b088              | Free-run stop selection                          | 00: 0-Hz start<br>01: f-match (Frequency matching start)<br>02: Actv. f-match (Active Frequency Matching restart) | 00              | —    |
| b003              | Retry wait time                                  | 0.3 to 100.0                                                                                                      | 1.0             | s    |
| b007              | Frequency matching lower limit frequency setting | 0.00 to 400.00                                                                                                    | 0.00            | Hz   |
| Related functions |                                                  | F003, F203, F303                                                                                                  |                 |      |

## Free-run Stop Selection

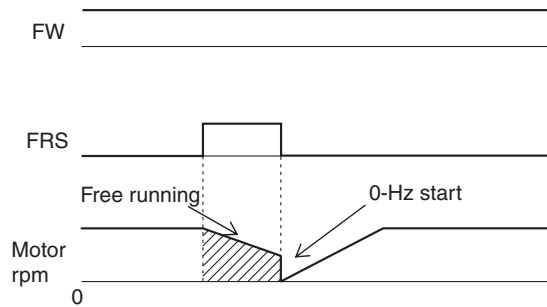
- Activating the free-run stop (FRS) function shuts off the Inverter output, letting the motor go into free-run status.

| Parameter No. | Function name                                           | Data                                                                                                                       | Default setting | Unit |
|---------------|---------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------|-----------------|------|
| b088          | Free-run stop selection                                 | 00: 0-Hz start<br>01: f-match (Frequency matching start)<br>02: Actv. f-match (Active Frequency Matching restart)          | 00              | —    |
| b003          | Retry wait time                                         | 0.3 to 100.0: Time before restart                                                                                          | 1.0             | s    |
| b007          | Frequency matching lower limit frequency setting        | 0.00 to 400.00:<br>Set a frequency matching level.                                                                         | 0.00            | Hz   |
| b028          | Active Frequency Matching restart level                 | 0.20 × Rated current to 2.00 × Rated current (0.4 to 55 kW)<br>0.20 × Rated current to 1.80 × Rated current (75 to 132 kW) | Rated current   | A    |
| b029          | Active Frequency Matching restart parameter             | 0.10 to 30.00                                                                                                              | 0.50            | s    |
| b030          | Starting frequency at Active Frequency Matching restart | 00: Off FQ (Frequency at interruption)<br>01: Max.FQ (Max. frequency)<br>02: Set FQ (Set frequency)                        | 00              | —    |

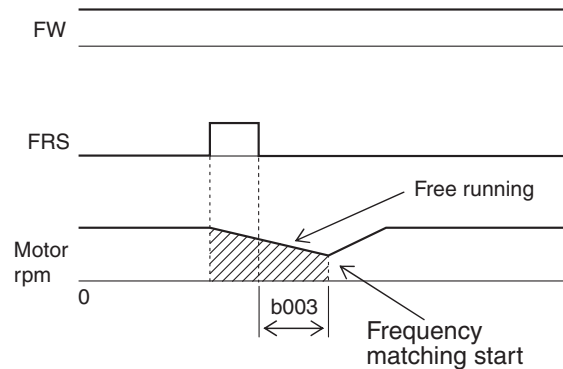
- Helps stop the motor using a mechanical brake such as an electromagnetic one.  
Note that an overcurrent trip may occur if the mechanical brake forces the motor to stop during Inverter output.
- Allocate 11 (FRS) to any of multi-function inputs 1 to 8 (C001 to C008).
- Performs a free-run stop (FRS) while the FRS terminal is turned on.  
When the FRS terminal is turned off, the motor restarts after the retry wait time (b003) elapses. However, if RUN command selection A002 is set to "02" (Digital Operator), the Inverter does not restart.  
To restart the Inverter, input the RUN command.
- You can select as the Inverter output mode for restart a 0-Hz start, frequency matching start or Active Frequency Matching restart at free-run stop selection b088. (Examples 1, 2, 3)
- If you set frequency matching lower limit frequency setting b007, the Inverter restarts at 0 Hz, when the Inverter detects a frequency equal to or lower than this setting during frequency matching start.

- The setting of this function is applied to the FRS terminal, and also to the status when the Inverter is reset from free running.

(Example 1) 0-Hz start

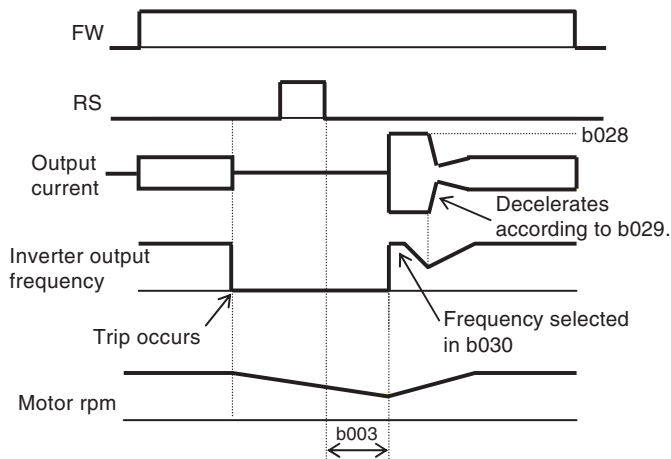


(Example 2): Frequency matching start



- The Inverter starts running at 0 Hz regardless of the motor rpm. The retry wait time is ignored at 0-Hz start.
- If the Inverter starts running at 0 Hz with the motor rpm high, an overcurrent trip may occur.
- When the FRS terminal is turned off and the retry wait time elapses, the motor frequency is matched and a Active Frequency Matching starts without stopping the motor. If an overcurrent trip occurs at frequency matching start, extend the retry wait time.
- Even if "frequency matching start" is selected, the Inverter may start at 0 Hz when:
  - The output frequency is equal to or lower than 1/2 of the base frequency
  - The motor induction voltage quickly attenuates
  - The Inverter detects a frequency equal to or lower than the frequency matching lower limit frequency setting (b007)

(Example 3) Active Frequency Matching restart



- After the retry wait time (b003) elapses, the Inverter starts output from the b030 set value. The Inverter then decelerates according to b029, while keeping the output current at the b028 set value.
- When the frequency matches the voltage, the Inverter accelerates again, and then output frequency is restored to the original level.
- If an overcurrent trip occurs under this method, reduce the b028 set value.

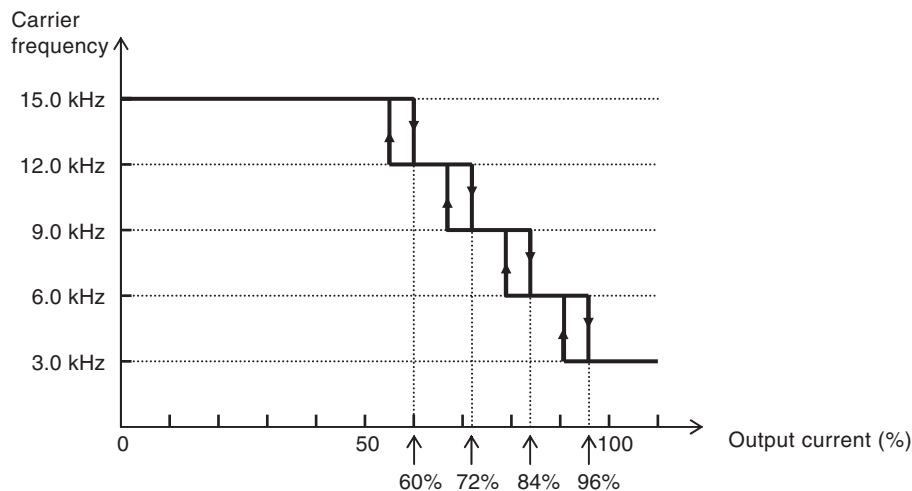
## Automatic Carrier Frequency Reduction Function

- This function automatically reduces carrier frequency according to an increase in output current.
- This function is enabled when automatic carrier frequency reduction selection b089 is set to "01".

| Parameter No. | Function name               | Data                                   | Default setting | Unit |
|---------------|-----------------------------|----------------------------------------|-----------------|------|
| b089          | Automatic carrier reduction | 00: OFF (Disabled)<br>01: ON (Enabled) | 00              | —    |

- When output current exceeds 60%, 72%, 84% and 96% of the rated current, the carrier frequency is reduced to 12, 9, 6, and 3 kHz, respectively.
- When the output current falls below -5% of each level, this function will be reset.

| Carrier frequency reduction starting level (Recovery level) | Reduced carrier frequency (kHz) |
|-------------------------------------------------------------|---------------------------------|
| Less than 60% of the rated current                          | 15.0                            |
| 60% (55%) of the rated current                              | 12.0                            |
| 72% (67%) of the rated current                              | 9.0                             |
| 84% (79%) of the rated current                              | 6.0                             |
| 96% (91%) of the rated current                              | 3.0                             |



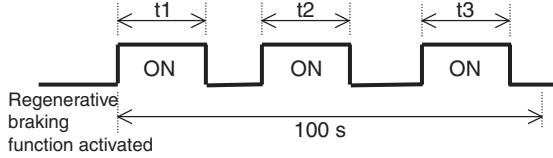
- The carrier frequency reduction rate is 2 kHz per second.
- The upper limit of carrier frequency variable with this function conforms to the set value of carrier frequency b083, and the lower limit is 3 kHz.

Note: When b083 is 3 kHz or lower, this function is disabled regardless of the b089 setting.



## Regenerative Braking Function

- This function applies to the Inverter models with a built-in regenerative braking circuit (3G3RX-A2220/A4220 or lower models).
- With the built-in regenerative braking circuit, this function allows an external braking resistor to consume the motor's regeneration energy as heat.  
This function is useful for a system in which the motor works as a generator when it is rapidly decelerated.
- To use this function, configure the following settings.

| Parameter No. | Function name                                     | Data                                                                                                                                                                                                                                                                                                                                                                                         | Default setting                                          | Unit |
|---------------|---------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------|------|
| b090          | Usage rate of regenerative braking function       | <p>0.0: Does not operate.<br/>0.0 to 100.0:<br/>A regenerative braking usage rate for 100 seconds can be set, in increments of 0.1%.<br/>If the set usage rate is exceeded, a braking resistor overload trip (E06) occurs.</p>  $\text{Usage rate (\%)} = \frac{(t1 + t2 + t3)}{100 \text{ s}} \times 100$ | 0.0                                                      | %    |
| b095          | Regenerative braking function operation selection | <p>00: OFF (Disabled)<br/>01: RUN-ON (Enabled (Disabled during stop))<br/>02: Alws-ON (Enabled (Enabled during stop))</p>                                                                                                                                                                                                                                                                    | 00                                                       | —    |
| b096          | Regenerative braking function ON level            | <p>200-V class: 330 to 380 *<br/>400-V class: 660 to 760 *<br/>(Inverter DC voltage)</p>                                                                                                                                                                                                                                                                                                     | <p>200-V class:<br/>360 V<br/>400-V class:<br/>720 V</p> | V    |

\* The regenerative braking function ON level conforms to the voltage setting for the Inverter's internal converter (DC unit).

## Cooling Fan Control

- You can set whether to operate the Inverter's cooling fan constantly or only during Inverter operation.

| Parameter No. | Function name       | Data                                                                                                                                                                                                | Default setting | Unit |
|---------------|---------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|------|
| b092          | Cooling fan control | <p>00: Alws-ON (Always ON)<br/>01: ON in RUN (ON during RUN)<br/>Regardless of the settings, the cooling fan operates for 5 minutes after power-on, and for 5 minutes after the Inverter stops.</p> | 01              | —    |

Note: If a momentary power interruption occurs or the power is shut off while the cooling fan is in operation, the cooling fan stops temporarily and restarts automatically after power recovery.

## External Thermistor (TH)

- This function enables thermal protection of the external equipment (e.g. motor) if its internal thermistor is connected to the Inverter.

| Parameter No. | Function name          | Data                                                                                                                       | Default setting | Unit     |
|---------------|------------------------|----------------------------------------------------------------------------------------------------------------------------|-----------------|----------|
| b098          | Thermistor selection   | 00: Disabled<br>01: PTC enabled<br>02: NTC enabled                                                                         | 00              | —        |
| b099          | Thermistor error level | 0 to 9999:<br>Set a temperature resistance value to trip the Inverter, according to the specifications of your thermistor. | 3000            | $\Omega$ |
| C085          | Thermistor adjustment  | 0.0 to 1000.0:<br>Used for gain adjustment.                                                                                | Factory default | —        |

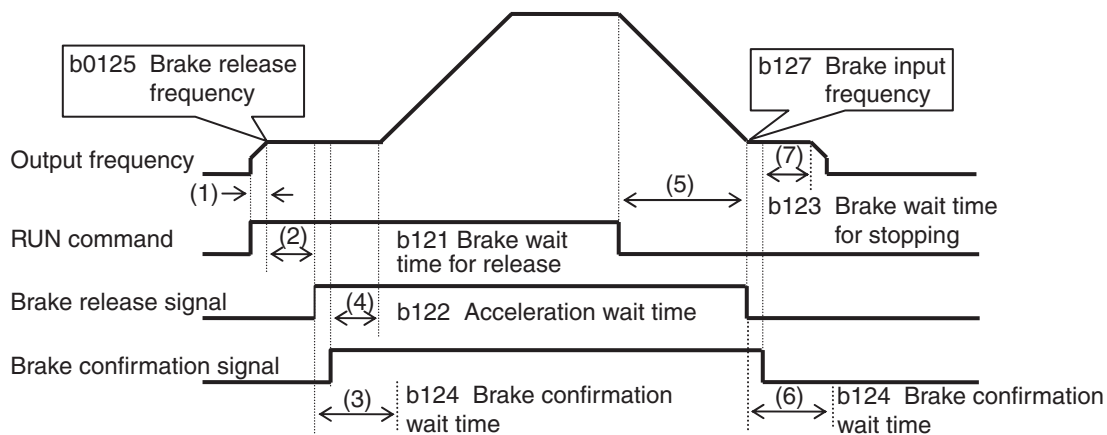
Note: If thermistor selection b098 is set to "01" without connecting an external thermistor, the Inverter trips.

- Connect an external thermistor between control terminals TH and CM1.
- Set the following functions according to the specifications of your thermistor.
- When this function is used, keep the cable length between the motor and Inverter within 20 m. Since the current flowing through the thermistor is weak, you must take measures to prevent noise due to motor current. (For example, place the thermistor cable away from the motor cable.)

## Brake Control Function

- This function allows the Inverter to control the external brake of equipment, including an elevating system. When brake control selection b120 is set to "01" (enabled), the Inverter operates as follows:

- (1) At RUN command input, the Inverter starts output, and accelerates to the release frequency.
- (2) After the release frequency is reached, the Inverter outputs the brake release signal (BRK) after the brake release establishment wait time (b121) elapses. However, if the Inverter's output current is less than the current value set in release current b126, the Inverter does not output the brake release signal. In this case, the Inverter trips, and outputs the brake error signal (BER).
- (3) If the brake confirmation signal (BOK) is allocated to a multi-function input (when "44" is set in any of C001 to C008), the Inverter waits for the brake confirmation signal for the period set in brake confirmation wait time b124 without accelerating, after the brake release signal is output. If the brake confirmation signal does not turn on within the period set in b124, the Inverter outputs the brake error signal (BER), resulting in trip. If the brake confirmation signal is not allocated to a multi-function input, brake confirmation wait time b124 is disabled, and the Inverter performs processing (4) after the brake release signal is output.
- (4) After the brake confirmation signal is input (or after the brake release signal is output if BOK is not selected), the Inverter restarts acceleration up to a set frequency after the period set in acceleration wait time b122 elapses.
- (5) After the RUN command is turned off, the Inverter decelerates to the brake release frequency (b125), and turns off the brake release signal (BRK).
- (6) If the brake confirmation signal (BOK) is allocated to a multi-function input (when "44" is set in any of C001 to C008), the Inverter waits for the brake confirmation signal to be turned off for the period set in brake confirmation wait time b124 without decelerating, after the brake release signal is turned off. If the brake confirmation signal is not turned off within the period set in b124, the Inverter outputs the brake error signal (BER), resulting in trip. If the brake confirmation signal is not allocated to a multi-function input, brake confirmation wait time b124 is disabled, and the Inverter performs processing (7) after the brake release signal is turned off.
- (7) After the brake confirmation signal is turned off (or after the brake release signal is turned off if BOK is not selected), the Inverter restarts deceleration down to 0 Hz after the period set in stop wait time b123 elapses.



Note: The above operation chart applies to a case where the brake confirmation signal (44: BOK) is selected for any of multi-function inputs 1 to 8 (C001 to C008). If BOK is not selected, the acceleration wait time (b122) starts at the brake release signal ON timing. The stop wait time (b123) starts at the brake release signal OFF timing.

- To use the brake control function, allocate the following functions to multi-function I/O terminals, as required.
  - To input a brake release signal from an external brake to the Inverter, allocate the brake confirmation signal (44: BOK) to any of multi-function inputs 1 to 8 (C001 to C008).

•Allocate the brake release signal (19: BRK) to any of multi-function output terminals 11 to 15 (C021 to C025). Also, to use a brake error output signal, allocate the brake error signal (20: BER).

•To use the brake control function, you are recommended to select "sensorless vector control" (A044 = 03), "0-Hz sensorless vector control" (A044 = 04), or "sensor vector control" (A044 = 05) so that the Inverter outputs high torque during startup. (Refer to page 4-21.)

### Parameters Required for Brake Control Function

| Parameter No.     | Function name                    | Data                                                                                                                                                                  | Default setting | Unit |
|-------------------|----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|------|
| b120              | Brake control selection          | 00: OFF (Disabled)<br>01: ON (Enabled)                                                                                                                                | 00              | —    |
| b121              | Brake wait time for release      | 0.00 to 5.00:<br>Set a time required for the output current to reach the rate of the release current after reaching the release frequency.                            | 0.00            | s    |
| b122              | Brake wait time for acceleration | 0.00 to 5.00:<br>Set a mechanical delay time from when the release signal is output until the brake is released.                                                      | 0.00            | s    |
| b123              | Brake wait time for stopping     | 0.00 to 5.00:<br>Set a mechanical delay time from when the release signal is turned off until the brake is closed.                                                    | 0.00            | s    |
| b124              | Brake wait time for confirmation | 0.00 to 5.00:<br>Set a wait time longer than the time from when the release signal is released until the brake outputs the release completion signal to the Inverter. | 0.00            | s    |
| b125              | Brake release frequency          | 0.00 to 400.00:<br>Set a frequency to output the brake release signal. *1                                                                                             | 0.00            | Hz   |
| b126              | Brake release current            | 0.0 to 2.00 x Rated current (0.4 to 55 kW)<br>0.0 to 1.80 x Rated current (75 to 132 kW)                                                                              | Rated current   | —    |
| b127              | Brake input frequency            | 0.00 to 400.00:<br>Set a frequency to close the brake during stop. *1                                                                                                 | 0.00            | Hz   |
| Related functions |                                  | C001 to C008, C021 to C025                                                                                                                                            |                 |      |

\*1. Set a brake release frequency higher than the starting frequency (b082).

\*2. If the set current is too low, sufficient torque may not be provided when the brake is released.

In any of the following cases, the Inverter trips and outputs the brake error signal (BER). (Brake error: E36)

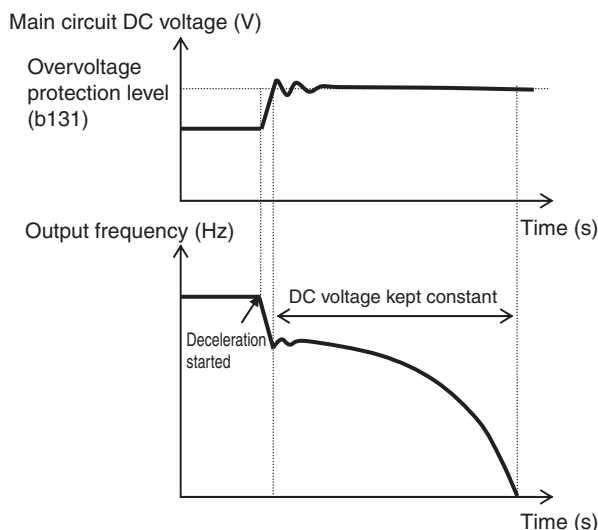
- The output current is lower than the release current after the brake release establishment wait time (b121) elapses.
- When the brake confirmation (BOK) signal is used, the brake confirmation signal does not turn on within the brake confirmation wait time (b124) during acceleration, or does not turn off within the brake confirmation wait time (b124) during deceleration; or the brake confirmation signal turns off, although the brake release signal is output.

## Overvoltage Protection Function During Deceleration

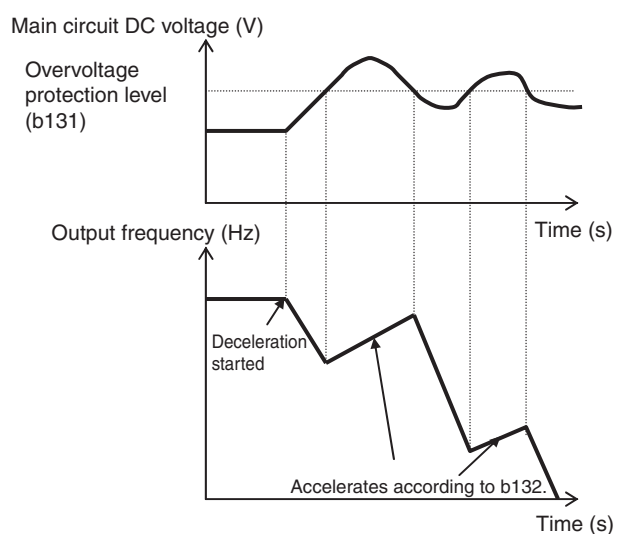
- This function helps avoid an overvoltage trip due to regenerative energy from the motor during deceleration.
- You can set whether to enable or disable this function with overvoltage protection function selection during deceleration b130.
- If overvoltage protection function selection b130 is set to "01" (enabled: DC voltage constant control), the Inverter automatically decelerates while keeping the main circuit DC voltage rise due to deceleration start at the overvoltage protection function level setting (b131).
- If overvoltage protection function selection b130 is set to "02" (enabled: with acceleration), the main circuit DC voltage increases because of deceleration start. When the main circuit DC voltage exceeds the overvoltage protection function level setting (b131), the Inverter starts acceleration according to the setting of overvoltage protection parameter b132. After that, when the main circuit DC voltage falls below the b131 level, the Inverter starts deceleration again.

| Parameter No. | Function name                                                 | Data                                                                                                                        | Default setting | Unit |
|---------------|---------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|-----------------|------|
| b130          | Overvoltage protection function selection during deceleration | 00: OFF (Disabled)<br>01: V-const (DC voltage kept constant) (example 1) *2<br>02: Accel (Acceleration enabled) (example 2) | 01              | —    |
| b131          | Overvoltage protection level during deceleration *1           | 200-V class: 330 to 390<br>400-V class: 660 to 780                                                                          | 380/760         | V    |
| b132          | Overvoltage protection parameter                              | 0.10 to 30.00:<br>Set the acceleration rate applied when this function is enabled.                                          | 1.00            | s    |
| b133          | Overvoltage protection proportional gain setting              | 0.00 to 2.55:<br>Proportional gain for DC voltage constant control (b130 = 01 only)                                         | 0.50            | —    |
| b134          | Overvoltage protection integral time setting                  | 0.000 to 65.535:<br>Integral time for DC voltage constant control (b130 = 01 only)                                          | 0.060           | s    |

(Example 1) When b130 = 01



(Example 2) When b130 = 02



Note 1: With this function enabled, the actual deceleration time may be longer than the set value.

Particularly with b130 = 02, if b131 is set too low, the Inverter may not decelerate.

Note 2: Even if this function is enabled, an overvoltage trip may occur depending on the deceleration rate and load condition.

Note 3: When using this function, the Inverter may reduce frequency depending on the moment of inertia of motor load, and takes a long time to stop.

- \*1. If the b131 set value is lower than the incoming voltage or equivalent, the motor may not be stopped.
- \*2. When b130 = 01, PI control works to keep the internal DC voltage constant.
  - Though quicker response is expected with a larger proportional gain (b133), control tends to be divergent and may easily lead to a trip.
  - Response also becomes quicker with a shorter integral time (b134), but if too short, the same situation may occur.

## <Group C: Multi-function Terminal Function>

The RX has eight input terminals [1], [2], [3], [4], [5], [6], [7], and [8]; five open collector output terminals [11], [12], [13], [14], and [15]; one relay output terminal [AL2] and [AL1] (SPDT contact); two analog output terminals [AM] and [AMI]; as well as one digital output terminal [FM].

### Multi-function Input Selection

- You can use the following functions by allocating them to any of multi-function inputs 1 to 8. To allocate the functions, set the following data in C001 to C008. For example, C001 corresponds to input terminal 1.
- The same two functions cannot be allocated to the multi-function input terminals. If you attempt to allocate the same two functions to the terminals by mistake, the terminal where you allocated the function last takes precedence. The previous data is set to "no (no allocation)", and the terminal function is disabled.
- After allocating functions to terminals 1 to 8, make sure that the function settings have been stored.

| Parameter No. | Data | Function name                           | Reference item                                       | Page |
|---------------|------|-----------------------------------------|------------------------------------------------------|------|
| C001 to C008  | 01   | RV : Reverse                            | RUN command                                          | —    |
|               | 02   | CF1 : Multi-step speed setting binary 1 | Multi-step speed operation function                  | 4-16 |
|               | 03   | CF2 : Multi-step speed setting binary 2 |                                                      |      |
|               | 04   | CF3 : Multi-step speed setting binary 3 |                                                      |      |
|               | 05   | CF4 : Multi-step speed setting binary 4 | Multi-step speed operation function                  | 4-16 |
|               | 06   | JG : Jogging                            | Jogging operation                                    | 4-18 |
|               | 07   | DB : External DC injection braking      | DC injection braking (external DC injection braking) | 4-24 |
|               | 08   | SET : 2nd control                       | 2nd/3rd control function                             | 4-82 |
|               | 09   | 2CH : 2-step acceleration/deceleration  | 2-step acceleration/deceleration function            | 4-37 |
|               | 11   | FRS : Free-run stop                     | Free-run stop                                        | 4-71 |
|               | 12   | EXT : External trip                     | External trip                                        | 4-84 |
|               | 13   | USP : USP function                      | Power recovery restart prevention function           | 4-84 |
|               | 14   | CS : Commercial switch                  | Commercial switch                                    | 4-85 |

| Parameter No. | Data | Function name                                        | Reference item                      | Page  |
|---------------|------|------------------------------------------------------|-------------------------------------|-------|
| C001 to C008  | 15   | SFT : Soft lock                                      | Soft lock                           | 4-51  |
|               | 16   | AT : Analog input switching                          | External analog input               | 4-12  |
|               | 17   | SET3 : 3rd control                                   | 2nd/3rd control function            | 4-82  |
|               | 18   | RS : Reset                                           | Reset                               | 4-87  |
|               | 20   | STA : 3-wire start                                   | 3-wire input function               | 4-88  |
|               | 21   | STP : 3-wire stop                                    |                                     |       |
|               | 22   | F/R : 3-wire forward/reverse                         |                                     |       |
|               | 23   | PID : PID enabled/disabled                           | PID function                        | 4-31  |
|               | 24   | PIDC : PID integral reset                            |                                     |       |
|               | 26   | CAS : Control gain switching                         | Control gain switching              | 4-89  |
|               | 27   | UP : UP/DWN function accelerated                     | UP/DOWN function                    | 4-90  |
|               | 28   | DWN : UP/DWN function decelerated                    |                                     |       |
|               | 29   | UDC : UP/DWN function data clear                     |                                     |       |
|               | 31   | OPE : Forced operator                                | Forced operator function            | 4-91  |
|               | 32   | SF1 : Multi-step speed setting bit 1                 | Multi-step speed operation function | 4-16  |
|               | 33   | SF2 : Multi-step speed setting bit 2                 |                                     |       |
|               | 34   | SF3 : Multi-step speed setting bit 3                 |                                     |       |
|               | 35   | SF4 : Multi-step speed setting bit 4                 |                                     |       |
|               | 36   | SF5 : Multi-step speed setting bit 5                 |                                     |       |
|               | 37   | SF6 : Multi-step speed setting bit 6                 |                                     |       |
|               | 38   | SF7 : Multi-step speed setting bit 7                 |                                     |       |
|               | 39   | OLR : Overload limit switching                       | Overload limit                      | 4-49  |
|               | 40   | TL : Torque limit enabled                            | Torque limit function               | 4-57  |
|               | 41   | TRQ1 : Torque limit switching 1                      |                                     |       |
|               | 42   | TRQ2 : Torque limit switching 2                      |                                     |       |
|               | 43   | PPI : P/PI switching                                 | P/PI switching function             | 4-92  |
|               | 44   | BOK : Brake confirmation                             | Brake control function              | 4-76  |
|               | 45   | ORT : Orientation                                    | Orientation function                | 4-134 |
|               | 46   | LAC : LAD cancel                                     | LAD cancel function                 | 4-9   |
|               | 47   | PCLR : Position deviation clear                      | V2 control mode selection           | 4-124 |
|               | 48   | STAT : Pulse train position command input permission |                                     |       |
|               | 50   | ADD : Frequency addition                             | Set frequency addition function     | 4-41  |
|               | 51   | F-TM : Forced terminal block                         | Forced terminal function            | 4-93  |
|               | 52   | ATR : Torque command input permission                | Torque control                      | 4-126 |
|               | 53   | KHC : Integrated power clear                         | Integrated power                    | 4-4   |
|               | 54   | SON : Servo ON                                       | Servo ON function                   | 4-143 |

| Parameter No. | Data | Function name                      | Reference item                  | Page  |
|---------------|------|------------------------------------|---------------------------------|-------|
| C001 to C008  | 55   | FOC : Preliminary excitation       | Preliminary excitation function | 4-119 |
|               | 56   | MI1 : Drive Programming input 1    | Drive Programming input 1 to 8  | —     |
|               | 57   | MI2 : Drive Programming input 2    |                                 |       |
|               | 58   | MI3 : Drive Programming input 3    |                                 |       |
|               | 59   | MI4 : Drive Programming input 4    |                                 |       |
|               | 60   | MI5 : Drive Programming input 5    |                                 |       |
|               | 61   | MI6 : Drive Programming input 6    |                                 |       |
|               | 62   | MI7 : Drive Programming input 7    |                                 |       |
|               | 63   | MI8 : Drive Programming input 8    |                                 |       |
|               | 65   | AHD : Analog command held          | Analog command held             | 4-93  |
|               | 66   | CP1 : Position command selection 1 | Absolute position control mode  | 4-139 |
|               | 67   | CP2 : Position command selection 2 |                                 |       |
|               | 68   | CP3 : Position command selection 3 |                                 |       |
|               | 69   | ORL : Zero return limit signal     |                                 | —     |
|               | 70   | ORG : Zero return startup signal   |                                 | 4-142 |
|               | 71   | FOT : Forward driving stop         |                                 |       |
|               | 72   | ROT : Reverse driving stop         |                                 | 4-140 |
|               | 73   | SPD : Speed/Position switching     |                                 |       |
|               | 74   | PCNT : Pulse counter               | Multi-function pulse counter    | 4-94  |
|               | 75   | PCC : Pulse counter clear          |                                 |       |
|               | 82   | PRG : Drive program start          | Drive program start             | —     |
|               | no   | NO : No allocation                 | —                               | —     |

• You can select NO- or NC-contact input for each multi-function input terminal.

| Parameter No.     | Function name                                   | Data                                                                                                                                                                                                                                 | Default setting | Unit |
|-------------------|-------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|------|
| C011 to C018      | Multi-function input 1 to 8 operation selection | 00: NO<br>01: NC<br>• You can set NO- and NC-contact inputs individually for multi-function input terminals 1 to 8 and the FW terminal.                                                                                              | 00              | —    |
| C019              | FW terminal operation selection                 | • NO contact: "ON" with the contact closed, "OFF" with the contact open.<br>• NC contact: "ON" with the contact open. "OFF" with the contact closed.<br>• A terminal with reset (RS) setting function only can be set as NO contact. | 00              | —    |
| Related functions |                                                 | C001 to C008                                                                                                                                                                                                                         |                 |      |



## 2nd/3rd Control Function

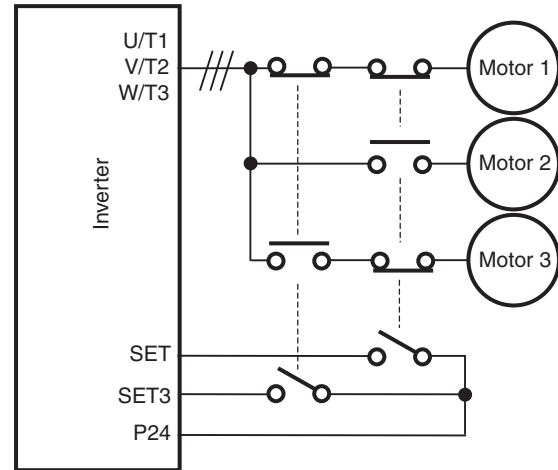
- You can switch between three motors to control the Inverter by allocating 08 (SET)/17 (SET3) to any of multi-function inputs 1 to 8 (C001 to C008) and then turning on/off the SET/SET3 terminal.

| Parameter No. | Function name                       | Data                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Default setting | Unit |
|---------------|-------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|------|
| C001          | Multi-function input 1 selection *1 | 01: RV (reverse)<br>02: CF1 (multi-step speed setting binary 1)<br>03: CF2 (multi-step speed setting binary 2)<br>04: CF3 (multi-step speed setting binary 3)<br>05: CF4 (multi-step speed setting binary 4)<br>06: JG (jogging)<br>07: DB (external DC injection braking)<br>08: SET (2nd control)                                                                                                                                                                                 | 01              | —    |
| C002          | Multi-function input 2 selection    | 09: 2CH (2-step acceleration/deceleration)<br>11: FRS (free-run stop)<br>12: EXT (external trip)<br>13: USP (USP function)<br>14: CS (commercial switch)<br>15: SFT (soft lock)<br>16: AT (analog input switching)<br>17: SET3 (3rd control)<br>18: RS (reset)                                                                                                                                                                                                                      | 12              |      |
| C003          | Multi-function input 3 selection *1 | 20: STA (3-wire start)<br>21: STP (3-wire stop)<br>22: F/R (3-wire forward/reverse)<br>23: PID (PID enabled/disabled)<br>24: PIDC (PID integral reset)<br>26: CAS (control gain switching)<br>27: UP (UP/DWN function accelerated)<br>28: DWN (UP/DWN function decelerated)<br>29: UDC (UP/DWN function data clear)<br>31: OPE (forced operator)                                                                                                                                    | 18              |      |
| C004          | Multi-function input 4 selection    | 32: SF1 (multi-step speed setting bit 1)<br>33: SF2 (multi-step speed setting bit 2)<br>34: SF3 (multi-step speed setting bit 3)<br>35: SF4 (multi-step speed setting bit 4)<br>36: SF5 (multi-step speed setting bit 5)<br>37: SF6 (multi-step speed setting bit 6)<br>38: SF7 (multi-step speed setting bit 7)<br>39: OLR (overload limit switching)                                                                                                                              | 02              |      |
| C005          | Multi-function input 5 selection    | 40: TL (torque limit enabled)<br>41: TRQ1 (torque limit switching 1)<br>42: TRQ2 (torque limit switching 2)<br>43: PPI (P/PI switching)<br>44: BOK (brake confirmation)<br>45: ORT (orientation)<br>46: LAC (LAD cancel)<br>47: PCLR (position deviation clear)<br>48: STAT (pulse train position command input permission)                                                                                                                                                         | 03              |      |
| C006          | Multi-function input 6 selection    | 50: ADD (frequency addition)<br>51: F-TM (forced terminal)<br>52: ATR (torque command input permission)<br>53: KHC (integrated power clear)<br>54: SON (servo ON)<br>55: FOC (preliminary excitation)                                                                                                                                                                                                                                                                               | 06              |      |
| C007          | Multi-function input 7 selection    | 56: MI1 (drive programming input 1)<br>57: MI2 (drive programming input 2)<br>58: MI3 (drive programming input 3)<br>59: MI4 (drive programming input 4)<br>60: MI5 (drive programming input 5)<br>61: MI6 (drive programming input 6)<br>62: MI7 (drive programming input 7)<br>63: MI8 (drive programming input 8)<br>65: AHD (analog command held)<br>66: CP1 (position command selection 1)<br>67: CP2 (position command selection 2)<br>68: CP3 (position command selection 3) | 08              |      |
| C008          | Multi-function input 8 selection    | 69: ORL (zero return limit signal)<br>70: ORG (zero return startup signal)<br>71: FOT (forward driving stop)<br>72: ROT (reverse driving stop)<br>73: SPD (speed/position switching)<br>74: PCNT (pulse counter)<br>75: PCC (pulse counter clear)<br>82: PRG (drive program start)<br>no: NO (no allocation)                                                                                                                                                                        | no              |      |

\*1. When the emergency shutoff function is enabled (SW1 = ON), C001 and C003 are forced to change to "18" (RS) and "64" (EMR), respectively. (You cannot intentionally set "64".)  
If SW1 is turned on and then off, C003 is set to "no" (no allocation).

The functions switchable via the SET/SET3 terminal are:

|                  |               |                                    |
|------------------|---------------|------------------------------------|
| F002/F202/F302 * | : 1st/2nd/3rd | acceleration time                  |
| F003/F203/F303 * | : 1st/2nd/3rd | deceleration time                  |
| A003/A203/A303   | : 1st/2nd/3rd | base frequency                     |
| A004/A204/A304   | : 1st/2nd/3rd | maximum frequency                  |
| A020/A220/A320 * | : 1st/2nd/3rd | multi-step speed reference 0       |
| A041/A241        | : 1st/2nd     | torque boost selection             |
| A042/A242/A342 * | : 1st/2nd/3rd | manual torque boost voltage        |
| A043/A243/A343 * | : 1st/2nd/3rd | manual torque boost frequency      |
| A044/A244/A344   | : 1st/2nd/3rd | V/f characteristics selection      |
| A046/A246 *      | : 1st/2nd     | automatic torque boost             |
|                  |               | voltage compensation gain          |
| A047/A247 *      | : 1st/2nd     | automatic torque boost slip        |
|                  |               | compensation gain                  |
| A061/A261 *      | : 1st/2nd     | frequency upper limit              |
| A062/A262 *      | : 1st/2nd     | frequency lower limit              |
| A092/A292/A392 * | : 1st/2nd/3rd | acceleration time 2                |
| A093/A293/A393 * | : 1st/2nd/3rd | deceleration time 2                |
| A094/A294        | : 1st/2nd     | 2-step acceleration/deceleration   |
|                  |               | selection                          |
| A095/A295        | : 1st/2nd     | 2-step acceleration frequency      |
| A096/A296        | : 1st/2nd     | 2-step deceleration frequency      |
| b012/b212/b312 * | : 1st/2nd/3rd | electronic thermal level           |
| b013/b213/b313 * | : 1st/2nd/3rd | electronic thermal characteristics |
|                  |               | selection                          |
| H002/H202        | : 1st/2nd     | motor parameter selection          |
| H003/H203        | : 1st/2nd     | motor capacity selection           |
| H004/H204        | : 1st/2nd     | motor pole number selection        |
| H005/H205 *      | : 1st/2nd     | speed response                     |
| H006/H206/H306 * | : 1st/2nd/3rd | stabilization parameter            |
| H020/H220        | : 1st/2nd     | motor parameter R1                 |
| H021/H221        | : 1st/2nd     | motor parameter R2                 |
| H022/H222        | : 1st/2nd     | motor parameter L                  |
| H023/H223        | : 1st/2nd     | motor parameter I0                 |
| H024/H224        | : 1st/2nd     | motor parameter J                  |
| H030/H230        | : 1st/2nd     | motor parameter R1 (auto-tuning)   |
| H031/H231        | : 1st/2nd     | motor parameter R2 (auto-tuning)   |
| H032/H232        | : 1st/2nd     | motor parameter L (auto-tuning)    |
| H033/H233        | : 1st/2nd     | motor parameter I0 (auto-tuning)   |
| H034/H234        | : 1st/2nd     | motor parameter J (auto-tuning)    |
| H050/H250 *      | : 1st/2nd     | PI proportional gain               |
| H051/H251 *      | : 1st/2nd     | PI integral gain                   |
| H052/H252 *      | : 1st/2nd     | P proportional gain                |
| H060/H260 *      | : 1st/2nd     | Limit at 0 Hz                      |



\*: Parameters changeable during operation.

- The 1st/2nd/3rd control functions are displayed identically. You'll see which one is enabled by checking whether the terminal is turned on/off.
- When both SET and SET3 terminals are turned on, priority is given to SET, and the 2nd control function is enabled.
- During operation, you cannot switch between the 1st, 2nd, and 3rd control functions. You can switch them only during stop.

## External Trip

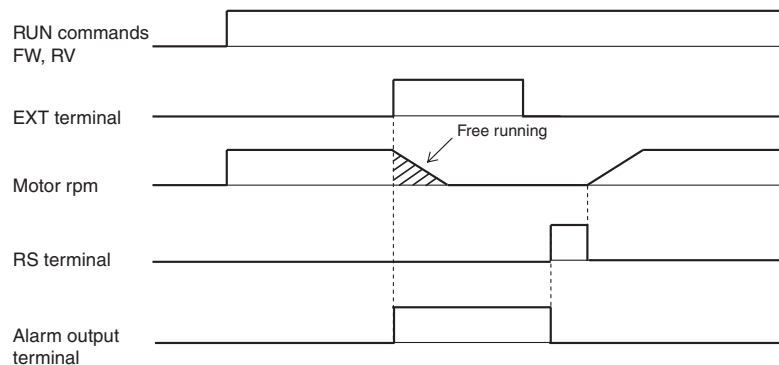
- This function trips the Inverter via an error (trip) signal from a peripheral system. To use this function, allocate "12" (EXT) to any of multi-function inputs 1 to 8 (C001 to C008).

| Data                      | Symbol | Function name | Status | Description                                               |
|---------------------------|--------|---------------|--------|-----------------------------------------------------------|
| 12                        | EXT    | External trip | ON     | Sets the motor to free-run status by shutting off output. |
|                           |        |               | OFF    | The motor is in normal operation.                         |
| Available input terminals |        | C001 to C008  |        |                                                           |

Note: Do not turn on the EXT terminal after shutting off the power. Otherwise, the Inverter may not store data correctly.

- When the EXT terminal is turned on, E12 is displayed and the Inverter trips to stop output.
- When the Inverter has tripped, indicating E12, the trip is not reset even if the error signal from external equipment is reset (EXT terminal is turned off).  
To reset the trip, perform the reset operation or turn the power off and on again.

## Power Recovery Restart Prevention Function

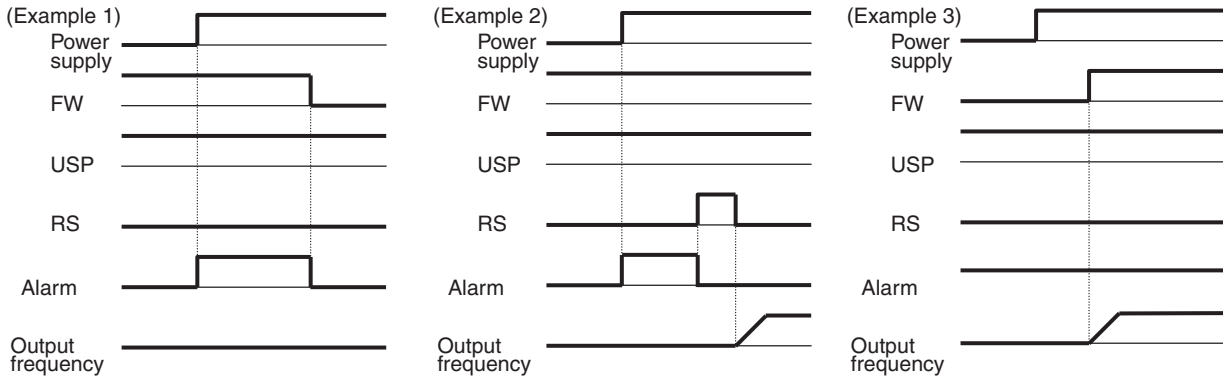


- This function trips the Inverter, displaying "E13", if the power is turned on with the RUN command to the Inverter turned on.

| Data                      | Symbol | Function name | Status | Description                                                                          |
|---------------------------|--------|---------------|--------|--------------------------------------------------------------------------------------|
| 13                        | USP    | USP function  | ON     | Does not start the Inverter with the power turned on while the RUN command is input. |
|                           |        |               | OFF    | Starts the Inverter with the power turned on while the RUN command is input.         |
| Available input terminals |        | C001 to C008  |        |                                                                                      |

- To reset a trip, perform the reset operation, or turn off the RUN command. (Example 1)
- If a trip is reset with the RUN command input turned on, the Inverter restarts operation immediately after the trip is reset. (Example 2)
- If the RUN command is turned on after the power is turned on, the Inverter operates normally. (Example 3)
- Allocate 13 (USP) to any of multi-function inputs 1 to 8 (C001 to C008).

•The following shows how the power recovery restart prevention function works.

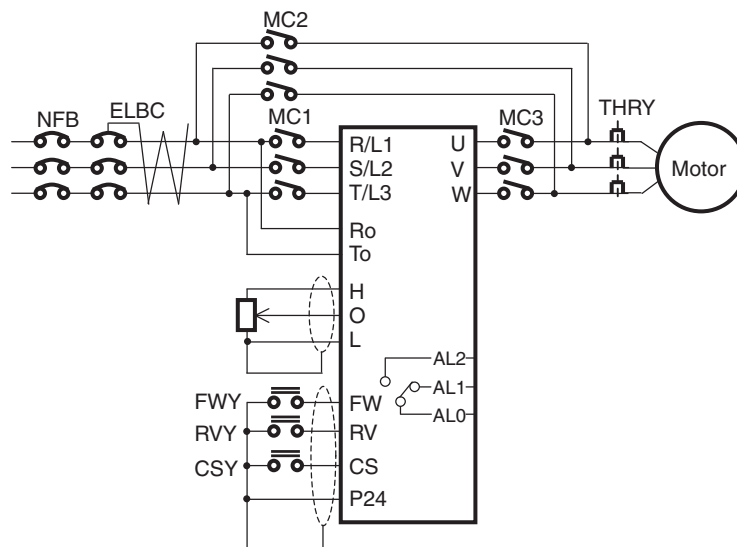


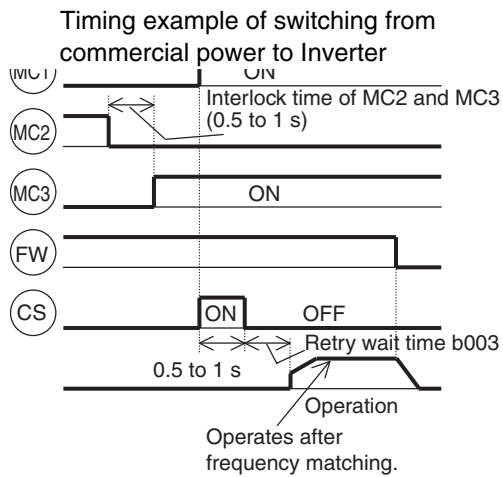
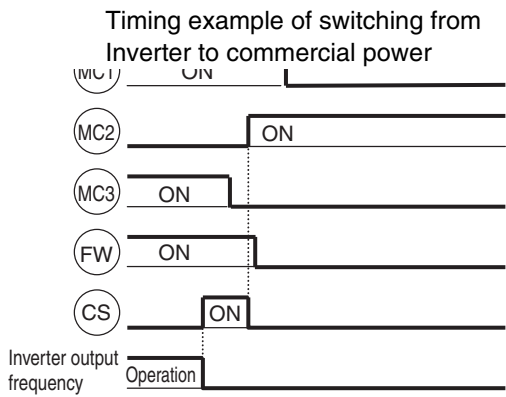
4

## Commercial Switching

- You can use this function to drive a system with large moment of inertia during acceleration and deceleration by using the Inverter, and during constant speed by using a commercial power supply.
- Allocate "14" (CS) to any of multi-function inputs 1 to 8 (C001 to C008).
- When the CS terminal is turned on and then off with the RUN command turned on, the Inverter starts acceleration in synchronization with the motor rpm during free running, after the retry wait time (b003) elapses (frequency matching start). Note that the Inverter may start at 0 Hz if:
  - The motor rpm is equal to or lower than 1/2 of the base rpm
  - The motor induction voltage quickly attenuates
- If frequency matching lower limit frequency setting b007 is set, the Inverter starts at 0 Hz when the motor rpm lowers to the frequency set in b007. (Refer to page 4-38)
- Ensure that MC3 and MC2 are mechanically interlocked.
- If the earth leakage breaker (ELB) has tripped because of ground fault, the commercial power supply circuit does not work, either. If you need backup, supply power from a commercial power supply circuit (ELBC).
- For FWY, RVY, and CSY, use low current relays. Refer to the following sequence for timing.
- If an overcurrent trip occurs at frequency matching, extend the retry wait time (b003).
- For commercial switching operation, refer to the following examples of connections and timing of commercial switching operation.
- At power-on, the Inverter can automatically perform retry operation. This does not require the following CS terminal. For details, refer to "Reset" (page 4-87).

Examples of connections and timing of commercial switching operation





## Reset

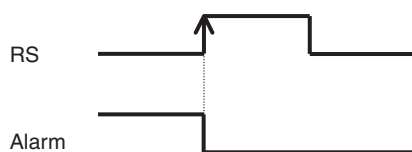
- This function resets an Inverter trip.

| Parameter No. | Function name                                          | Data                                                                                                                                                            | Default setting | Unit |
|---------------|--------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|------|
| b003          | Retry wait time                                        | 0.3 to 100.0:<br>(Refer to "Momentary Power Interruption/<br>Trip Retry (Restart)" (page 4-42).)<br>Time from reset to restart                                  | 1.0             | s    |
| b007          | Frequency matching<br>lower limit frequency<br>setting | 0.00 to 400.00:<br>(Refer to "Momentary Power Interruption/<br>Trip Retry (Restart)" (page 4-42).)                                                              | 0.00            | Hz   |
| C102          | Reset selection                                        | 00: ON-RESET (Trip reset at power-on)<br>(example 1)<br>Normal: Output shut off<br>Abnormal: Trip reset                                                         | 00              | —    |
|               |                                                        | 01: OFF-RESET (Trip reset when the<br>power is OFF (example 2)<br>Normal: Output shut off<br>Abnormal: Trip reset                                               |                 |      |
|               |                                                        | 02: On in Trip (Enabled only during trip<br>(Reset when the power is OFF))<br>(example 1)<br>Normal: Disabled<br>Abnormal: Trip reset                           |                 |      |
|               |                                                        | 03: Trip RESET (Trip reset only)<br>(example 1)<br>The Inverter does not initialize internal<br>data at trip reset.<br>Normal: Disabled<br>Abnormal: Trip reset |                 |      |
| C103          | Reset frequency<br>matching selection                  | 00: 0 Hz start<br>01: f-match (Frequency matching start)<br>(example 3)<br>02: Actv. f-match (Active Frequency<br>Matching restart)                             | 00              | —    |

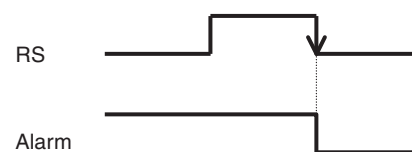
- To reset an Inverter trip, press the STOP/RESET key on the Digital Operator, or switch the RS terminal from ON to OFF.
- To reset via the control circuit terminal block, allocate 18 (RS) to the desired multi-function input.
- With reset frequency matching selection C103, you can select how to restart the Inverter after reset, a frequency matching or 0-Hz start. If an overcurrent trip occurs at frequency matching start, increase the retry wait time (b003).
- You can select an alarm reset timing in reset selection C102. In addition, you can enable the reset signal only for alarm resetting during error.
- For the RS terminal, only NO contact is available.

Note: Do not use the reset terminal to shut off the Inverter output. Reset operation clears the internal data (e.g. electronic thermal BRD counter), causing damage to the Inverter.

(Example 1)

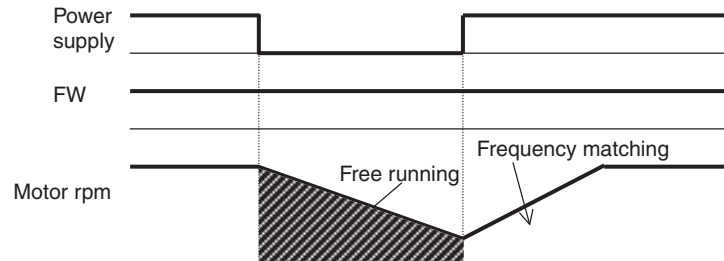


(Example 2)



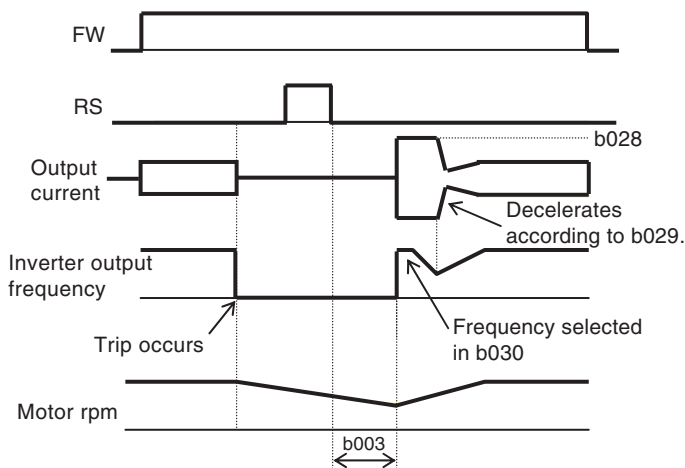
(Example 3) If "01" (frequency matching start) is selected in reset frequency matching selection C103, frequency matching start is also enabled when the power is turned on again. When C103 = 00 (0-Hz start), the retry wait time (b003) is ignored. Even if "frequency matching start" is selected, however, the Inverter may start at 0 Hz if:

- The output frequency is equal to or lower than 1/2 of the base frequency
- The motor induction voltage quickly attenuates



Note: The counters used for the Inverter's internal protection are cleared during reset.  
To shut off the Inverter's output via a multi-function input terminal, use the free-run stop terminal (FRS).

(Example 4) Active Frequency Matching restart



- After the retry wait time (b003) elapses, the Inverter starts output from the b030 set value. The Inverter then decelerates according to the b029 setting, while keeping the output current at the b028 set value.
- When the frequency matches the voltage, the Inverter accelerates again, and the frequency is restored to the original level.
- If an overcurrent trip occurs under this method, reduce the b028 setting.

Note: If a reset signal is input during the retry wait time, the value of "frequency at interruption" stored in the Inverter is cleared, resulting in a 0-Hz start.

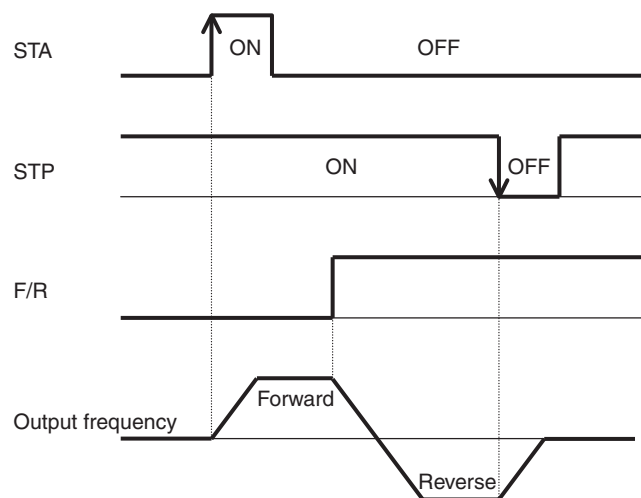
## 3-wire Input Function

- This function helps start and stop the Inverter using an auto-recovery contact (e.g. pushbutton switch).

| Data                      | Symbol | Function name          | Status | Description                         |
|---------------------------|--------|------------------------|--------|-------------------------------------|
| 20                        | STA    | 3-wire start           | ON     | Starts with auto recovery contacts. |
|                           |        |                        | OFF    | Irrelevant to the motor operation.  |
| 21                        | STP    | 3-wire stop            | ON     | Stops with auto recovery contacts.  |
|                           |        |                        | OFF    | Irrelevant to the motor operation.  |
| 22                        | F/R    | 3-wire forward/reverse | ON     | Reverse                             |
|                           |        |                        | OFF:   | Forward                             |
| Available input terminals |        | C001 to C008           |        |                                     |
| Required settings         |        | A002 = 01              |        |                                     |

- Set RUN command selection A002 to 01 (control circuit terminal block).

- The following operations become possible when 20 (STA), 21 (STP), and 22 (F/R) are allocated to any of multi-function inputs 1 to 8 (C001 to C008). Allocating the STP terminal disables the FW and RV terminals.
- Below are the outputs via terminal operation.



## Control Gain Switching Function

- This function provides two types of gain and time constant settings for the speed control system (proportional/integral compensation). You can switch over these settings when "sensorless vector control", "0-Hz sensorless vector control", or "sensor vector control" is selected as the control method.

| Parameter No. | Function name                          | Data                                                                                                               | Default setting | Unit |
|---------------|----------------------------------------|--------------------------------------------------------------------------------------------------------------------|-----------------|------|
| A044/A244     | V/f characteristics selection          | 03: SLV (Sensorless vector control)<br>04: 0SLV (0-Hz sensorless vector control)<br>05: V2 (Sensor vector control) | 00              | —    |
| C001 to C008  | Multi-function inputs 1 to 8 selection | 26: CAS (control gain switching)                                                                                   | —               | —    |
| H005/H205     | Speed response                         | 0.001 to 80.000                                                                                                    | 1.590           | —    |
| H050/H250     | PI proportional gain                   | 0.0 to 1000.0                                                                                                      | 100.0           | %    |
| H051/H251     | PI integral gain                       | 0.0 to 1000.0                                                                                                      | 100.0           | %    |
| H052/H252     | P proportional gain                    | 0.01 to 10.00                                                                                                      | 1.00            | —    |
| H070          | For PI proportional gain switching     | 0.0 to 1000.0                                                                                                      | 100.0           | %    |
| H071          | For PI integral gain switching         | 0.0 to 1000.0                                                                                                      | 100.0           | %    |
| H072          | For P proportional gain switching      | 0.00 to 10.00                                                                                                      | 1.00            | —    |
| H073          | Gain switching time                    | 0 to 9999 (ms):<br>Taper time during gain switching                                                                | 100             | ms   |

- If control gain switching is selected in the multi-function input selection, turning off the signal selects the gain setting of H050, H250, H051, H251, H052, or H252. Turning on the signal selects the gain setting of H070, H071, or H072.
- If control gain switching is not selected in multi-function inputs 1 to 8 (C001 to C008), the gain setting conforms to the status in which the signal is turned off.



## UP/DOWN Function

- This function allows you to change the Inverter output frequency using the UP and DWN terminals of the multi-function inputs.

| Data                      | Symbol | Function name               | Status | Description                                                 |
|---------------------------|--------|-----------------------------|--------|-------------------------------------------------------------|
| 27                        | UP     | UP/DWN function accelerated | ON     | Increases the current speed during the signal input period. |
|                           |        |                             | OFF    | Keeps the current speed.                                    |
| 28                        | DWN    | UP/DWN function decelerated | ON     | Decreases the current speed during the signal input period. |
|                           |        |                             | OFF    | Keeps the current speed.                                    |
| 29                        | UDC    | UP/DWN function data clear  | ON     | Clears the stored UP/DWN speed.                             |
|                           |        |                             | OFF    | Keeps the stored UP/DWN speed.                              |
| Available input terminals |        | C001 to C008                |        |                                                             |

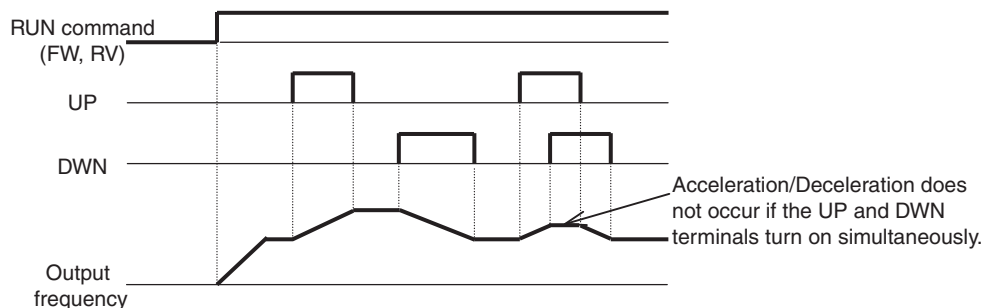
Note: Do not turn on/off the UP/DWN terminal after shutting off the power. Otherwise, the Inverter may not store data correctly.

- Allocate "27" (UP) and "28" (DWN) to any of multi-function inputs 1 to 8 (C001 to C008).
- This function is enabled only when frequency reference selection A001 is set to "01" or "02". If "01" (terminal) is selected, however, this function is enabled for multi-step speed operation only.
- When you use an external analog input as frequency reference input, or when you set the jogging operation frequency, this function is disabled.
- While the UP/DWN terminal is turned on, the acceleration/deceleration time depends on F002, F003/F202, F203/F302, and F303. To switch between the 1st/2nd/3rd controls, allocate 08 (SET)/17 (SET3) to the desired multi-function input and then turn on/off the SET terminal.
- You can store a frequency set value after UP/DWN adjustment. Choose whether to store the value with C101.

Also, you can clear the stored frequency set value.

By allocating "29" (UDC) to a multi-function input and turning on/off the UDC terminal, you can clear or store the frequency reference setting adjusted at UP/DOWN.

| Parameter No. | Data | Description                                                                                                                              |
|---------------|------|------------------------------------------------------------------------------------------------------------------------------------------|
| C101          | 00   | Does not store the frequency reference adjusted at UP/DWN. After restoring the power, returns to the value set before UP/DWN adjustment. |
|               | 01   | Stores the frequency reference adjusted at UP/DWN. After restoring the power, maintains the set value after UP/DWN adjustment.           |



## Forced Operator Function

- This function forcibly enables operation via the Digital Operator by turning on/off the multi-function terminal if the frequency reference/RUN command sources are not set to the Digital Operator.

| Data                      | Symbol | Function name   | Status | Description                                                                                                |
|---------------------------|--------|-----------------|--------|------------------------------------------------------------------------------------------------------------|
| 31                        | OPE    | Forced operator | ON     | Prioritizes the command from the Digital Operator (A020, A220 set values) over the A001 and A002 settings. |
|                           |        |                 | OFF    | Operates according to the A001 and A002 settings.                                                          |
| Available input terminals |        | C001 to C008    |        |                                                                                                            |
| Related codes             |        | A001, A002      |        |                                                                                                            |

- If the Forced Operator function is selected in the multi-function input selection, the Inverter is operated with the signal from the frequency reference source and RUN command source selected in A001 and A002, when the input signal is OFF. When the signal is ON, the Inverter is forced to operate with the frequency reference or RUN command from the Digital Operator.
- If you switch on/off this function during operation, the RUN command is reset to stop the Inverter output. Before resuming operation, turn off the RUN command from each command source to avoid possible danger and then input it again.

## P/PI Switching Function

- This function allows you to switch the control (compensation) method for the speed control system between proportional integral compensation and proportional compensation, when "sensorless vector control", "0-Hz sensorless vector control", or "sensor vector control" is selected as the control method.

| Parameter No.  | Function name                          | Data                                                                                                                                                 | Default setting | Unit |
|----------------|----------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|------|
| A044/A244/A344 | V/f characteristics selection          | 03: SLV (Sensorless vector control) (A344 is blank.)<br>04: 0SLV (0 Hz sensorless vector control) (A344 is blank.)<br>05: V2 (Sensor vector control) | 00              | —    |
| C001 to C008   | Multi-function inputs 1 to 8 selection | 43: PPI (P/PI switching)                                                                                                                             | —               | —    |
| H005/H205      | Speed response                         | 0.001 to 80.000                                                                                                                                      | 1.590           | —    |
| H050/H250      | PI proportional gain                   | 0.0 to 1000.0                                                                                                                                        | 100.0           | %    |
| H051/H251      | PI integral gain                       | 0.0 to 1000.0                                                                                                                                        | 100.0           | %    |
| H052/H252      | P proportional gain                    | 0.01 to 10.00                                                                                                                                        | 1.00            | —    |

- If P/PI switching is selected in the multi-function input selection, proportional integral compensation is enabled while the signal is off; proportional compensation is enabled while the signal is on. If P/PI switching is not selected in multi-function inputs 1 to 8 (C001 to C008), proportional integral compensation is enabled.

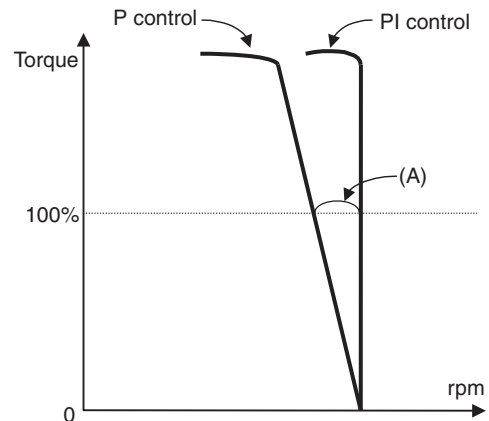
Normally, the Inverter performs proportional integral compensation (PI control) for speed control so that the difference between frequency reference and actual rpm becomes zero. If one load is operated by several motors, however, proportional control (P control) may be required. To enable proportional control (P control), allocate the P/PI switching function to any of multi-function input terminals 1 to 8 (set "43" in any of C001 to C008) via the Digital Operator, and turn on the terminal. If you choose to enable proportional control, set a "KPP" value in H052 (P proportional gain).

The relationship between the KPP value and speed change ratio is expressed broadly in the following formula:

$$(\text{Speed change ratio}) = \frac{10}{(\text{KPP set value})} \%$$

The relationship between speed change ratio and speed error is expressed broadly in the following formula:

$$(\text{Speed change ratio}) = \frac{\text{Speed error at rated torque (A)}}{\text{Synchronous rpm at base frequency}} \times 100\%$$



## Forced Terminal Block Function (F-TM)

- This function forcibly enables operation via the control terminal block by turning on/off the multi-function terminal if the frequency reference/RUN command sources are not set to the control terminal block.

| Data                      | Symbol | Function name                  | Description     |
|---------------------------|--------|--------------------------------|-----------------|
| 51                        | F-TM   | Multi-function input selection | Forced terminal |
| Available input terminals |        | C001 to C008                   |                 |
| Related codes             |        | A001, A002                     |                 |

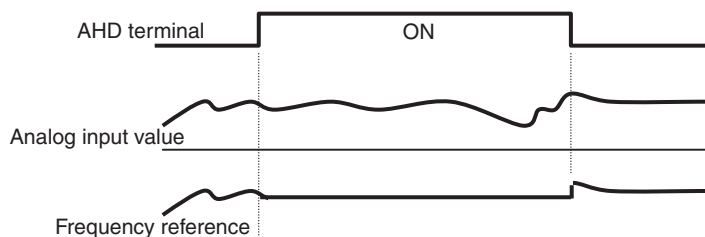
- If the Forced Terminal Block function is selected in the multi-function input selection, the Inverter is operated with the signal from the frequency reference source and RUN command source selected in A001 and A002, when the input signal is OFF. When the signal is ON, the Inverter is forced to operate with the frequency reference or RUN command from the control circuit terminal block.
- If you switch on/off this function during operation, the RUN command is reset to stop the Inverter output. Before resuming operation, turn off the RUN command from each command source to avoid possible danger and then input it again.

## Analog Command Hold Function

- While the AHD terminal is turned on, the Inverter keeps external analog input results on hold.

| Parameter No. | Function name                             | Data                          | Default setting | Unit |
|---------------|-------------------------------------------|-------------------------------|-----------------|------|
| C001 to C008  | Multi-function inputs<br>1 to 8 selection | 65: AHD (analog command held) | —               | —    |

- While the AHD terminal is turned on, you can use the UP/DWN function based on the reference value of the analog signal kept on hold by this function.
- If UP/DWN selection C101 is set to "01", the Inverter can store an UP/DWN result.
- If the power is turned on with the AHD terminal turned on, or if the RS terminal is turned on and then off, the Inverter employs the data kept on hold immediately before.



Note1: If the control function is switched via the SET/SET3 terminal with the AHD terminal turned on, the set frequency is retained. To change the control function, turn off the AHD terminal once, and keep the analog signal on hold again.

Note 2: If this function is frequently used, the internal storage element service life may be shortened.

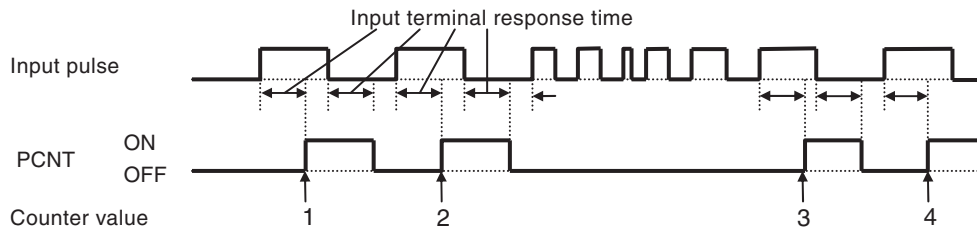
## Multi-function Pulse Counter (PCNT, PCC)

- The Inverter can input pulse trains via a multi-function input.
- With pulse counter monitor d028, you can monitor the total count of input pulses.

| Parameter No.     | Function name                             | Data                                                      | Default setting | Unit |
|-------------------|-------------------------------------------|-----------------------------------------------------------|-----------------|------|
| C001 to C008      | Multi-function inputs<br>1 to 8 selection | 74: PCNT (pulse counter)<br>75: PCC (pulse counter clear) | —               | —    |
| Related functions |                                           | d028                                                      |                 |      |

- The total pulse count value cannot be stored. After the power is turned on or after reset, the counter is reset to zero.
- Turning on PCC (pulse counter clear) clears the total count value.
- The input pulse frequency resolution can be obtained with the following formula. (This applies to pulse input with a 50% duty ratio.) The Inverter cannot input frequency higher than the specified frequency resolution. It is recommended that you use input frequencies up to 100 Hz. For details on input terminal response, refer to "Input Terminal Response Time" (page 4-108).

Frequency resolution (Hz) =  $250 / (\text{Input terminal response time set values C160 to C168} + 1)$   
 Example: When the input terminal response time = 1, the frequency resolution = 125 Hz.



## Multi-function Output Terminal Selection

- You can allocate the following functions to any of multi-function output terminals 11 to 15 (C021 to C025) or the alarm relay output terminal (C026).
- Multi-function output terminals 11 to 15 provide open-collector output. The alarm relay output terminal provides relay output.
- You can select NO- or NC-contact output for each output terminal with C031 to C035, or C036.
- If alarm code output is selected in C062 (refer to page 4-101), alarm code output (AC0 to AC3) is provided via output terminals 11 to 13 (for 3-bit code), or via output terminals 11 to 14 (for 4-bit code). The C021 to C025 settings are disabled.

| Data | Description                                    | Reference item                            | Page  |
|------|------------------------------------------------|-------------------------------------------|-------|
| 00   | RUN: Signal during RUN                         | Signal during RUN                         | 4-98  |
| 01   | FA1: Constant speed arrival signal             | Frequency arrival signal                  | 4-98  |
| 02   | FA2: Over set frequency arrival signal         |                                           |       |
| 03   | OL: Overload warning                           | Overload limit/Overload warning           | 4-49  |
| 04   | OD: Excessive PID deviation                    | PID function                              | 4-31  |
| 05   | AL: Alarm output                               | —                                         | —     |
| 06   | FA3: Set-frequency-only arrival signal         | Frequency arrival signal                  | 4-98  |
| 07   | OTQ: Overtorque                                | Overtorque                                | 4-100 |
| 08   | IP: Signal during momentary power interruption | Momentary power interruption/Undervoltage | 4-44  |
| 09   | UV: Signal during undervoltage                 |                                           |       |
| 10   | TRQ: Torque limit                              | Torque limit function                     | 4-57  |
| 11   | RNT: RUN time over                             | RUN time over                             | 4-52  |
| 12   | ONT: Power ON time over                        | Power ON time over                        | 4-52  |
| 13   | THM: Thermal warning                           | Electronic thermal function               | 4-46  |
| 19   | BRK: Brake release                             | Brake control function                    | 4-76  |
| 20   | BER: Brake error                               |                                           |       |
| 21   | ZS: 0-Hz signal                                | 0-Hz detection signal                     | 4-101 |
| 22   | DSE: Excessive speed deviation                 | V2 control mode selection                 | 4-124 |
| 23   | POK: Position ready                            | Orientation function                      | 4-134 |
| 24   | FA4: Set frequency exceeded 2                  | Frequency arrival signal                  | 4-98  |
| 25   | FA5: Set frequency only 2                      |                                           |       |
| 26   | OL2: Overload warning 2                        | Overload limit/Overload warning           | 4-49  |
| 27   | ODc: Analog O disconnection detection          | Window comparator function                | 4-66  |
| 28   | OIDc: Analog OI disconnection detection        |                                           |       |
| 29   | O2Dc: Analog O2 disconnection detection        |                                           |       |
| 31   | FBV: PID FB status output                      | PID function                              | 4-31  |
| 32   | NDc: Network error                             | Network error                             | 4-104 |

| Data              | Description                          | Reference item                      | Page  |
|-------------------|--------------------------------------|-------------------------------------|-------|
| 33                | LOG1: Logic operation output 1       | Logic operation function            | 4-102 |
| 34                | LOG2: Logic operation output 2       |                                     |       |
| 35                | LOG3: Logic operation output 3       |                                     |       |
| 36                | LOG4: Logic operation output 4       |                                     |       |
| 37                | LOG5: Logic operation output 5       |                                     |       |
| 38                | LOG6: Logic operation output 6       |                                     |       |
| 39                | WAC: Capacitor life warning signal   | Capacitor life warning signal       | 4-103 |
| 40                | WAF: Cooling fan life warning signal | Cooling fan speed drop signal       | 4-104 |
| 41                | FR: Starting contact signal          | Starting contact signal             | 4-105 |
| 42                | OHF: Fin overheat warning            | Fin overheat warning                | 4-105 |
| 43                | LOC: Light load detection signal     | Light load detection signal         | 4-106 |
| 44                | MO1 (Drive programming output 1)     | Drive programming outputs           | —     |
| 45                | MO2 (Drive programming output 2)     |                                     |       |
| 46                | MO3 (Drive programming output 3)     |                                     |       |
| 47                | MO4 (Drive programming output 4)     |                                     |       |
| 48                | MO5 (Drive programming output 5)     |                                     |       |
| 49                | MO6 (Drive programming output 6)     |                                     |       |
| 50                | IRDY: Operation ready signal         | Operation ready signal              | 4-106 |
| 51                | FWR: Forward run signal              | Forward run signal                  | 4-107 |
| 52                | RVR: Reverse run signal              | Reverse run signal                  | 4-107 |
| 53                | MJA: Fatal fault signal              | Fatal fault signal                  | 4-107 |
| 54                | WCO: Window comparator O             | Window comparator function          | 4-66  |
| 55                | WCO1: Window comparator O1           |                                     |       |
| 56                | WCO2: Window comparator O2           |                                     |       |
| 63                | OPO: Option board output             | Output controlled from option board | —     |
| Related functions |                                      | C021 to C025, C026                  |       |

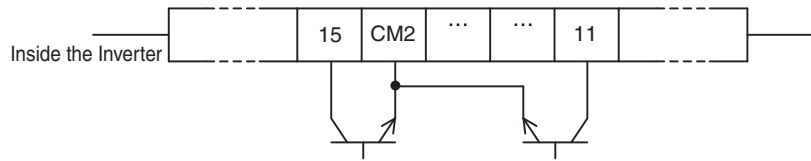
## Multi-function Output Terminal Contact Selection

- You can set NO- or NC-contact output individually for multi-function output terminals 11 to 15 as well as the relay output terminal.
- Multi-function output terminals 11 to 15 provide open-collector output.

| Parameter No. | Function name                                             | Data                                                                                           | Default setting | Unit |
|---------------|-----------------------------------------------------------|------------------------------------------------------------------------------------------------|-----------------|------|
| C031 to C035  | Multi-function output terminal 11 to 15 contact selection | 00: NO<br>01: NC                                                                               | 00              | —    |
| C036          | Relay output (AL2, AL1) contact selection                 | 00: NO contact between AL2, NC contact at AL1<br>01: NC contact between AL2, NO contact at AL1 | 01              | —    |

## ■ Specifications of Multi-function Output Terminals 11 to 15

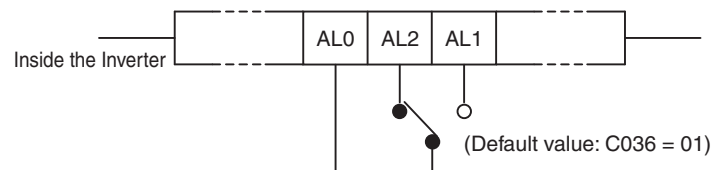
- Below are the specifications of multi-function output terminals 11 to 15.



| C031 to C035 set values | Power supply | Output status | Electrical characteristics                                                                                                             |
|-------------------------|--------------|---------------|----------------------------------------------------------------------------------------------------------------------------------------|
| 00<br>(NO contact)      | ON           | ON            | Between each terminal and CM2<br>Voltage drop 4 V max. at power-on<br>Max. allowable voltage: 27 V DC<br>Max. allowable current: 50 mA |
|                         | OFF          | —             |                                                                                                                                        |
| 01<br>(NC contact)      | ON           | ON            |                                                                                                                                        |
|                         | OFF          | —             |                                                                                                                                        |

## ■ Specifications of the Relay Output Terminals

- The relay output terminals have an SPDT contact configuration. Below is its operation.



(Example) When the relay output terminals are used for alarm

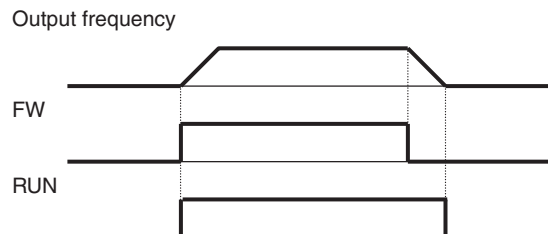
| C036 set values | Power | Inverter status | Output terminal status |         | Resistance load       |                                   | Inductive load                    |
|-----------------|-------|-----------------|------------------------|---------|-----------------------|-----------------------------------|-----------------------------------|
|                 |       |                 | AL2-AL0                | AL1-AL0 | AL2-AL0               | AL1-AL0                           |                                   |
| 00              | ON    | Abnormal        | Closed                 | Open    | Max. contact capacity | 250 V AC, 2 A<br>30 V DC, 8 A     | 250 V AC, 0.2 A<br>30 V DC, 0.6 A |
|                 |       | Normal          | Open                   | Closed  | Min. contact capacity | 100 V AC, 10 mA<br>5 V DC, 100 mA |                                   |
|                 | OFF   | —               | Open                   | Closed  | Max. contact capacity | 250 V AC, 1 A<br>30 V DC, 1 A     | 250 V AC, 0.2 A<br>30 V DC, 0.2 A |
| 01<br>(Default) | ON    | Abnormal        | Open                   | Closed  | Min. contact capacity | 100 V AC, 10 mA<br>5 V DC, 100 mA |                                   |
|                 |       | Normal          | Closed                 | Open    |                       |                                   |                                   |
|                 | OFF   | —               | Open                   | Closed  |                       |                                   |                                   |



## Signal During RUN

- While the Inverter is running, this signal is output via multi-function output terminals 11 to 15 or the relay output terminal.
- Allocate "00" (RUN) to any of multi-function output terminals 11 to 15 (C021 to C025) or the relay output terminal (C026).
- This signal is also output during DC injection braking.

Below is the time chart.



## Frequency Arrival Signal

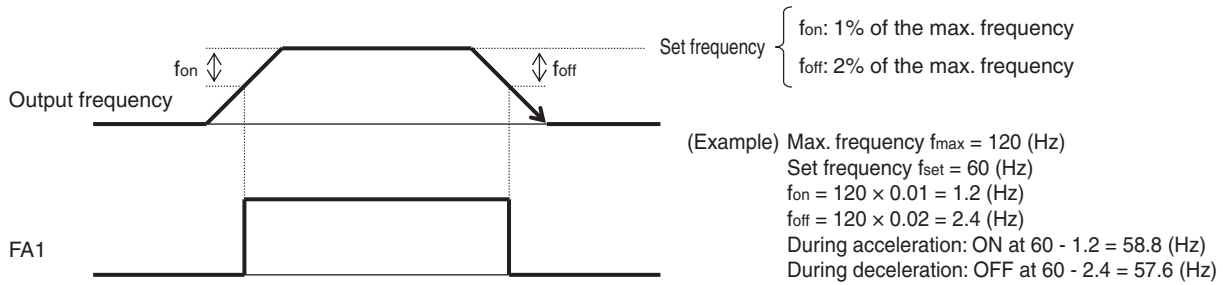
- When the output frequency reaches the set level, a frequency arrival signal is output.

| Parameter No. | Function name                           | Data                                                                                                                     | Default setting | Unit |
|---------------|-----------------------------------------|--------------------------------------------------------------------------------------------------------------------------|-----------------|------|
| C042          | Arrival frequency during acceleration   | 0.00: Does not output arrival signal during acceleration.<br>0.01 to 400.00: Outputs arrival signal during acceleration. | 0.00            | Hz   |
| C045          | Arrival frequency during acceleration 2 |                                                                                                                          |                 |      |
| C043          | Arrival frequency during deceleration   | 0.00: Does not output arrival signal during deceleration.<br>0.01 to 400.00: Outputs arrival signal during deceleration. | 0.00            | Hz   |
| C046          | Arrival frequency during deceleration 2 |                                                                                                                          |                 |      |

- For elevating machines, use this signal for applying the brake. To release the brake, use the overtorque signal.
- Allocate "01" (FA1: Constant speed arrival signal), "02" (FA2: Set frequency exceeded), "06" (FA3: Set frequency only), "24" (FA4: Set frequency exceeded 2), or "25" (FA5: Set frequency only 2) to any of multi-function output terminals 11 to 15 (C021 to C025) or the relay output terminal (C026).
- Below is the hysteresis of the frequency arrival signal:
  - ON: (Set frequency - 1% of the maximum frequency) (Hz)
  - OFF: (Set frequency - 2% of the maximum frequency) (Hz)
- If "06" (FA3) or "25" (FA5) is set, however, operation during acceleration is:
  - ON: (Set frequency - 1% of the maximum frequency) (Hz)
  - OFF: (Set frequency + 2% of the maximum frequency) (Hz)
- and operation during deceleration is:
  - ON: (Set frequency + 1% of the maximum frequency) (Hz)
  - OFF: (Set frequency - 2% of the maximum frequency) (Hz)

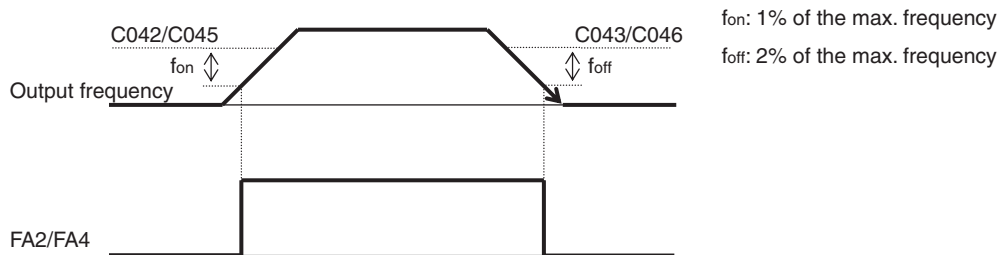
### ■ Constant Speed Arrival Output (01: FA1)

A signal is output when the output frequency has reached the level set in the frequency setting (F001, A020, A220, and A320) or multi-step speed (A021 to A035).



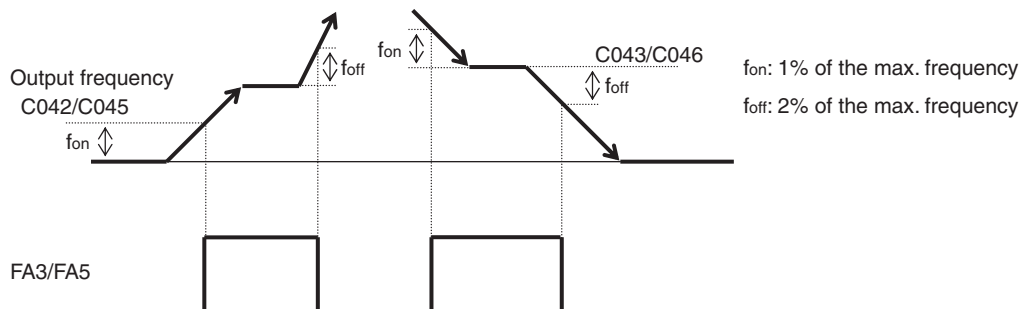
### ■ Set-frequency-exceeded Output (02: FA2, 24: FA4)

A signal is output when the output frequency has exceeded the arrival frequencies during acceleration/deceleration set in [C042, C043 (FA2)] and [C045, C046 (FA4)].



### ■ Set-frequency-only Output (06: FA3, 25: FA5)

A signal is output when the output frequency equals the arrival frequencies during acceleration/deceleration set in [C042, C043 (FA3)] and [C045, C046 (FA5)].



## Overtorque (OTQ)

- This function outputs a signal when detecting a motor output torque estimated value exceeding a specified level.

| Parameter No.     | Function name                                     | Data                                                                                                    | Default setting                       | Unit |
|-------------------|---------------------------------------------------|---------------------------------------------------------------------------------------------------------|---------------------------------------|------|
| C021 to C025      | Multi-function output terminal 11 to 15 selection | 07: OTQ (Overtorque)                                                                                    | -                                     | —    |
| C026              | Relay output (AL2, AL1) function selection        |                                                                                                         | 05                                    |      |
| C055              | Overtorque level (Forward power running)          | 0 to 200 (0.4 to 55 kW)<br>0 to 180 (75 to 132 kW)<br>OTQ signal output level for forward power running | 200 (Under 55 kW)<br>180 (Over 75 kW) | %    |
| C056              | Overtorque level (Reverse regeneration)           | 0 to 200 (0.4 to 55 kW)<br>0 to 180 (75 to 132 kW)<br>OTQ signal output level for reverse regeneration  | 200 (Under 55 kW)<br>180 (Over 75 kW) | %    |
| C057              | Overtorque level (Reverse power running)          | 0 to 200 (0.4 to 55 kW)<br>0 to 180 (75 to 132 kW)<br>OTQ signal output level for reverse power running | 200 (Under 55 kW)<br>180 (Over 75 kW) | %    |
| C058              | Overtorque level (Forward regeneration)           | 0 to 200 (0.4 to 55 kW)<br>0 to 180 (75 to 132 kW)<br>OTQ signal output level for forward regeneration  | 200 (Under 55 kW)<br>180 (Over 75 kW) | %    |
| Related functions |                                                   | A044, A244, A344, C063                                                                                  |                                       |      |

- Enabled when "overtorque signal" is selected in the multi-function output selection. You can use this function only when "sensorless vector control", "0-Hz sensorless vector control", or "sensor vector control" is selected in V/f characteristics selection A044/A244. With other settings, the output is unstable.
- For elevating machines, use this signal for releasing the brake. To close the brake, use the frequency arrival signal.

## 0-Hz Detection Signal

- This function outputs a detection signal when the Inverter's output frequency falls below the 0-Hz detection value set in 0-Hz detection level C063.

| Parameter No.     | Function name                                     | Data                                                       | Default setting | Unit |
|-------------------|---------------------------------------------------|------------------------------------------------------------|-----------------|------|
| C021 to C025      | Multi-function output terminal 11 to 15 selection | 21: ZS (0-Hz signal)                                       | —               | —    |
| C026              | Relay output (AL2, AL1) function selection        |                                                            | 05              |      |
| C063              | 0-Hz detection level                              | 0.00 to 100.00:<br>Set a frequency to be detected as 0 Hz. | 0.00            | Hz   |
| Related functions |                                                   | A044, A244, A344                                           |                 |      |

- Enabled when "21" (ZS) is allocated to any of multi-function output terminals 11 to 15 (C021 to C025) or the relay output terminal (C026).  
When "VC", "special VP", "free V/F", "sensorless vector control", or "0-Hz sensorless vector control" is selected as the control method, this function works for the Inverter's output frequency.  
When the control method is "sensor vector control", this function works for the motor rotation frequency.

## Alarm Code Output (AC0 to AC3)

- This function outputs a 3-bit or 4-bit code signal to indicate the cause of an Inverter trip.

| Parameter No. | Function name        | Data               | Default setting | Unit |
|---------------|----------------------|--------------------|-----------------|------|
| C062          | Alarm code selection | 00: OFF (Disabled) | 00              | —    |
|               |                      | 01: 3-bit          |                 |      |
|               |                      | 02: 4-bit          |                 |      |

- If "01" (3-bit) or "02" (4-bit) is selected in alarm code selection C062, multi-function output terminals 11 to 13, or 11 to 14, are forced to output an alarm code.  
The following table shows the output alarm codes.

| Multi-function output terminals |     |     |     | With 4-bit code selected |                                                                 | With 3-bit code selected |                                             |
|---------------------------------|-----|-----|-----|--------------------------|-----------------------------------------------------------------|--------------------------|---------------------------------------------|
| 14                              | 13  | 12  | 11  | Factor code              | Trip cause                                                      | Factor code              | Trip cause                                  |
| AC3                             | AC2 | AC1 | AC0 |                          |                                                                 |                          |                                             |
| 0                               | 0   | 0   | 0   | Normal                   | Normal                                                          | Normal                   | Normal                                      |
| 0                               | 0   | 0   | 1   | E01 to E03, E04          | Overcurrent protection                                          | E01 to E03, E04          | Overcurrent protection                      |
| 0                               | 0   | 1   | 0   | E05, E38                 | Overload protection<br>Overload protection in a low speed range | E05                      | Overload protection                         |
| 0                               | 0   | 1   | 1   | E07, E15                 | Overvoltage/Incoming overvoltage protection                     | E07, E15                 | Overvoltage/Incoming overvoltage protection |
| 0                               | 1   | 0   | 0   | E09                      | Undervoltage protection                                         | E09                      | Undervoltage protection                     |
| 0                               | 1   | 0   | 1   | E16                      | Momentary power interruption protection                         | E16                      | Momentary power interruption protection     |
| 0                               | 1   | 1   | 0   | E30                      | IGBT error                                                      | E30                      | IGBT error                                  |
| 0                               | 1   | 1   | 1   | E06                      | Braking resistor overload protection                            | —                        | Other errors                                |

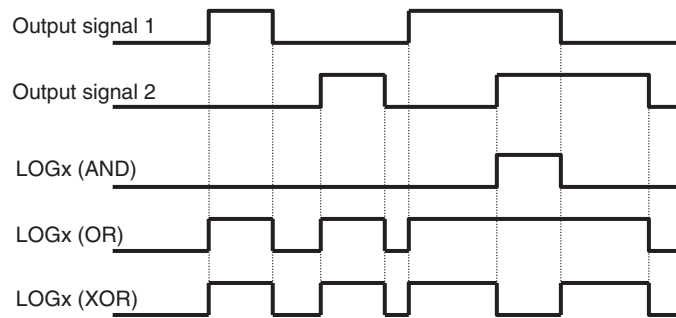
| Multi-function output terminals |     |     |     | With 4-bit code selected |                                                                           | With 3-bit code selected |            |
|---------------------------------|-----|-----|-----|--------------------------|---------------------------------------------------------------------------|--------------------------|------------|
| 14                              | 13  | 12  | 11  | Factor code              | Trip cause                                                                | Factor code              | Trip cause |
| AC3                             | AC2 | AC1 | AC0 |                          |                                                                           |                          |            |
| 1                               | 0   | 0   | 0   | E08, E11<br>E23, E25     | EEPROM error, CPU error,<br>GA communication error, Main<br>circuit error | —                        | —          |
| 1                               | 0   | 0   | 1   | E10                      | CT error                                                                  | —                        | —          |
| 1                               | 0   | 1   | 0   | E12, E13<br>E35, E36     | External trip, USP error,<br>Thermistor error, Brake error                | —                        | —          |
| 1                               | 1   | 0   | 0   | E14                      | Grounding protection                                                      | —                        | —          |
| 1                               | 1   | 0   | 1   | E20                      | Abnormal temperature due to<br>the cooling fin's speed drop               |                          |            |
| 1                               | 1   | 0   | 1   | E21                      | Abnormal temperature                                                      | —                        | —          |
| 1                               | 1   | 1   | 0   | E24                      | Input phase loss protection                                               | —                        | —          |
| 1                               | 1   | 1   | 1   | E50 to E79               | Network error, Options 1, 2<br>Errors 0 to 9                              | —                        | —          |

## Output Signal Logic Operation

- This function performs output signal logic operations inside the Inverter.
- All output signals are operation targets.  
However, the logic operation outputs (LOG1 to LOG6) are not subject to operations.

| Parameter No.                     | Function name                                           | Data                                                                                                                                                                                                                                                                                                                                                                     | Default setting | Unit |
|-----------------------------------|---------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|------|
| C021 to C025                      | Multi-function<br>output terminal 11<br>to 15 selection | 33: LOG1<br>(Logic operation output [C142, C143, C144])<br>34: LOG2<br>(Logic operation output 2 [C145, C146, C147])<br>35: LOG3<br>(Logic operation output 3 [C148, C149, C150])<br>36: LOG4<br>(Logic operation output 4 [C151, C152, C153])<br>37: LOG5<br>(Logic operation output 5 [C154, C155, C156])<br>38: LOG6<br>(Logic operation output 6 [C157, C158, C159]) | —               | —    |
| C026                              | Relay output<br>(AL2, AL1) function<br>selection        |                                                                                                                                                                                                                                                                                                                                                                          | 05              |      |
| C142/C145/C148/<br>C151/C154/C157 | Logic output signal<br>selection 1                      | Select 00 to 50 from the multi-function output<br>data (other than LOG1 to LOG6):<br>Select operand 1.                                                                                                                                                                                                                                                                   | 00              | —    |
| C143/C146/C149/<br>C152/C155/C158 | Logic output signal<br>selection 2                      | Select 00 to 50 from the multi-function output<br>data (other than LOG1 to LOG6):<br>Select operand 2.                                                                                                                                                                                                                                                                   | 00              | —    |
| C144/C147/C150/<br>C153/C156/C159 | Logic output signal<br>operator selection               | 00: AND<br>01: OR<br>02: XOR                                                                                                                                                                                                                                                                                                                                             | 00              | —    |

- You can select from three types of operators (AND, OR, and XOR).



- The setting parameters vary depending on the logic operation output selected. Refer to the following table to set the necessary parameters.

| Selected signal                     | Operand 1 selection | Operand 2 selection | Operator selection |
|-------------------------------------|---------------------|---------------------|--------------------|
| 33: Logic operation output 1 (LOG1) | C142                | C143                | C144               |
| 34: Logic operation output 2 (LOG2) | C145                | C146                | C147               |
| 35: Logic operation output 3 (LOG3) | C148                | C149                | C150               |
| 36: Logic operation output 4 (LOG4) | C151                | C152                | C153               |
| 37: Logic operation output 5 (LOG5) | C154                | C155                | C156               |
| 38: Logic operation output 6 (LOG6) | C157                | C158                | C159               |

(Example) To output a logic output 1 (LOG1) signal through AND operation of "RUN signal" (00: RUN) and "over set frequency arrival signal" (02: FA2) to multi-function output 2

- Multi-function input 2 selection (C002) : 33 (LOG1)
- Logic output signal 1 selection 1 (C142) : 00 (RUN)
- Logic output signal 1 selection 2 (C143) : 02 (FA2)
- Logic output signal 1 operator selection (C144): 00 (AND)

## Capacitor Life Warning Signal

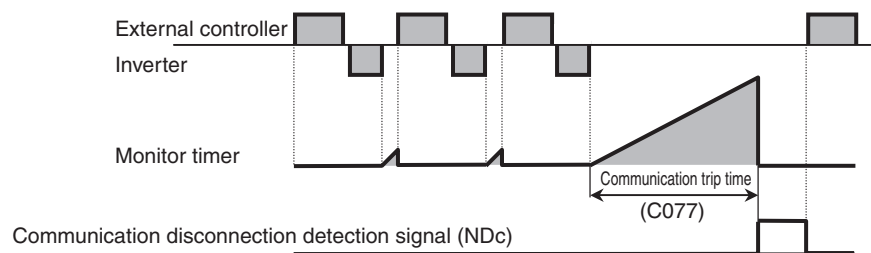
- This function determines estimated service life of the capacitor on the PCB, based on the Inverter's internal temperature and ON time.
- Life assessment monitor d022 shows the status of this signal.
- If this function is activated, it is recommended that the main circuit board and logic board be replaced.

| Parameter No. | Function name                                     | Data                                                | Default setting | Unit |
|---------------|---------------------------------------------------|-----------------------------------------------------|-----------------|------|
| C021 to C025  | Multi-function output terminal 11 to 15 selection | 39: WAC<br>(Capacitor life warning signal (on PCB)) | —               | —    |
| C026          | Relay output (AL2, AL1) function selection        |                                                     | 05              |      |

## Network Error

- Enabled only when ModBus-RTU is selected for RS485 communication.
- If a reception timeout error occurs, this signal is output until reception of the next data.
- Set a time before reception timeout in communication error timeout C077.
- For details, refer to "4-4 Communication Function".

| Parameter No. | Function name                                     | Data                                                   | Default setting | Unit |
|---------------|---------------------------------------------------|--------------------------------------------------------|-----------------|------|
| C021 to C025  | Multi-function output terminal 11 to 15 selection | 32: NDc (network error)                                | —               | —    |
| C026          | Relay output (AL2, AL1) function selection        |                                                        | 05              |      |
| C077          | Communication error timeout                       | 0.00 to 99.99:<br>Set a time before reception timeout. | 0.00            | s    |



## Cooling Fan Speed Drop Signal

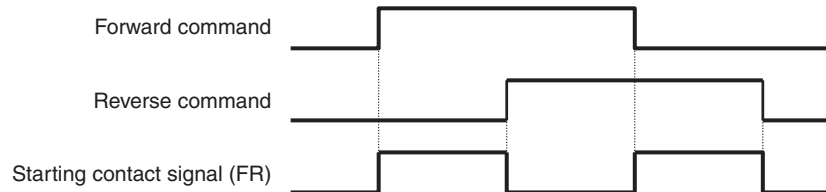
- This signal is output when detecting that the Inverter's built-in cooling fan rotation speed is reduced to 75% or less.
- If "01" is selected in cooling fan control b092, this signal is not output even while the fan is stopped.
- While this signal is output, check the cooling fan for clogging.
- Life assessment monitor d022 shows the status of this signal.

| Parameter No.     | Function name                                        | Data                                         | Default setting | Unit |
|-------------------|------------------------------------------------------|----------------------------------------------|-----------------|------|
| C021 to C025      | Multi-function output terminal<br>11 to 15 selection | 40: WAF<br>(cooling fan life warning signal) | —               | —    |
| C026              | Relay output (AL2, AL1)<br>function selection        |                                              | 05              |      |
| Related functions |                                                      | b092, d022                                   |                 |      |

## Starting Contact Signal

- While the Inverter is receiving the RUN command, a starting contact signal is output.
- The output is enabled regardless of the setting of RUN command source selection A002.
- If inputs FW and RV are simultaneously turned on, the Inverter stops.

| Parameter No. | Function name                                     | Data                             | Default setting | Unit |
|---------------|---------------------------------------------------|----------------------------------|-----------------|------|
| C021 to C025  | Multi-function output terminal 11 to 15 selection | 41: FR (starting contact signal) | —               | —    |
| C026          | Relay output (AL2, AL1) function selection        |                                  | 05              |      |



## Fin Overheat Warning

- This function monitors the Inverter's internal fin temperature and outputs a signal when the temperature exceeds the fin overheat warning level (C064).

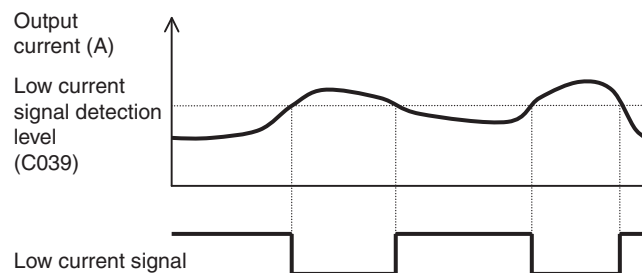
| Parameter No. | Function name                                     | Data                                                               | Default setting | Unit |
|---------------|---------------------------------------------------|--------------------------------------------------------------------|-----------------|------|
| C021 to C025  | Multi-function output terminal 11 to 15 selection | 42: OHF (fin overheat warning)                                     | —               | —    |
| C026          | Relay output (AL2, AL1) function selection        |                                                                    | 05              |      |
| C064          | Fin overheat warning level                        | 0 to 200: Set a temperature to output the overheat warning signal. | 120             | °C   |



## Light Load Detection Signal

- This signal is output when output current falls below the light load detection level (C039).
- In light load signal output mode C038, you can set whether this output is enabled in any operation mode, or only in constant speed operation.

| Parameter No. | Function name                                     | Data                                                                                                                                      | Default setting | Unit |
|---------------|---------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|-----------------|------|
| C021 to C025  | Multi-function output terminal 11 to 15 selection | 43: LOC (light load detection signal)                                                                                                     | —               | —    |
| C026          | Relay output (AL2, AL1) function selection        |                                                                                                                                           | 05              |      |
| C038          | Light load signal output mode                     | 00: ACC/DEC/CST (Enabled during acceleration/deceleration/constant speed)<br>01: Const (Enabled only during constant speed)               | 01              | —    |
| C039          | Light load detection level                        | 0.0 to 2.00 × Rated current: (0.4 to 55 kW)<br>0.0 to 1.80 × Rated current (75 to 132 kW)<br>Set an output level for low current signals. | Rated current   | A    |



## Operation Ready Signal

- This signal is output when the Inverter becomes ready for operation (ready to receive the RUN command).
- Even if the RUN command is input while this signal is not output, the Inverter does not recognize the RUN command.
- If this signal is not output, check if the input power supply voltage (R/L1, S/L2, T/L3) is within the specified range.

| Parameter No. | Function name                                     | Data                              | Default setting | Unit |
|---------------|---------------------------------------------------|-----------------------------------|-----------------|------|
| C021 to C025  | Multi-function output terminal 11 to 15 selection | 50: IRDY (operation ready signal) | —               | —    |
| C026          | Relay output (AL2, AL1) function selection        |                                   | 05              |      |

## Forward Run Signal

- This signal is output while the Inverter is running forward.
- While the Inverter is running in reverse, or when stopped, this signal is turned off.

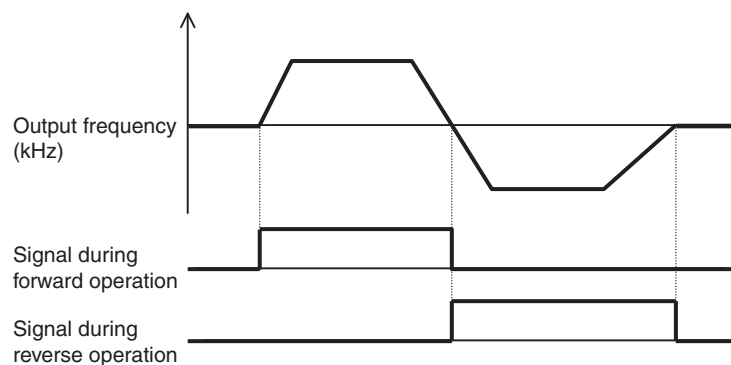
| Parameter No. | Function name                                     | Data                         | Default setting | Unit |
|---------------|---------------------------------------------------|------------------------------|-----------------|------|
| C021 to C025  | Multi-function output terminal 11 to 15 selection | 51: FWR (forward run signal) | —               | —    |
| C026          | Relay output (AL2, AL1) function selection        |                              | 05              |      |

4

## Reverse Run Signal

- This signal is output while the Inverter is running in reverse.
- While the Inverter is running forward, or when stopped, this signal is turned off.

| Parameter No. | Function name                                     | Data                         | Default setting | Unit |
|---------------|---------------------------------------------------|------------------------------|-----------------|------|
| C021 to C025  | Multi-function output terminal 11 to 15 selection | 52: RVR (reverse run signal) | —               | —    |
| C026          | Relay output (AL2, AL1) function selection        |                              | 05              |      |



## Fatal Fault Signal

| Parameter No. | Function name                                     | Data                         | Default setting | Unit |
|---------------|---------------------------------------------------|------------------------------|-----------------|------|
| C021 to C025  | Multi-function output terminal 11 to 15 selection | 53: MJA (fatal fault signal) | —               | —    |
| C026          | Relay output (AL2, AL1) function selection        |                              | 05              |      |

- In addition to an alarm, this signal is output if any of the following trips occurs. (These trips are caused by hardware.)

| No. | Error code | Description                                  |
|-----|------------|----------------------------------------------|
| 1   | E10.*      | CT error                                     |
| 2   | E11.*      | CPU error                                    |
| 3   | E14.*      | Grounding protection                         |
| 4   | E20.*      | Abnormal temperature due to cooling fan stop |
| 5   | E23.*      | Gate array communications error              |
| 6   | E25.*      | Main circuit error                           |

## Multi-function Output Terminal ON Delay/OFF Delay

- You can set ON/OFF delay times for each output terminal.

| Output terminal | ON delay time | OFF delay time |
|-----------------|---------------|----------------|
| 11              | C130          | C131           |
| 12              | C132          | C133           |
| 13              | C134          | C135           |
| 14              | C136          | C137           |
| 15              | C138          | C139           |
| RY (AL*)        | C140          | C141           |

- All output signals immediately turn on/off when the specified conditions are satisfied. Depending on the selected signal, chattering may occur. In such a case, use this function to hold or delay the signal.
- Set the parameters for individual output terminals (multi-function output terminals 11 to 15 and the relay output terminal: six terminals in total). For the output terminals and the corresponding parameters, refer to the table below.

| Function code                     | Item             | Data                                    | Default setting | Unit |
|-----------------------------------|------------------|-----------------------------------------|-----------------|------|
| C130/C132/C134/C136/<br>C138/C140 | Output ON delay  | 0.0 to 100.0:<br>Set an ON delay time.  | 0.0             | s    |
| C131/C133/C135/C137/<br>C139/C141 | Output OFF delay | 0.0 to 100.0:<br>Set an OFF delay time. | 0.0             | s    |

## Input Terminal Response Time

- You can set a sampling time individually for multi-function input terminals 1 to 8 as well as the FW terminal. This helps remove chattering or other noise.
- If the terminal input becomes unstable because of chattering, increase the set value. The larger the data value is, the slower the response time. A setting range of 0 to 200 is available, which corresponds to approx. 2 to 400 ms.

| Parameter No. | Function name                       | Data                                                 | Default setting | Unit |
|---------------|-------------------------------------|------------------------------------------------------|-----------------|------|
| C160 to C167  | Input terminal response time 1 to 8 | 0 to 200 (× 2 ms):<br>Can be set in increments of 1. | 1               | ms   |
| C168          | FW terminal response time           |                                                      |                 |      |

## Digital FM Terminal

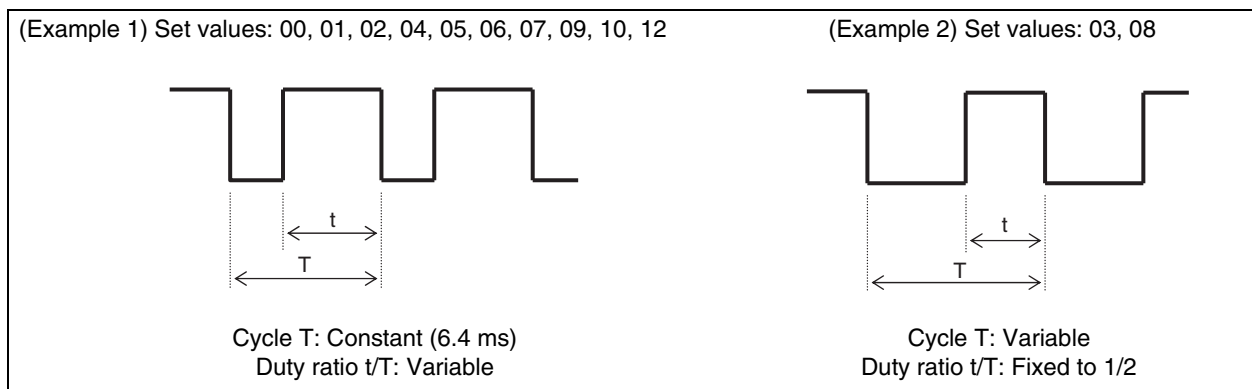
- You can monitor the output frequency and current using the FM terminal on the control circuit terminal block.
- The FM terminal provides pulse output.

### ■ FM Selection

- Select a signal to output from the following table.  
For "03" (digital output frequency), use the digital frequency counter.  
For other output signals, use the analog meter.

| Parameter No. | Data | Description                             | Full-scale value                          |
|---------------|------|-----------------------------------------|-------------------------------------------|
| C027          | 00   | Output frequency (example 1)            | 0 to Max. frequency (Hz) <sup>*3</sup>    |
|               | 01   | Output current (example 1)              | 0% to 200%                                |
|               | 02   | Output torque (example 1) <sup>*1</sup> | 0% to 200%                                |
|               | 03   | Digital output frequency (example 2)    | 0 to Max. frequency (Hz)                  |
|               | 04   | Output voltage (example 1)              | 0% to 100%                                |
|               | 05   | Power (example 1)                       | 0% to 200%                                |
|               | 06   | Thermal load rate (example 1)           | 0% to 100%                                |
|               | 07   | LAD frequency (example 1)               | 0 to Max. frequency (Hz)                  |
|               | 08   | Digital current monitor                 | <sup>*2</sup>                             |
|               | 09   | Motor temperature                       | 0°C to 200°C (0°C output at 0°C or lower) |
|               | 10   | Fin temperature                         | 0°C to 200°C (0°C output at 0°C or lower) |
|               | 12   | Drive programming output (YA0)          | -                                         |
|               | 19   | Option board 1 (OP1)                    | -                                         |
|               | 20   | Option board 2 (OP2)                    | -                                         |

\*1. This output is enabled only when "SLV", "0-Hz SLV", or "V2" is selected. (Refer to "Control Method (V/f Characteristics)" (page 4-21).)



\*2. Digital current monitor

- When the monitor displays the value set in digital current monitor reference value C030, 1440 Hz is output.

| Parameter No. | Function name                           | Data                                                                                                                                                                    | Default setting | Unit |
|---------------|-----------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|------|
| C030          | Digital current monitor reference value | 0.20 × Rated current to<br>2.00 × Rated current (Under 55 kW)<br>0.20 × Rated current to<br>1.50 × Rated current (Over 75 kW)<br>Set a current value at 1440-Hz output. | Rated current   | A    |

\*3. In any other method the real output frequency of the inverter including compensations (different than d001 value) is displayed.

## ■FM Adjustment

- Adjust the Inverter output gain according to the meter connected to the FM terminal.

| Parameter No.     | Function name   | Data                                      | Default setting | Unit |
|-------------------|-----------------|-------------------------------------------|-----------------|------|
| C105              | FM gain setting | 50 to 200: Set a gain for the FM monitor. | 100             | %    |
| Related functions |                 | C027, b081                                |                 |      |

## Analog Output AM/AMI Terminals

You can monitor the output frequency and current using the AM and AMI terminals on the control circuit terminal block.

The AM terminal provides 0- to 10-V analog output.

The AMI terminal provides 4- to 20-mA analog output.

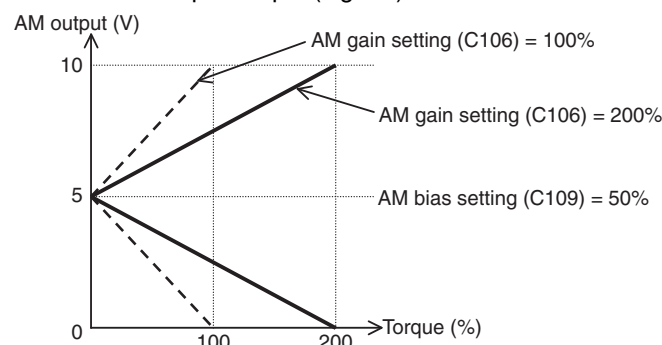
## ■AM/AMI Selection

- Select a signal to output from the following table.

| Parameter No. | Function name                  | Data                                                                                   | Default setting | Unit |
|---------------|--------------------------------|----------------------------------------------------------------------------------------|-----------------|------|
| C028/C029     | AM selection/<br>AMI selection | 00: Output frequency (0 to Max. frequency (Hz) * <sup>3</sup> )                        | 00              | —    |
|               |                                | 01: Output current (0% to 200%)                                                        |                 |      |
|               |                                | 02: Output torque * <sup>1</sup> (0% to 200%)                                          |                 |      |
|               |                                | 04: Output voltage (0% to 100%)                                                        |                 |      |
|               |                                | 05: Power (0% to 200%)                                                                 |                 |      |
|               |                                | 06: Thermal load rate (0% to 100%)                                                     |                 |      |
|               |                                | 07: LAD frequency (0 to Max. frequency [Hz])                                           |                 |      |
|               |                                | 09: Motor temperature (0°C to 200°C) (0°C output at 0°C or lower)                      |                 |      |
|               |                                | 10: Fin temperature (0°C to 200°C) (0°C output at 0°C or lower)                        |                 |      |
|               |                                | 11: Output torque (signed) (AM output only. 0% to 200% * <sup>1</sup> * <sup>2</sup> ) |                 |      |
|               |                                | 13: Drive programming output (YA1) (AM selection only)                                 |                 |      |
|               |                                | 14: Drive programming output (YA2) (AMI selection only)                                |                 |      |
|               |                                | 19: Option board 1 (OP1) (AM selection only)                                           |                 |      |
|               |                                | 20: Option board 2 (OP2) (AM selection only)                                           |                 |      |

\*1. This output is enabled only when "SLV", "0-Hz SLV", or "V2" is selected. (Refer to "Control Method (V/f Characteristics)" (page 4-21).)

\*2. Below are the specifications of the output torque (signed).



\*3. In any other method the real output frequency of the inverter including compensations (different than d001 value) is displayed.

## ■AM/AMI Adjustment

•Adjust the Inverter output gain according to the meters connected to the AM and AMI terminals.

| Parameter No. | Function name    | Data                                            | Default setting | Unit |
|---------------|------------------|-------------------------------------------------|-----------------|------|
| C106          | AM gain setting  | 50 to 200: Set a gain for the AM monitor.       | 100             | %    |
| C109          | AM bias setting  | 0 to 100:<br>Set an offset for the AM monitor.  | 0               |      |
| C107          | AMI gain setting | 50 to 200: Set a gain for the AMI monitor.      | 100             |      |
| C110          | AMI bias setting | 0 to 100:<br>Set an offset for the AMI monitor. | 20              |      |

Note: The offset data is set in %.

(Example) If AMI provides 4 to 20 mA output, the offset value is 20% (= 4/20). (Default value)

## Operation Selection During Option Error

If the built-in optional board causes an error, you can set whether the Inverter trips or continues to run regardless of the option error.

| Parameter No. | Function name                       | Data                                      | Default setting | Unit |
|---------------|-------------------------------------|-------------------------------------------|-----------------|------|
| P001/P002     | Operation selection at option error | 00: Trip<br>01: RUN (Continues operation) | 00              | —    |

## <Group H: Motor Control Parameters>

### Offline Auto-Tuning Function

- This function enables measurement and automatic setting of the motor parameters required for "sensorless vector control", "0-Hz sensorless vector control", and "sensor vector control".
- To perform "sensorless vector control", "0-Hz sensorless vector control", or "sensor vector control" for a motor with unknown motor parameters, perform offline auto-tuning to determine the motor parameters.
- To use the online auto-tuning function described later, be sure to perform offline auto-tuning in advance.
- This function is applicable to 1st/2nd control, not to 3rd control.
- For motor parameters, the Inverter inputs data on one phase of Y-connection at 50 Hz.

| Parameter No. | Function name                         | Data                                                                                                                    | Default setting                | Unit     |
|---------------|---------------------------------------|-------------------------------------------------------------------------------------------------------------------------|--------------------------------|----------|
| H001          | Auto-tuning selection                 | 00: OFF (Disabled)<br>01: ON (STOP)<br>02: ON (Rotation)                                                                | 00                             | —        |
| H002/H202     | Motor parameter selection             | 00: Standard motor parameter<br>01: Auto-tuning parameter<br>02: Auto-tuning parameter<br>(Online auto-tuning enabled.) | 00                             | —        |
| H003/H203     | Motor capacity selection              | 0.20 to 160.00                                                                                                          | Factory default                | kW       |
| H004/H204     | Motor pole number selection           | 2/4/6/8/10                                                                                                              | 4                              | Pole     |
| H030/H230     | Motor parameter R1 (auto-tuning data) | 0.001 to 65.535                                                                                                         | Depends on the motor capacity. | $\Omega$ |
| H031/H231     | Motor parameter R2 (auto-tuning data) | 0.001 to 65.535                                                                                                         | Depends on the motor capacity. | $\Omega$ |

| Parameter No. | Function name                            | Data                                                                                                         | Default setting                | Unit             |
|---------------|------------------------------------------|--------------------------------------------------------------------------------------------------------------|--------------------------------|------------------|
| H032/H232     | Motor parameter L<br>(auto-tuning data)  | 0.01 to 655.35                                                                                               | Depends on the motor capacity. | mH               |
| H033/H233     | Motor parameter IO<br>(auto-tuning data) | 0.01 to 655.35                                                                                               | Depends on the motor capacity. | A                |
| H034/H234     | Motor parameter J<br>(auto-tuning data)  | 0.001 to 9999.000                                                                                            | Depends on the motor capacity. | kgm <sup>2</sup> |
| A003          | Base frequency                           | 30 to Max. frequency                                                                                         | 50                             | Hz               |
| A051          | DC injection braking selection           | 00: OFF (Disabled)<br>01: ON (Enabled)<br>02: ON (FQ) (Frequency control [A052 set value])                   | 00                             | —                |
| A082          | AVR voltage selection                    | 200/215/220/230/240:<br>Selectable for 200-V class<br>380/400/415/440/460/480:<br>Selectable for 400-V class | 200/400                        | —                |

•Note the following before use:

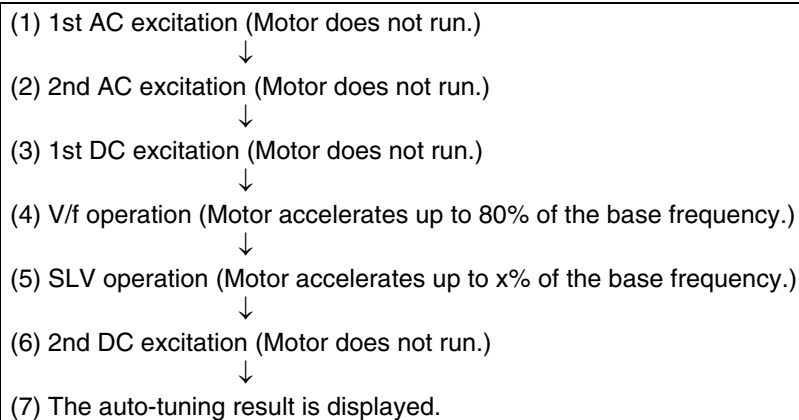
- Set base frequency A003 and AVR voltage selection A082 according to the specifications of the motor to be measured.
- The motor parameters can be determined for motors with the maximum applicable capacity or one rank lower motor size. For motors with other capacities, correct constant data may not be obtained. (In some cases, auto-tuning may not be completed. In this case, pressing the STOP/RESET key displays an error message.)
- If DC injection braking selection A051 is set to "01" (enabled), the data cannot be measured correctly. Be sure to set to "00" (disabled). (The default setting is "00" (disabled).)
- If "02" (auto-tuning with motor rotation) is selected in auto-tuning selection H001, note the following:
  - Make sure there is no problem even if the motor accelerates up to approx. 80% of the base frequency.
  - The motor is not driven by external equipment.
  - The brake is released.
  - During auto-tuning, the output torque is insufficient, which may cause an elevator system to slip and fall. To prevent this, remove the motor from the load machine, and perform the auto-tuning for the motor separately. (In this case, moment of inertia (J) is determined for the single motor. You should add a motor shaft conversion value of the load machine's moment of inertia to parameter J.)
  - With a machine (e.g. lift, ball screw) whose motor shaft rotation is limited, the machine may be damaged if the allowable rotation limit is exceeded. In this case, set H001 to "01" (auto-tuning without motor rotation).
  - With a motor whose no-load current is unknown, measure the current at 50 Hz in the "V/f setting" mode, and perform auto-tuning after setting the current value in H023/H223.
- Even if "01" (auto-tuning without motor rotation) is selected in H001, the motor may slightly rotate.
- To perform auto-tuning for one rank lower motor size, enable the overload limit function and set the overload limit level to 1.5 times the rated current of the motor.

### Operating Procedure

(1) Set auto-tuning selection H001 to "01" or "02".

(2) Turn on the RUN command.

Turning on the RUN command starts automatic operation in the following sequence.



Note 1: When "auto-tuning without motor rotation" is selected (H001 = 01), steps (4) and (5) are not performed.

Note 2: The rotation frequency in step (5) is defined as follows ("T" is whichever larger value of acceleration time or deceleration time in step (4)):

When  $T \leq 0 < 50$  s,  $x = 40\%$

When  $50 \text{ s} \leq T < 100$  s,  $x = 20\%$

When  $100 \text{ s} \leq T$ ,  $x = 10\%$

Note 3: If a trip occurs during auto-tuning, the auto-tuning processing is forced to stop.

(No error message appears. Trip display is given higher priority.)

After removing the cause of a trip, perform the auto-tuning again.

Note 4: If the auto-tuning is interrupted by STOP command input (by pressing the STOP key or by turning off the RUN command), the parameters for auto-tuning may remain in the Inverter. To perform the auto-tuning again, initialize the parameters, and then set each parameter again. (This also applies when you restart ordinary operation.)

Note 5: If the offline auto-tuning is performed with "free V/f setting" selected as the control method, the Inverter displays an error message and stops processing.

Note 6: Even if auto-tuning is completed normally, the Inverter cannot be operated with the tuning data. To do so, be sure to set motor parameter selection H002 to "01".

### Online Auto-Tuning Function

- Online auto-tuning compensates for changes in motor parameters resulting from a motor temperature rise or other factor, thus ensuring stable operation.
- This function is applicable to 1st/2nd control, not to 3rd control.

| Parameter No. | Function name             | Data                                                                                                                         | Default setting | Unit |
|---------------|---------------------------|------------------------------------------------------------------------------------------------------------------------------|-----------------|------|
| H002/H202     | Motor parameter selection | 00: Standard motor parameter<br>01: Auto-tuning parameter<br>02: Auto-tuning parameter<br>(Online auto-tuning data enabled.) | 00              | —    |

Note the following before use:

- Be sure to perform the offline auto-tuning before the online auto-tuning.
- This function calculates online auto-tuning data during offline auto-tuning. Even with a general-purpose motor, perform offline auto-tuning once.
- After the motor is stopped, online auto-tuning is performed for 5 seconds max. (For tuning R1 and R2, this function performs DC excitation once. The tuning result is not displayed.) If the RUN command is input during this period, priority is given to the RUN command, and the online auto-tuning is aborted. (The tuning result is not reflected.)



- With "DC injection braking during stop" selected, online auto-tuning starts after DC injection braking is completed.
- If FOC and SON are allocated to terminals, online auto-tuning is not performed.

#### Operating Procedure

- (1) Set motor parameter selection H002 to "02" (online auto-tuning enabled).  
(Set auto-tuning selection H001 to "00" (disabled).)
- (2) Turn on the RUN command. (The Inverter automatically performs online auto-tuning during stop.)

## Secondary Resistance Compensation Function (Temperature Compensation)

- This function compensates for speed fluctuations resulting from motor temperature changes, when "sensorless vector control", "0-Hz sensorless vector control", or "sensor vector control" is selected as the control method.

To use this function, set thermistor selection b098 to "02" (NTC).

(With other thermistors and settings, the motor temperature cannot be detected correctly.)

| Parameter No. | Function name                                              | Data                                   | Default setting | Unit |
|---------------|------------------------------------------------------------|----------------------------------------|-----------------|------|
| P025          | Secondary resistance compensation enable/disable selection | 00: OFF (Disabled)<br>01: ON (Enabled) | 00              | —    |

## Motor Parameter Selection

- Set this parameter according to your motor.
- To use several motors with a single Inverter in the "VC", "special VP", or "free V/F setting" control mode, calculate the total capacity of the motors and select the closest value in the motor capacity selection.
- When automatic torque boost is used, improper setting of this parameter may result in torque reduction or motor hunting.
- The motor parameters for "sensorless vector control", "0-Hz sensorless vector control", or "sensor vector control" can be selected from the following three types:
  - Motor parameter of a standard motor
  - Motor parameter measured by offline auto-tuning
  - Arbitrarily set motor parameter
- For 3rd control, motor parameters specified for 1st control are used.

| Parameter No.      | Function name                         | Data                                                                                                                                                                                                                                                            | Default setting                | Unit             |
|--------------------|---------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|------------------|
| A044/A244/<br>A344 | V/f characteristics selection         | 00: VC (Constant torque characteristics)<br>01: VP (Special reduced torque characteristics)<br>02: Free V/f (characteristics) *1<br>03: SLV (Sensorless vector control) *1<br>04: 0SLV (0-Hz sensorless vector control) *1<br>05: V2 (Sensor vector control) *1 | 00                             | —                |
| H002/H202          | Motor parameter selection             | 00: Standard motor parameter<br>01: Auto-tuning parameter<br>02: Online auto-tuning parameter                                                                                                                                                                   | 00                             | —                |
| H003/H203          | Motor capacity selection              | 0.2 to 160.0                                                                                                                                                                                                                                                    | Factory default                | kW               |
| H004/H204          | Motor pole number selection           | 2/4/6/8/10                                                                                                                                                                                                                                                      | 4                              | Pole             |
| H020/H220          | Motor parameter R1                    | 0.001 to 65.535                                                                                                                                                                                                                                                 | Depends on the motor capacity. | $\Omega$         |
| H021/H221          | Motor parameter R2                    | 0.001 to 65.535                                                                                                                                                                                                                                                 | Depends on the motor capacity. | $\Omega$         |
| H022/H222          | Motor parameter L                     | 0.01 to 655.35                                                                                                                                                                                                                                                  | Depends on the motor capacity. | mH               |
| H023/H223          | Motor parameter IO                    | 0.01 to 655.35                                                                                                                                                                                                                                                  | Depends on the motor capacity. | A                |
| H024/H224          | Motor parameter J                     | 0.001 to 9999.000 *2                                                                                                                                                                                                                                            | Depends on the motor capacity. | kgm <sup>2</sup> |
| H030/H230          | Motor parameter R1 (auto-tuning data) | 0.001 to 65.535                                                                                                                                                                                                                                                 | Depends on the motor capacity. | $\Omega$         |
| H031/H231          | Motor parameter R2 (auto-tuning data) | 0.001 to 65.535                                                                                                                                                                                                                                                 | Depends on the motor capacity. | $\Omega$         |
| H032/H232          | Motor parameter L (auto-tuning data)  | 0.01 to 655.35                                                                                                                                                                                                                                                  | Depends on the motor capacity. | mH               |
| H033/H233          | Motor parameter IO (auto-tuning data) | 0.01 to 655.35                                                                                                                                                                                                                                                  | Depends on the motor capacity. | A                |
| H034/H234          | Motor parameter J (auto-tuning data)  | 0.001 to 9999.000 *2                                                                                                                                                                                                                                            | Depends on the motor capacity. | kgm <sup>2</sup> |

\*1. For 1st control A044, all items (00 to 05) are selectable. However, for 2nd control A244 and 3rd control A344, the selectable range is 00 to 04, and 00 to 01, respectively. For ND the selectable range is 00 to 02.

\*2: Convert moment of inertia J into motor shaft data. The larger the J value, the faster the response, resulting in a steep torque rise; the smaller the J value, the slower the response, resulting in a gradual torque rise. After setting the J value, adjust the response speed in speed response H005/H205.

### Arbitrary Motor Parameter

- For arbitrary settings of motor parameters, the function codes vary depending on the setting of 1st/2nd control and on the set value of the motor parameter selection.
  - When 1st/2nd control is enabled and the motor parameter selection is set to "00" → Directly enter H020 to H024.
  - When 1st/2nd control is enabled and the motor parameter selection is set to "01" or "02" → Directly enter H030 to H034.
- If offline auto-tuning has not been performed, the motor parameters in the same capacity rank as the Inverter (standard motor parameters) are set in H030/H230 to H034/H234.

### Sensorless Vector Control

- This function estimates and controls motor rpm and output torque based on the Inverter's output voltage and current, as well as the motor parameter settings. This control method provides high starting torque in a low-frequency range (0.3 Hz), enabling high-precision operation.
- To use this function, set V/f characteristics selection A044/A244 to "03".
- To use this function, make sure that the motor parameter settings are suitable for your motor. (Refer to "Motor Parameter Selection" (page 4-115)).
- Note the following before use:
  - Sufficient characteristics may not be obtained if you select a motor size two or more ranks lower than the motor size specified.
  - If sensorless vector control cannot provide the desired characteristics, adjust the motor parameters depending on the phenomena, as shown in the table below.

| Operation status        | Phenomenon                                               | Adjusting method                                                                                                                                                              | Adjustment item      |
|-------------------------|----------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|
| Power running           | Speed change ratio is a negative value.                  | Increase motor parameter R2 gradually (up to set parameter $\times 1.2$ ).                                                                                                    | H021/H221/H031       |
|                         | Speed change ratio is a positive value.                  | Reduce motor parameter R2 gradually (down to set parameter $\times 0.8$ ).                                                                                                    | H021/H221/H031       |
| Regeneration            | Insufficient torque at low frequency (several Hz)        | Increase motor parameter R1 gradually (up to set parameter $\times 1.2$ ).                                                                                                    | H020/H220/H030       |
|                         |                                                          | Increase motor parameter I <sub>o</sub> gradually (up to set parameter $\times 1.2$ ).                                                                                        | H023/H223/H033       |
| During startup          | Shock occurs during startup.                             | Reduce motor parameter J from the set parameter.                                                                                                                              | H024/H224/H034       |
| During deceleration     | Motor hunting                                            | Reduce the speed response.                                                                                                                                                    | H005/H205            |
|                         |                                                          | Reduce motor parameter J from the set parameter.                                                                                                                              | H024/H224/H034       |
| During torque limit     | Insufficient torque at low frequency during torque limit | Set a overload limit level lower than that of the torque.                                                                                                                     | b021<br>b041 to b044 |
| Low-frequency operation | Rotation is not constant.                                | Increase motor parameter J from the set parameter.                                                                                                                            | H024/H224/H034       |
| Related functions       |                                                          | A001, A044/A244, F001, b040, b041 to b044, H002/H202, H003/H203, H004/H204, H005/H205, H020/H220, H021/H221, H022/H222, H023/H223, H024/H224, H050/H250, H051/H251, H052/H252 |                      |

Note 1: Make sure that the carrier frequency (b083) is not lower than 2.1 kHz. If the carrier frequency is lower than 2.1 kHz, the Inverter does not operate normally.

Note 2: To use lower rank motor size than the Inverter, set a torque limit value (b041 to b044), while keeping the value  $\alpha$ , calculated with the following formula, at 200% or lower. Otherwise, the motor may burn out.

$$\alpha = \text{Torque limit set value} \times (\text{Inverter capacity}) / (\text{Motor capacity})$$

(Example) If the Inverter capacity is 0.75 kW and the motor capacity is 0.4 kW, the torque limit set value for  $\alpha = 200\%$ , calculated with the above formula, is as follows: Torque limit set value (b041 to b044) =  $\alpha \times (\text{Motor capacity}) / (\text{Inverter capacity}) = 200\% \times (0.4 \text{ kW}) / (0.75 \text{ kW}) = 106\%$

## 0-Hz Sensorless Vector Control

- This function enables high-torque operation in the 0-Hz range (0- to 3-Hz frequency reference). This control method is particularly suitable for applications such as an elevating system, which requires sufficient torque in a low-frequency range at startup (e.g. crane, hoist).
- To use this function, set V/f characteristics selection A044/A244 to "04".
- To use this function, make sure that the motor parameter settings are suitable for your motor. (Refer to "Motor Parameter Selection" (page 4-115).)
- The parameters for 0-Hz SLV control are as follows:
  - In 0-Hz limit H060/H260, you can set a current value used for constant current control in the 0-Hz range (generally, 3.0 Hz or lower). This parameter is expressed as a ratio of the output current to the Inverter's rated current.
  - In 0-Hz SLV startup boost amount H061/H261, you can set a current boost amount at startup in the 0-Hz range. A current value expressed as a ratio to the Inverter's rated current is added to the current value set in H060/H260 at startup only.

| Parameter No. | Function name                     | Data                                                  | Default setting | Unit |
|---------------|-----------------------------------|-------------------------------------------------------|-----------------|------|
| H060/H260     | Limit at 0 Hz                     | 0.0 to 100.0:<br>Current limit in low frequency range | 100.0           | %    |
| H061/H261     | Boost amount at SLV startup, 0 Hz | 0 to 50: Current boost amount at startup              | 50              | %    |

- Note the following before use:
  - Select an Inverter with one rank higher in capacity than the motor's.
  - Sufficient characteristics may not be obtained if you select a motor size two or more ranks lower than the maximum applicable motor size.
  - In the 0-Hz sensorless control mode, the digital command board (3GAX-DI01) cannot be used.
  - If 0-Hz sensorless vector control cannot provide the desired characteristics, adjust the motor parameters depending on the phenomena, as shown in the table below.

| Operation status               | Phenomenon                                          | Adjusting method                                                                                                                                                                                    | Adjustment item |
|--------------------------------|-----------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|
| Power running                  | Speed change ratio is a negative value.             | Increase motor parameter R2 gradually (up to set parameter $\times 1.2$ ).                                                                                                                          | H021/H221/H031  |
|                                | Speed change ratio is a positive value.             | Reduce motor parameter R2 gradually (down to set parameter $\times 0.8$ ).                                                                                                                          | H021/H221/H031  |
| Regeneration                   | Insufficient torque at low frequency (several Hz)   | Increase motor parameter R1 gradually (up to set parameter $\times 1.2$ ).                                                                                                                          | H020/H220/H030  |
|                                |                                                     | Increase motor parameter I <sub>o</sub> gradually (up to set parameter $\times 1.2$ ).                                                                                                              | H023/H223/H033  |
| During startup                 | Shock occurs during startup.                        | Reduce motor parameter J from the set parameter.                                                                                                                                                    | H024/H224/H034  |
| During deceleration            | Motor hunting                                       | Reduce the speed response.                                                                                                                                                                          | H005/H205       |
|                                |                                                     | Reduce motor parameter J from the set parameter.                                                                                                                                                    | H024/H224/H034  |
| Immediately after deceleration | Overcurrent or overvoltage protection is activated. | Reduce motor parameter I <sub>o</sub> gradually (down to set parameter $\times 0.8$ ).                                                                                                              | H023/H223/H033  |
|                                |                                                     | Set AVR selection A081 to "00" (always ON) or "01" (always OFF).                                                                                                                                    | A081            |
| Low-frequency operation        | Rotation is not constant.                           | Increase motor parameter J from the set parameter.                                                                                                                                                  | H024/H224/H034  |
| Related functions              |                                                     | A001, A044/A244, F001, b040, b041 to b044, H002/H202, H003/H203, H004/H204, H005/H205, H020/H220, H021/H221, H022/H222, H023/H223, H024/H224, H050/H250, H051/H251, H052/H252, H060/H260, H061/H261 |                 |

Note 1: Make sure that the carrier frequency (b083) is not lower than 2.1 kHz. If the carrier frequency is at 2.1 kHz or lower, the Inverter does not operate normally.

Note 2: Set a torque limit value (b041 to b044), while keeping the value  $\alpha$ , calculated with the following formula, at 200% or lower. Otherwise, the motor may burn out.

$$\alpha = \text{Torque limit set value} \times (\text{Inverter capacity}) / (\text{Motor capacity})$$

(Example) If the Inverter capacity is 0.75 kW and the motor capacity is 0.4 kW, the torque limit set value for  $\alpha = 200\%$ , calculated with the above formula, is as follows: Torque limit set value (b041 to b044) =  $\alpha \times (\text{Motor capacity}) / (\text{Inverter capacity}) = 200\% \times (0.4 \text{ kW}) / (0.75 \text{ kW}) = 106\%$

## Torque Monitor Function

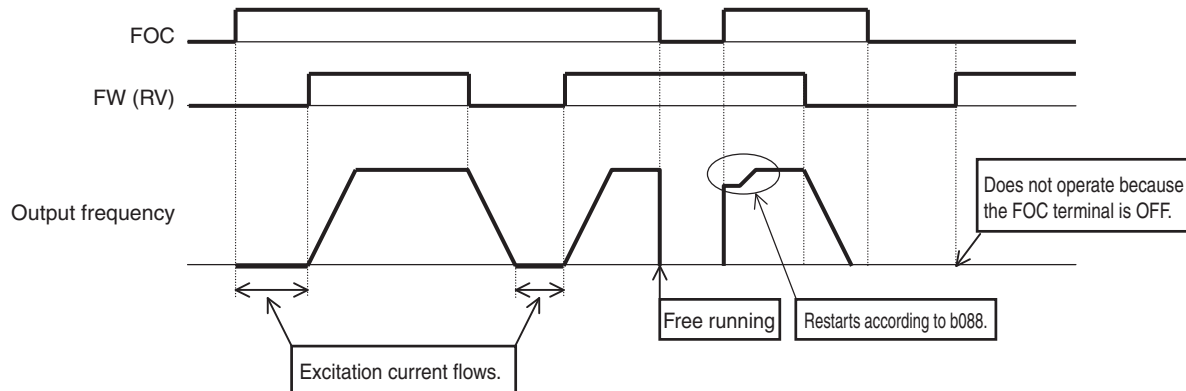
- This function allows you to monitor an estimated motor output torque, when "sensorless vector control", "0-Hz sensorless vector control", or "sensor vector control" is selected as the control method.

| Parameter No.        | Function name                                 | Data                                                                                                               | Default setting | Unit |
|----------------------|-----------------------------------------------|--------------------------------------------------------------------------------------------------------------------|-----------------|------|
| A044/A244            | V/f characteristics selection                 | 03: SLV (Sensorless vector control)<br>04: 0SLV (0-Hz sensorless vector control)<br>05: V2 (Sensor vector control) | 00              | —    |
| C027<br>C028<br>C029 | FM selection<br>AM selection<br>AMI selection | 02: Output TRQ (Output torque)<br>11: Out TRQ sign (Output torque (signed))<br>(C028 only)                         | 00              | —    |
| H003/H203            | Motor capacity selection                      | 0.20 to 160.0                                                                                                      | Factory default | kW   |
| H004/H204            | Motor pole number selection                   | 2/4/6/8/10                                                                                                         | 4               | Pole |

- To use the monitor via the Digital Operator, select display code d012.
- To use the monitor with a signal from the control terminal block, refer to "Digital FM Terminal" (page 4-109) or "Analog Output AM/AMI Terminals" (page 4-110).
- If "VC", "special VP", or "free V/f setting" is selected in V/f characteristics selection A044/A244, this function is disabled, and the display or the output signal from the control terminal block is not defined.
- For a torque monitor value of this function, the output torque at the rated frequency equivalent to the motor's output rating during synchronous rotation is indicated as 100%.
- Since this function estimates output torque based on the motor current, the accuracy is approx. 20% when a motor with the same output capacity as the Inverter is used.

## Preliminary Excitation Function (FOC)

- This function supplies excitation current from an input terminal to establish magnetic flux preliminarily, when "03" (sensorless vector control), "04" (0-Hz sensorless vector control), or "05" (sensor vector control) is selected in V/f characteristics selection A004/A244.
- Allocate 55 (FOC) to the desired multi-function input.
- The Inverter does not accept the RUN command unless the FOC terminal is turned on when FOC is allocated.
- If the FOC terminal is turned off during operation, the Inverter goes into free-run status. If the FOC terminal is turned on again, the Inverter restarts according to the setting of free-run stop selection b088.



Related functions

A044/A244, C001 to C008

## High-torque Multi-operation

- When "sensorless vector control" or "0-Hz sensorless vector control" is selected with a single Inverter, this function controls two motors of the same type to drive a single load.
- To use this function, you set the same parameters as when you select "Sensorless Vector Control" (page 4-116) or "0-Hz Sensorless Vector Control" (page 4-117). However, set the motor parameters as follows:
  - Set motor parameters R1, R2, and L to one half of the set value for one motor.
  - Set motor parameter I<sub>o</sub> to be twice the set value for one motor.
  - Set motor parameter J to one half of the total moment of inertia of two motors and loads connected to these motors.
  - Select the motor capacity value closest to the total capacity of two motors.
- When different loads are driven with two motors, a fluctuation in one load affects the operating condition of the other, which may hinder normal control.  
To prevent this, be sure to operate a system in a way that the load driven by two motors is regarded as one load.

Related functions

A044/A244, F001, b040, b041 to b044, H002/H202, H003/H203, H004/H204, H005/H205, H020/H220, H021/H221, H022/H222, H023/H223, H024/H224, H050/H250, H051/H251, H052/H252

## Stabilization Parameter

- This function adjusts to reduce motor hunting.
- In case of motor hunting, check whether motor capacity H003/H203 and motor pole number selection H004/H204 match your motor. If they do not, match them. If the motor's primary resistance is smaller than that of the standard motor, increase the H006/H206/H306 set value gradually. To run a motor with a capacity larger than the Inverter's rated capacity, reduce the set value.
- Other than this function, the following methods are suggested to reduce hunting:  
Lower the carrier frequency (b083). (Refer to page 4-68.)  
Lower the output voltage gain (A045). (Refer to page 4-24.)

| Parameter No.  | Function name           | Data                                                     | Default setting | Unit |
|----------------|-------------------------|----------------------------------------------------------|-----------------|------|
| H006/H206/H306 | Stabilization parameter | 0 to 255:<br>If hunting occurs, adjust the set value.    | 100             | —    |
| A045           | Output voltage gain     | 20 to 100:<br>If hunting occurs, reduce the set value.   | 100             | %    |
| b083           | Carrier frequency       | 0.5 to 15.0:<br>If hunting occurs, reduce the set value. | 5.0             | kHz  |

## Auto Return Initial Display

- Ten minutes after last key operation display returns to the initial parameter set by b038.

| Parameter No. | Function name               | Data                                   | Default setting |
|---------------|-----------------------------|----------------------------------------|-----------------|
| b164          | Auto return initial display | 00: OFF (Disabled)<br>01: ON (Enabled) | 00              |

## Data Read/Write Selection

- Restrict the data read/write operation by 3G3AX-OP05.

| Parameter No. | Function name             | Data                                                                   | Default setting |
|---------------|---------------------------|------------------------------------------------------------------------|-----------------|
| b166          | Data read/write selection | 00: R/W OK (Read/Write OK)<br>01: R/W Protected (Read/Write protected) | 00              |

## Option I/F cmd W Register 1 to 10

- When communication option board is used these parameters are used to define a user exchange area with the master unit. Refer to specific option board manual for details.

| Parameter No. | Function name                     | Data         | Default setting |
|---------------|-----------------------------------|--------------|-----------------|
| P160 to P169  | Option I/F cmd W register 1 to 10 | 0000 to FFFF | 0000            |

## Option I/F cmd R Register 1 to 10

- When communication option board is used these parameters are used to define a user exchange area with the master unit. Refer to specific option board manual for details.

| Parameter No. | Function name                     | Data         | Default setting |
|---------------|-----------------------------------|--------------|-----------------|
| P170 to P179  | Option I/F cmd R register 1 to 10 | 0000 to FFFF | 0000            |

## Profibus Communications

- Use these parameters to define the node address and communication type when 3G3AX-RX-PRT Profibus unit is used.

| Parameter No. | Function name          | Data                                             | Default setting |
|---------------|------------------------|--------------------------------------------------|-----------------|
| P180          | Profibus node address  | 0 to 125                                         | -               |
| P181          | Profibus clear mode    | 00: Clear<br>01: Last value                      | 00              |
| P182          | Profibus map selection | 00: PPO<br>01: Conventional<br>02: Flexible mode | 00              |

## CompoNet Communications

- Use these parameters to configure CompoNet network when 3G3AX-RX-CRT CompoNet unit is used.

| Parameter No. | Function name                             | Data                                                                                                                                                                                                                                                                            | Default setting |
|---------------|-------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|
| P045          | Operation setting at communications error | 00: Trip<br>01: Decel-Trip (Trip after deceleration stop)<br>02: Ignore<br>03: Free run<br>04: Decel-Stop (Deceleration stop)                                                                                                                                                   | 00              |
| P046          | Instance Number                           | 0: Basic speed I/O<br>1: Extended speed I/O<br>2: Extended speed and Torque control<br>3: Special I/O<br>4: Extended control I/O<br>5: Extended control I/O and multifunction I/O monitor<br>6: Flexible format<br>7: Extended speed and Acceleration control<br>8-20: Not used | 1               |
| P048          | Operation setting at idle mode detection  | 00: Trip<br>01: Decel-Trip (Trip after deceleration stop)<br>02: Ignore<br>03: Free RUN<br>04: Decel-Stop (Deceleration stop)                                                                                                                                                   | 00              |
| P190          | CompoNet node address                     | 0 to 63                                                                                                                                                                                                                                                                         | 0               |



## DeviceNet Communications

•Use these parameters to configure DeviceNet network when 3G3AX-RX-DRT unit is used.

| Parameter No. | Function name                             | Data                                                                                                                                                                                                                                                                            | Default setting |
|---------------|-------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|
| P044          | DeviceNet comm Watch dog timer            | 0.00 to 99.99                                                                                                                                                                                                                                                                   | 1.00            |
| P045          | Operation setting at communications error | 00: Trip<br>01: Decel-Trip (Trip after deceleration stop)<br>02: Ignore<br>03: Free RUN<br>04: Decel-Stop (Deceleration stop)                                                                                                                                                   | 00              |
| P046          | Instance Number                           | 0: Basic speed I/O<br>1: Extended speed I/O<br>2: Extended speed and Torque control<br>3: Special I/O<br>4: Extended control I/O<br>5: Extended control I/O and multifunction I/O monitor<br>6: Flexible format<br>7: Extended speed and Acceleration control<br>8-20: Not used | 1               |
| P048          | Operation setting at idle mode detection  | 00: Trip<br>01: Decel-Trip (Trip after deceleration stop)<br>02: Ignore<br>03: Free RUN<br>04: Decel-Stop (Deceleration stop)                                                                                                                                                   | 00              |
| P049          | Polarity setting for rotation speed       | 0/2/4/6/8/10/12/14/16/18/20/22/24/26/28/<br>30/32/34/36/38                                                                                                                                                                                                                      | 0               |
| P192          | DeviceNet node address                    | 0 to 63                                                                                                                                                                                                                                                                         | 63              |

4

Functions

## MECHATROLINK-II Communications

•Use these parameters to configure the MECHATROLINK-II network when 3G3AX-RX-MRT unit is used.

| Parameter No. | Function name    | Data                         | Default setting |
|---------------|------------------|------------------------------|-----------------|
| P195          | ML2 frame length | 00: 32 bytes<br>01: 17 bytes | 00              |
| P196          | ML2 node address | 21 to 3E                     | 21              |

## 4-3 Functions When PG Option Board (3G3AX-PG01) Is Used

### Functions That Need 3G3AX-PG01

- Generally, the Feedback Option Board (3G3AX-PG01) is required for the following two cases:
  - "05" (V2: sensor vector control) is selected in V/f characteristics selection A044.
  - "Pulse train frequency input" is selected in any of the following parameters:
- "06" (pulse train frequency) is selected in frequency reference selection A001.
- With "10" (operation function result) selected in frequency reference selection A001, "07" (pulse train frequency) is selected in operation frequency input A setting (A141) or operation frequency input B setting (A142).
- "03" (pulse train frequency) is selected in PID feedback selection A076.
- When running the Inverter with V/f characteristics selection A044 set to "00" (VC), you can check the rotation direction with real frequency monitor d008.  
(If positive frequency is detected when the forward command is activated, or if negative frequency is detected when the reverse command is activated, the rotation direction is judged as being normal.)

|                   |                              |
|-------------------|------------------------------|
| Related functions | A044, A001, A076, A141, A142 |
|-------------------|------------------------------|

## V2 Control Mode Selection

Select a control method in V2 control mode selection P012.

When "00" (ASR) is selected in P012, speed control mode is enabled. Select a frequency reference in frequency reference selection A001.

When "01" (APR) is selected in P012, the Inverter enables position control by generating frequency reference based on the position command pulse input from the pulse train position command input terminal, and on the position feedback detected by the encoder.

Select any of the three pulse train position command input modes in pulse train mode selection P013.

To perform pulse train position control, allocate "48" (STAT) to any of the multi-function input terminals. While the STAT terminal is tuned on, pulse train position command input is accepted.

Position deviation can be cleared through external input. Allocate "47" (PCLR) to any of the multi-function input terminals. Turning on and then off the PCLR terminal can clear position deviation data. Allocate "22" (DSE) to any of the multi-function output terminals to enable excessive speed deviation signal output.

Set a deviation level in speed deviation error detection level P027. When the deviation between real frequency and reference frequency exceeds the P027 set value, the DSE signal turns on.

When "02" (APR2) or "03" (HAPR) is selected in P012, the Inverter performs absolute position control with reference to the absolute position from its origin.

| Parameter No.     | Function name                                      | Data                                                                                                                                                                                  | Default setting | Unit  |
|-------------------|----------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|-------|
| P012              | V2 control mode selection                          | 00: ASR (speed control mode)<br>01: APR (pulse train position control mode)<br>02: APR2 (absolute position control mode)<br>03: HAPR (high-resolution absolute position control mode) | 00              | —     |
| P011              | Encoder pulses                                     | 128 to 65535:<br>Number of encoder pulses                                                                                                                                             | 1024            | Pulse |
| P023              | Position loop gain                                 | 0.00 to 100.00: Position loop gain                                                                                                                                                    | 0.50            | rad/s |
| P027              | Speed deviation error detection level              | 0.00 to 120.00:<br>DSE signal output level                                                                                                                                            | 7.50            | Hz    |
| H004              | Motor pole number selection                        | 2/4/6/8/10: Select the number of motor poles.                                                                                                                                         | 4               | Pole  |
| C001 to C008      | Multi-function inputs 1 to 8 selection             | 47: PCLR (position deviation clear)<br>48: STAT (pulse train position command input permission)                                                                                       | —               | —     |
| C021 to C025      | Multi-function output terminals 11 to 15 selection | 22: DSE (excessive speed deviation)                                                                                                                                                   | —               | —     |
| C026              | Relay output (AL2, AL1) function selection         |                                                                                                                                                                                       | 05              |       |
| Related functions |                                                    | A001, P013                                                                                                                                                                            |                 |       |

## Sensor Vector Control (Speed Control)

To use this function, set V/f characteristics selection A044 to "05" (V2), and V2 control mode selection P012 to "00" (speed control).

("Sensor vector control" can be selected for 1st control only.)

To use this function, make sure that the motor parameter settings are suitable for your motor. Refer to Inverter model RX user's manual "Chapter 4 Functions, 4-2 Function Mode, Motor Parameter Selection".

Also, be sure to set the number of your encoder pulses.

With V2 control mode selection P012, you can select four types of control modes: Speed control, Pulse train position control, Absolute position control, and High-resolution absolute position control. Note the following before use:

- Sufficient characteristics may not be obtained if you select a motor size two or more ranks lower than the maximum applicable motor size.
- If the Inverter does not normally accelerate, or if overload protection is activated, check the phase order of the encoder signal.

(If phase A is advanced by 90° from phase B during forward run, it is judged as being normal.)

When running the Inverter with V/f characteristics selection A044 set to "00" (VC), you can check the rotation direction with real frequency monitor d008.

(If positive frequency is detected when the forward command is activated, or if negative frequency is detected when the reverse command is activated, the rotation direction is judged as being normal.)

If sensor vector control cannot provide the desired characteristics, adjust the motor parameters depending on the phenomena, as shown in the table below.

| Operation status        | Phenomenon                                               | Adjusting method                                                                               | Adjustment item      |
|-------------------------|----------------------------------------------------------|------------------------------------------------------------------------------------------------|----------------------|
| During startup          | Shock occurs during startup.                             | Reduce motor parameter J from the set parameter.                                               | H024/H034            |
| During deceleration     | Motor hunting                                            | Reduce the speed response.                                                                     | H005                 |
|                         |                                                          | Reduce motor parameter J from the set parameter.                                               | H024/H034            |
| During torque limit     | Insufficient torque at low frequency during torque limit | Set a overload limit level lower than that of the torque.                                      | b021<br>b041 to b044 |
| Low-frequency operation | Rotation is not constant.                                | Increase motor parameter J from the set parameter.                                             | H024/H034            |
| Related functions       |                                                          | A001, A044, F001, b040, H002, H003, H004, H020, H021, H022, H023, H050, H051, H052, P011, P012 |                      |

Note 1: Make sure that the carrier frequency (b083) is not lower than 2.1 kHz. If the carrier frequency is at 2.1 kHz or lower, the Inverter does not operate normally.

Note 2: To use a lower rank motor size than the Inverter, set a torque limit value (b041 to b044), while keeping the value  $\alpha$ , calculated with the following formula, at 200% or lower. Otherwise, the motor may burn out.  
 $\alpha = \text{Torque limit set value} \times (\text{Inverter capacity}) / (\text{Motor capacity})$

(Example) If the Inverter capacity is 0.75 kW and the motor capacity is 0.4 kW, the torque limit set value for  $\alpha = 200\%$ , calculated with the above formula, is as follows:

$$\begin{aligned} \text{Torque limit set value (b041 to b044)} &= \alpha \times (\text{Motor capacity}) / (\text{Inverter capacity}) \\ &= 200\% \times (0.4 \text{ kW}) / (0.75 \text{ kW}) = 106\% \end{aligned}$$

## Torque Bias Function

This function applies bias to the torque reference generated by speed control, and is useful for elevating applications (e.g. elevator).

| Parameter No.     | Function name                                 | Data                                                                                                                    | Default setting | Unit |
|-------------------|-----------------------------------------------|-------------------------------------------------------------------------------------------------------------------------|-----------------|------|
| P036              | Torque bias mode                              | 00: OFF (Disabled)<br>01: OPE (Digital Operator)<br>02: O2 (Terminal O2) * <sup>1</sup><br>05: Option 1<br>06: Option 2 | 00              | —    |
| P037              | Torque bias value                             | -200 to 200 (0.4 to 55 kW)<br>-180 to 180 (75 to 132 kW)<br>Enabled when P036 = 01                                      | 0               | %    |
| P038              | Torque bias polarity selection * <sup>2</sup> | 00: Sign (Signed)<br>01: Direction (Depends on the RUN direction)                                                       | 00              | —    |
| Related functions | d010                                          |                                                                                                                         |                 |      |

\*1. When torque bias is set to the O2 terminal, -10 to +10 (V) is recognized as -200 to +200 (%).

\*2. • When "00" (As per sign) is selected:

When the polarity of a torque bias signal is (+), the torque increases for forward rotation, and when it is (-), the torque increases for reverse rotation, regardless of the RUN direction.

• When "01" (Depends on the RUN direction) is selected:

The torque bias signal polarity and torque bias direction vary depending on the RUN command direction.

Forward command: Applies torque in the same direction as the torque bias.

Reverse command: Applies torque in the opposite direction of the torque bias.

## Torque Control

Under this function, the Inverter can be used in torque control, as well as in the speed and pulse train position controls.

Torque control can be applied to winders, and more.

To run the Inverter in torque control mode, allocate "52" (ATR) to any of the multi-function inputs. While the ATR terminal is turned on, the torque reference input is enabled.

In torque reference input selection P033, you can select one of the three analog inputs or the input via the Digital Operator.

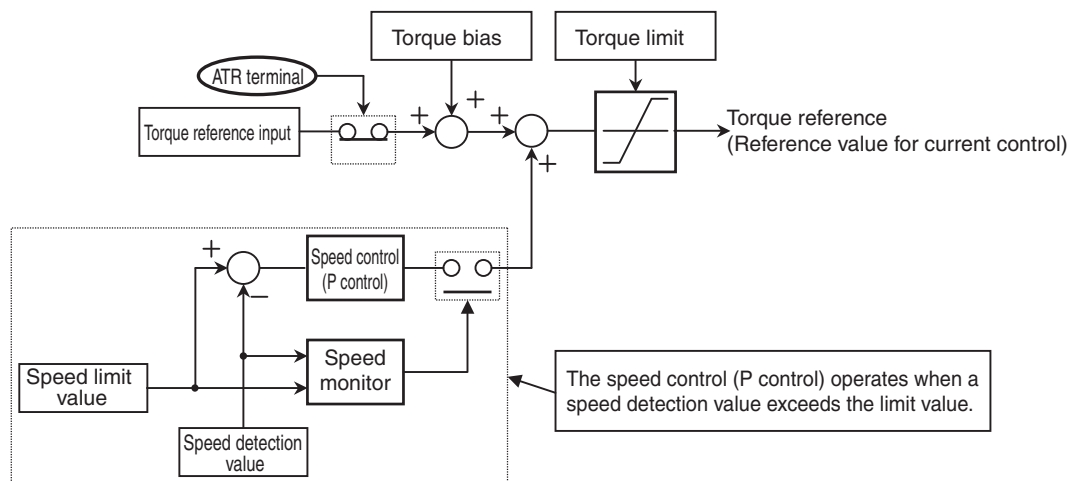
The torque control speed depends on the balance between torque and load. To prevent the Inverter from running out of control, set a speed limit value in P039 (forward) or P040 (reverse).

| Parameter No. | Function name                                 | Data                                                                                                                             | Default setting | Unit |
|---------------|-----------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------|-----------------|------|
| P033          | Torque reference input selection              | 00: O (Terminal O)<br>01: OI (Terminal OI)<br>02: O2 (Terminal O2)<br>03: OPE (Digital Operator)<br>06: Option 1<br>07: Option 2 | 00              | —    |
| P034          | Torque reference setting                      | 0 to 200 (0.4 to 55 kW)<br>0 to 180 (75 to 132 kW)<br>Torque reference when P033 = 03                                            | 0               | %    |
| P035          | Polarity selection at torque reference via O2 | 00: Sign (Signed)<br>01: Direction (Depends on the RUN direction)                                                                | 00              | -    |

## 4-3 Functions When PG Option Board (3G3AX-PG01) Is Used

| Parameter No.     | Function name                                 | Data                                                                                                 | Default setting | Unit |
|-------------------|-----------------------------------------------|------------------------------------------------------------------------------------------------------|-----------------|------|
| P039              | Speed limit value in torque control (forward) | 0.00 to Maximum frequency                                                                            | 0.00            | Hz   |
| P040              | Speed limit value in torque control (reverse) | 0.00 to Maximum frequency                                                                            | 0.00            | Hz   |
| P036              | Torque bias mode                              | 00: OFF (None)<br>01: OPE (Digital Operator)<br>02: O2 (Terminal O2)<br>05: Option 1<br>06: Option 2 | 00              | —    |
| P037              | Torque bias value                             | -200 to +200 (0.4 to 55 kW)<br>-180 to +180 (75 to 132 kW)<br>Enabled when P036 = 01                 | 0               | %    |
| P038              | Torque bias polarity selection                | 00: Sign (Signed)<br>01: Direction (Depends on the RUN direction)                                    | 00              | —    |
| C001 to C008      | Multi-function inputs 1 to 8 selection        | 52: ATR (torque command input permission)                                                            | —               | —    |
| Related functions | d009, d010, d012                              |                                                                                                      |                 |      |

### Control Block Diagram



## Pulse Train Position Control Mode

To use this function, set V/f characteristics selection A044 to "05" (V2), and V2 control mode selection P012 to "01" (pulse train position control).

("Sensor vector control" can be selected for 1st control only.)

Select a pulse train position command input mode in pulse train mode selection P013.

| Parameter No. | Function name              | Data                                                                                                                                                               | Default setting | Unit |
|---------------|----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|------|
| P012          | V2 control mode selection  | 01: APR (pulse train position control mode)                                                                                                                        | 00              | —    |
| P013          | Pulse train mode selection | 00: Mode 1 (pulse train with 90° phase difference)<br>01: Mode 2 (forward/reverse command + pulse train)<br>02: Mode 3 (forward pulse train + reverse pulse train) |                 |      |

| Parameter No. | Function name                              | Data                                                                                            | Default setting | Unit  |
|---------------|--------------------------------------------|-------------------------------------------------------------------------------------------------|-----------------|-------|
| P017          | Position ready range setting               | 0 to 10000:<br>Set a value equivalent to encoder ×4 multiplication.                             | 5               | —     |
| P018          | Position ready delay time setting          | 0.00 to 9.99                                                                                    | 0.00            | s     |
| P019          | Electronic gear setting position selection | 00: FB (Position feedback side)<br>01: REF (Position command side)                              | 00              | —     |
| P020          | Electronic gear ratio numerator            | 1 to 9999                                                                                       | 1               | —     |
| P021          | Electronic gear ratio denominator          | 1 to 9999                                                                                       | 1               | —     |
| P022          | Position control feedforward gain          | 0.00 to 655.35                                                                                  | 0.00            | —     |
| P023          | Position loop gain                         | 0.00 to 100.00                                                                                  | 0.50            | rad/s |
| P024          | Position bias amount                       | -2048 to 2048                                                                                   | 0               | rad/s |
| C001 to C008  | Multi-function inputs 1 to 8 selection     | 47: PCLR (position deviation clear)<br>48: STAT (pulse train position command input permission) | —               | —     |

Frequency reference for the pulse train position control mode is calculated with the following formula:

$$\text{Frequency reference (Hz)} = \frac{6.4 \times P \times K_v}{\text{ENC}} \times \frac{\Delta P}{255}$$

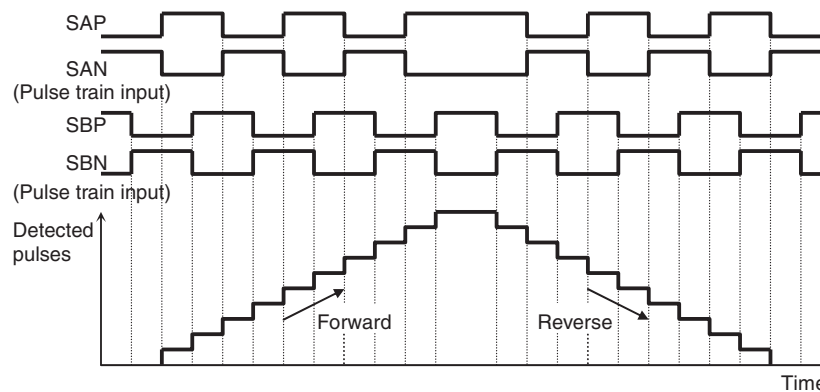
**P** : Number of motor poles  
**K<sub>v</sub>** : Position loop gain  
**ENC** : Number of encoder pulses  
**ΔP** : Position deviation

In the position control mode, the acceleration/deceleration time settings are disabled. (The Inverter is automatically brought into LAD cancel status.)

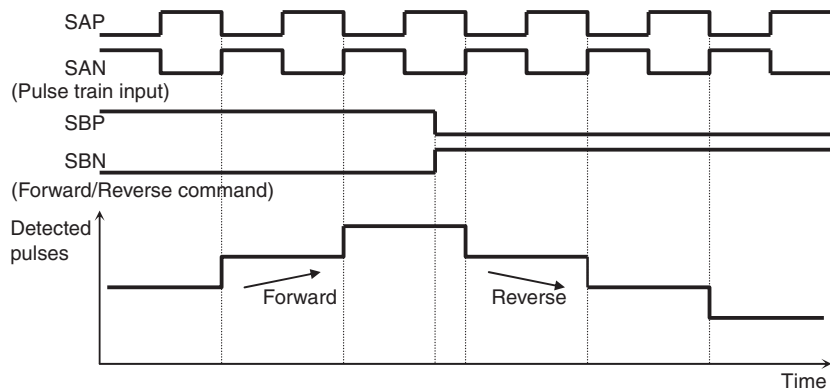
The higher the position loop-back gain, the shorter the acceleration/deceleration time.

For details on the pulse train input mode, refer to the following.

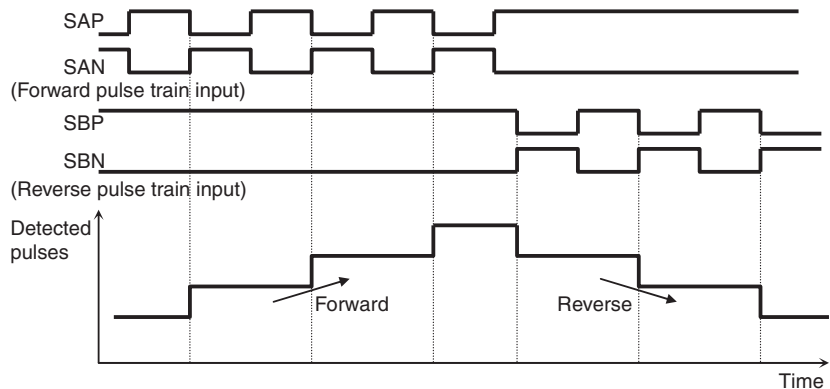
•Mode 0: Pulse train with 90° phase difference



•Mode 1: Forward/Reverse command + Pulse train



•Mode 2: Forward pulse train + Reverse pulse train



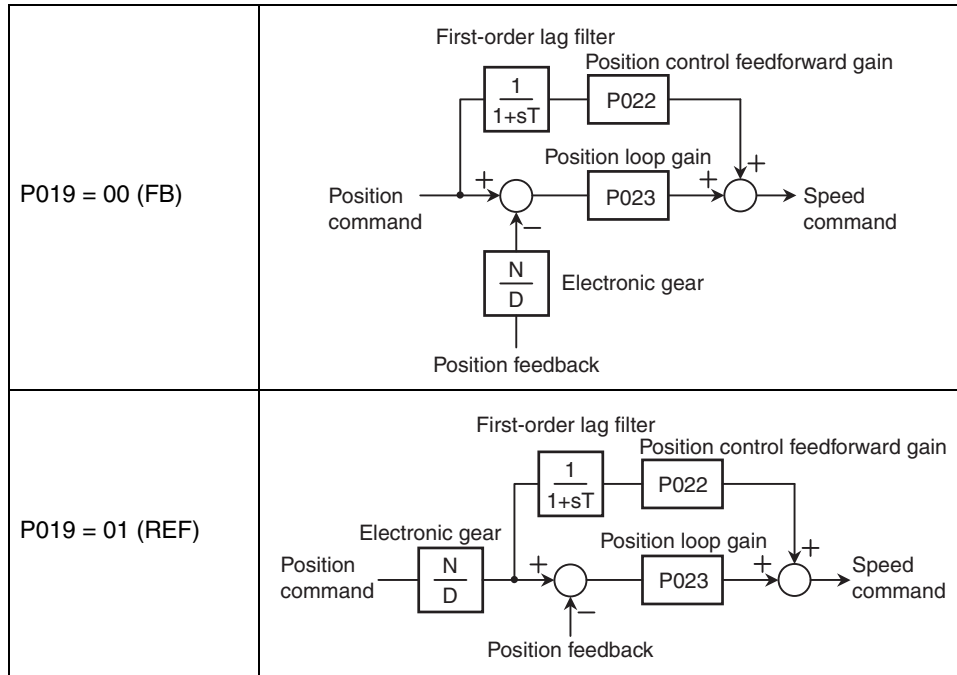
## Electronic Gear Function

This function allows you to set a gain relative to position command or position feedback and to change the main/sub motor rotation ratio, particularly for synchronous operation.

| Parameter No. | Function name                              | Data                                                               | Default setting | Unit  |
|---------------|--------------------------------------------|--------------------------------------------------------------------|-----------------|-------|
| P019          | Electronic gear setting position selection | 00: FB (Position feedback side)<br>01: REF (Position command side) | 00              | —     |
| P020          | Electronic gear ratio numerator *3         | 1 to 9999                                                          | 1               | —     |
| P021          | Electronic gear ratio denominator *3       | 1 to 9999                                                          | 1               | —     |
| P022          | Position control feedforward gain *1       | 0.00 to 655.35                                                     | 0.00            | —     |
| P023          | Position loop gain *2                      | 0.00 to 100.00                                                     | 0.50            | rad/s |

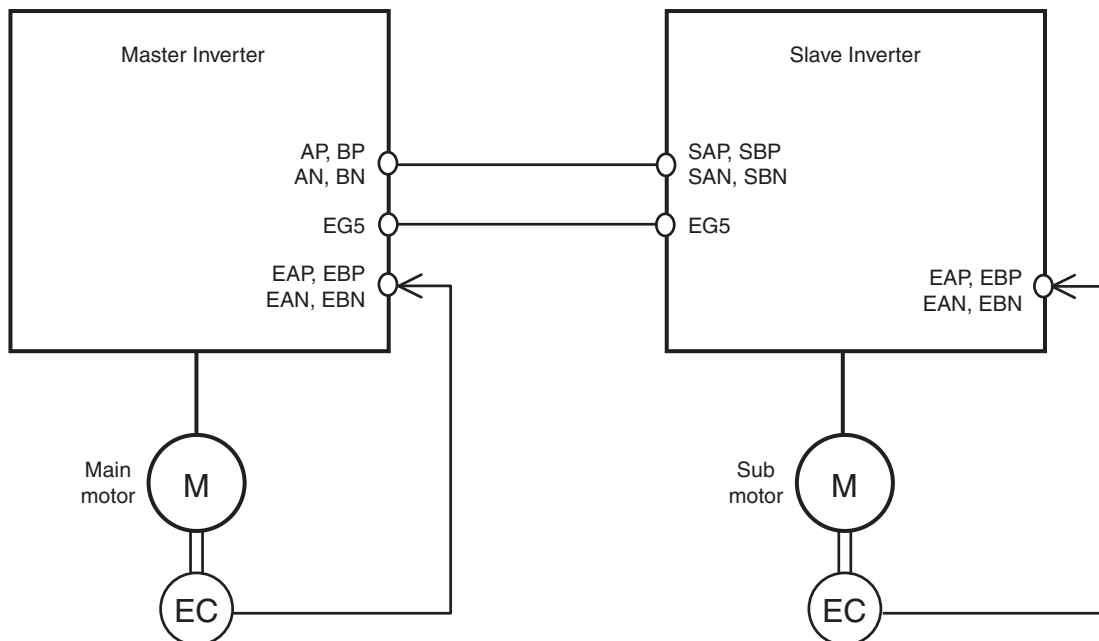


Note: Below are the block diagrams of the electronic gear function.



- \*1. It is recommended that position control feedforward gain adjustment should be started with  $P022 = 2.00$ . To reduce the position deviation between the main and sub motors, increase the feedforward gain. If motor hunting occurs, reduce the feedforward gain.
- \*2. It is recommended that position loop gain adjustment should be started with  $P023 = 2.00$ . To increase positioning accuracy and holding power, increase the position loop gain. If an increased position loop gain causes hunting, reduce the position loop gain.
- \*3. Make sure that the N/D setting is within the range of  $1/50 \leq N/D \leq 20$ .  
(N: Electronic gear ratio numerator [P020], D: Electronic gear ratio denominator [P021])

### Example: Synchronous Operation



For the Inverter (master Inverter) on the main motor side, you can select either the speed control or pulse train position control mode.  
For the Inverter (slave Inverter) on the sub motor side, you need to select the pulse train position control mode.

### Configuration Example

- Main motor : Number of encoder pulses = 1024
- Sub motor : Number of encoder pulses = 3000
- Main motor rpm:Sub motor rpm = 2:1

For operation under the above conditions, set the following data in the slave Inverter.

Pulse train mode selection (P013) : 00 (pulse with 90° phase difference)  
 Electronic gear setting position selection (P019) : 01 (REF)  
 Electronic gear ratio numerator (P020) : 3000  
 Electronic gear ratio denominator (P021) :  $1024 \times 2 = 2048$

The following shows an example of the ratio of slave rpm to master rpm depending on the P019 to P021 settings.

(Note that the same number of encoder pulses (1024 pulses) should be set on both Inverters.)

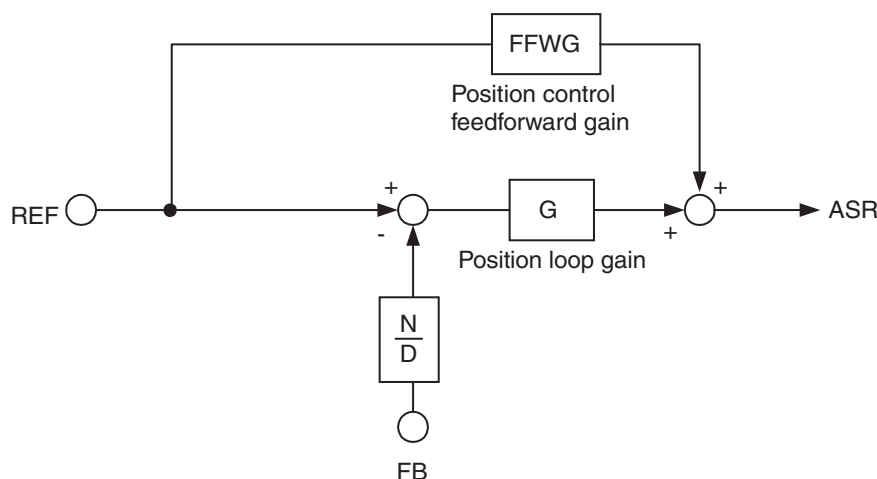
| Electronic gear setting position selection (P019) | REF (Position command side) | REF (Position command side) | FB (Position feedback side) | FB (Position feedback side) |
|---------------------------------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|
| Electronic gear ratio numerator (P020)            | 1024                        | 2048                        | 1024                        | 2048                        |
| Electronic gear ratio denominator (P021)          | 2048                        | 1024                        | 2048                        | 1024                        |
| Slave rpm/Master rpm                              | 1/2                         | 2                           | 2                           | 1/2                         |

### Configuration Example

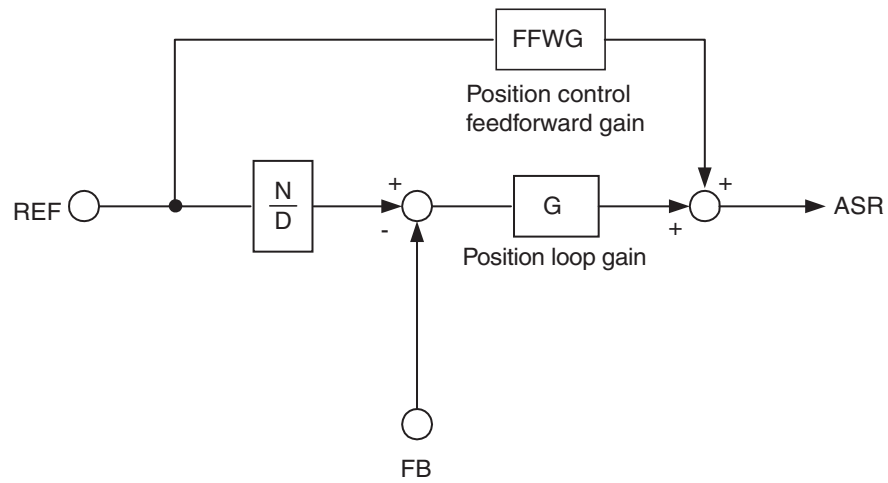
- Main motor : Number of encoder pulses = 1024
- Sub motor : Number of encoder pulses = 3000
- Main motor rpm:Sub motor rpm = 2:1

For operation under the above conditions, set the following data in the slave Inverter.

Electronic gear setting position selection (P019) : 01 (REF)  
 Electronic gear ratio numerator (P020) : 3000  
 Electronic gear ratio denominator (P021) :  $1024 \times 2 = 2048$



Electronic gear setting position = 00 (FB) selected



Electronic gear setting position =01(REF) selected

## Motor Gear Ratio Setting Function

This function is useful for a system with an optional encoder installed on the machine side.

Set the number of actual encoder pulses in encoder pulses P011.

Set a motor-to-encoder rpm ratio in motor gear ratio numerator/denominator P028/P029.

With the above settings, the number of encoder pulses converted into motor shaft data is set in the Inverter.

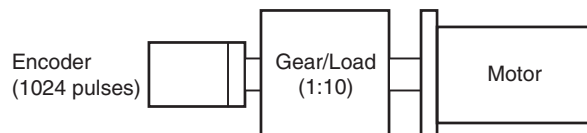
This function performs speed/position detection based on the number of encoder pulses converted into motor shaft data and calculates the orientation stop position based on the number of encoder pulses (P011).

| Parameter No. | Function name                | Data                                                     | Default setting | Unit  |
|---------------|------------------------------|----------------------------------------------------------|-----------------|-------|
| P028          | Motor gear ratio numerator   | 1 to 9999<br>Set a motor-to-encoder rpm ratio.           | 1               | —     |
| P029          | Motor gear ratio denominator |                                                          |                 |       |
| P011          | Encoder pulses               | 128 to 65535<br>Set the number of actual encoder pulses. | 1024            | Pulse |

Note: Make sure that the N/D setting is within the range of  $1/50 \leq N/D \leq 20$ .

(N: Motor gear ratio numerator, D: Motor gear ratio denominator)

<Example>



•When the motor-to-encoder rpm ratio is 1:10, set the following data:

Number of encoder pulses (P011) : 1024

Motor gear ratio numerator (P028) : 10

Motor gear ratio denominator (P029) : 100

In this case, the orientation stop position is defined as 4096 divisions of the encoder's one rotation.

Note that the concept of the stop position is inverted from the description in "Orientation stop position conceptual drawing" (page 4-135).

## Position Bias Function

Set this function to apply position command bias in the pulse train position control mode.

The set number of pulses is added to a change value at 2-ms intervals. This is used for adjusting the phase of synchronization points during synchronous operation.

Set an addition value in position bias amount P024. A positive value adds the value in the forward direction.

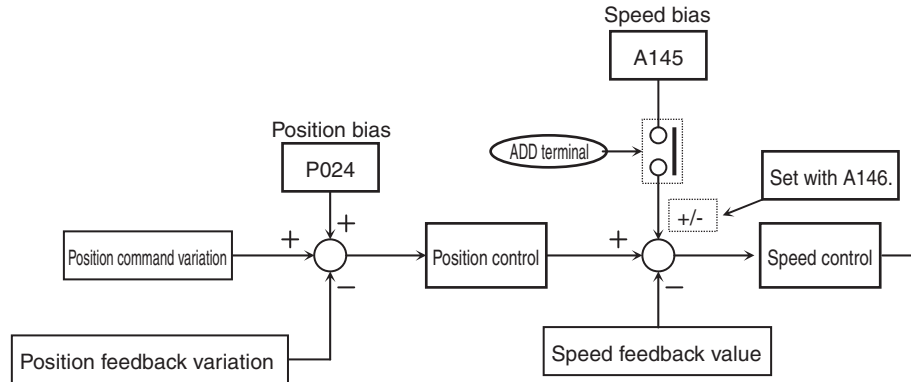
|                   |      |
|-------------------|------|
| Related functions | P024 |
|-------------------|------|

## Speed Bias Function

This function applies speed command bias in the pulse train position control mode.

Set a bias value in frequency addition amount A145, and select a sign in frequency addition direction A146.

Allocate 50 (ADD) to any of the multi-function inputs. While the ADD terminal is turned on, the bias value is added to the speed command.



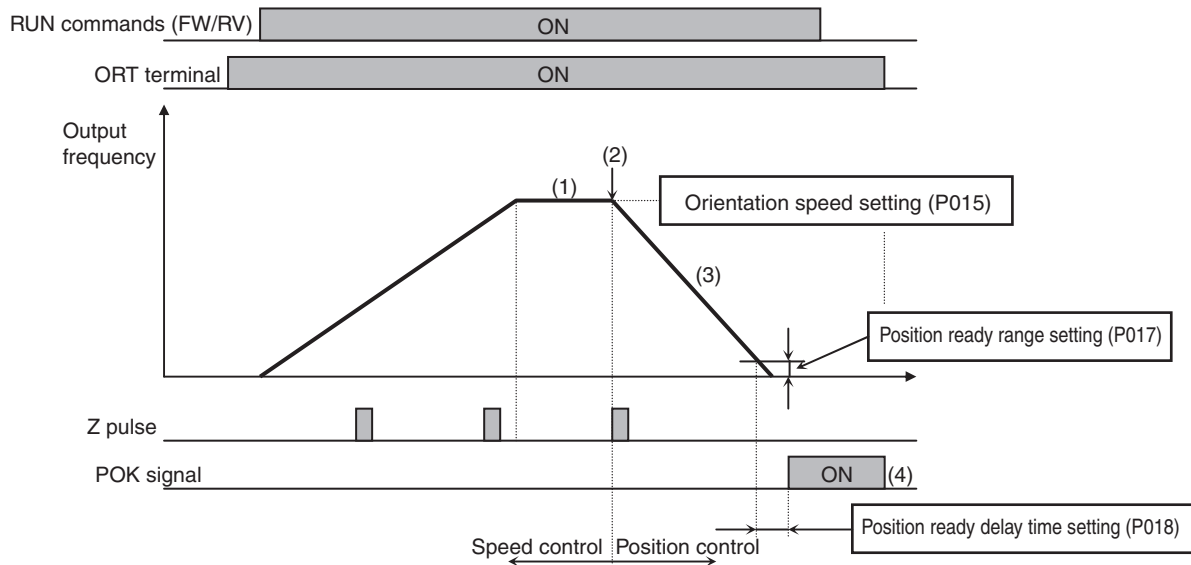
|                   |            |
|-------------------|------------|
| Related functions | A145, A146 |
|-------------------|------------|

## Orientation Function

This function determines a motor position at a single desired point during one rotation of the motor, and can be used to exchange tools for the machine tool main spindle or others.

During positioning, the Z-pulse (one rotation position signal) is used as the reference signal. Input Z-pulse between EZP and EZN.

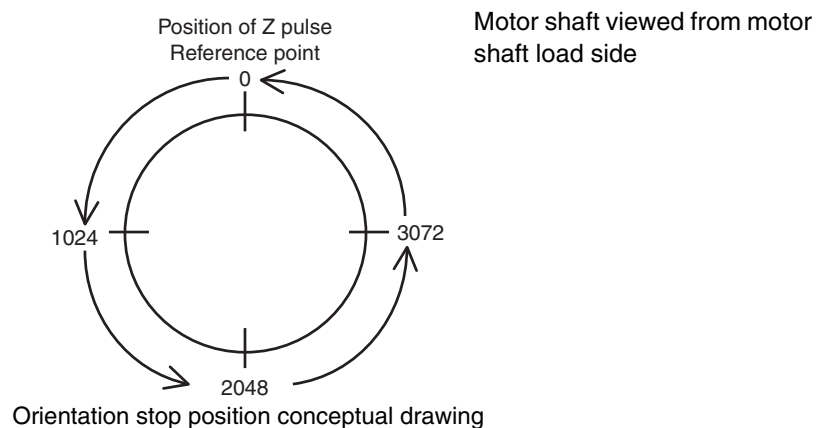
| Parameter No. | Function name                                        | Data                                                        | Default setting | Unit  |
|---------------|------------------------------------------------------|-------------------------------------------------------------|-----------------|-------|
| P011          | Encoder pulses                                       | 128 to 65535<br>(10000 to 65530)                            | 1024            | Pulse |
| P014          | Orientation stop position                            | 0 to 4095                                                   | 0               | —     |
| P015          | Orientation speed setting                            | Setting frequency to Max. frequency<br>(upper limit: 120.0) | 5.00            | Hz    |
| P016          | Orientation direction setting                        | 00: FWD (Forward side)                                      | 00              |       |
|               |                                                      | 01: REV (Reverse side)                                      |                 |       |
| P017          | Position ready range setting                         | 0 to 10000                                                  | 5               | Pulse |
| P018          | Position ready delay time setting                    | 0.00 to 9.99                                                | 0.00            | s     |
| P023          | Position loop gain                                   | 0.00 to 100.00                                              | 0.50            | rad/s |
| C001 to C008  | Multi-function inputs<br>1 to 8 selection            | 45: ORT (orientation)                                       | —               | —     |
| C021 to C025  | Multi-function output terminal<br>11 to 15 selection | 23: POK (position ready)                                    | —               |       |
| C026          | Relay output (AL2, AL1)<br>function selection        |                                                             | 05              |       |



- (1) When the RUN command is turned on with the ORT terminal turned on, the Inverter accelerates to the orientation speed (P015), and then performs constant speed operation.  
(If the RUN command is turned on during operation, the operation speed changes to the orientation speed when the ORT terminal is turned on.)
- (2) After the orientation speed is reached, the Inverter shifts to the position control mode when the first Z-pulse is detected.
- (3) During forward run, position control is performed with a target value of "Orientation stop position (P014) + one rotation"; During reverse run, with a target value of "Orientation stop position (P014) + two rotations".  
In this step, the higher the position loop gain (P023), the shorter the deceleration time (regardless of the deceleration time setting).
- (4) After the remaining number of pulses reaches the position ready range setting (P017), the Inverter outputs the POK signal after the position ready delay time setting (P018) elapses. (The POK output remains until the ORT signal is turned off.)  
After positioning is completed, the servo lock status remains until the RUN command is turned off.

Note 1: Do not set a high frequency for the orientation speed, because positioning must be completed within two rotations during deceleration. Otherwise, overvoltage protection may cause a trip.

Note 2: Orientation stop position is defined as 4096 (0 to 4095) divisions of one forward rotation from the reference point. (The number of divisions is fixed to 4096, regardless of the encoder's number of pulses.) The reference point is defined as the point where the pulse is input between EZP and EZN. Below is the layout of the stop target position. (Positive-phase connection)



## Absolute Position Control Mode

- To use this function, set V/f characteristics selection A044 to "05" (V2), and V2 control mode selection P012 to "02" (APR2: Absolute position control).
- When "03" (high-resolution absolute position control) is selected in V2 control mode selection P012, control is based on  $\times 4$  the number of pulses used for internal operations.  
(Set the multi-step position command and position range setting for  $\times 4$  multiplication control.)
- The position command can be changed up to 8 steps, depending on combinations of multi-function input terminals.
- Zero return speed can be selected from one low speed and two high speeds.  
(The orientation function, described in the previous section, is not available.)
- By using the teaching function, you can set the position command while running the machine.
- By allocating "73" (SPD) to a multi-function input, you can switch between the speed and position controls.
- For data with many digits (e.g. position command), only the higher 4 digits are displayed.

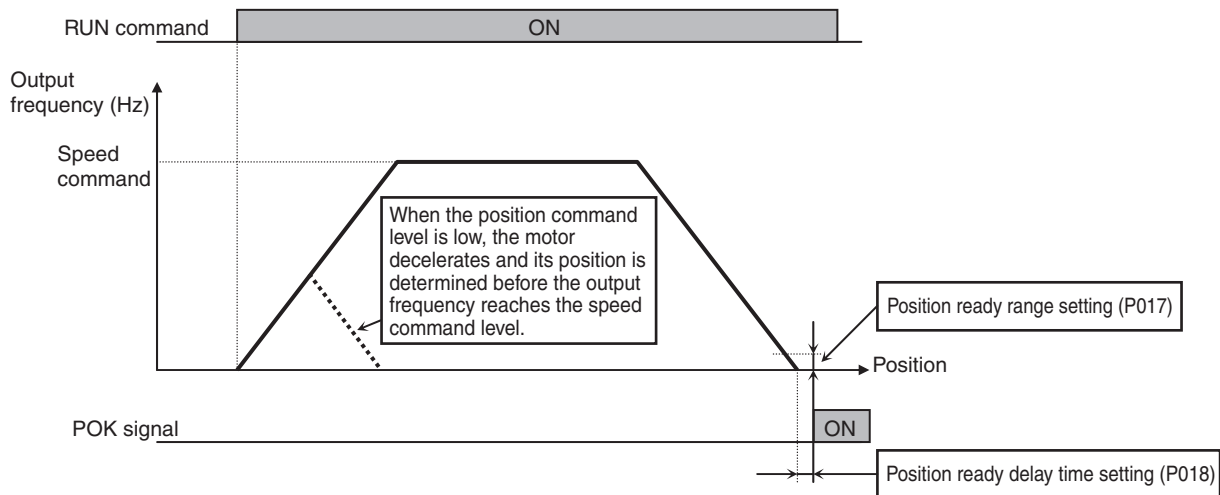
| Parameter No. | Function name                    | Data                                                                                                         | Default setting | Unit  |
|---------------|----------------------------------|--------------------------------------------------------------------------------------------------------------|-----------------|-------|
| P012          | V2 control mode selection        | 02: APR2 (absolute position control mode)<br>03: HAPR (high-resolution absolute position control mode)       | 00              | —     |
| P023          | Position loop gain               | 0.00 to 100.00                                                                                               | 0.50            | rad/s |
| P060          | Multi-step position command 0    | Position range setting (reverse side)<br>to Position range setting (forward side)<br>-268435455 to 268435455 | 0               | —     |
| P061          | Multi-step position command 1    | Position range setting (reverse side)<br>to Position range setting (forward side)<br>-268435455 to 268435455 | 0               | —     |
| P062          | Multi-step position command 2    | Position range setting (reverse side)<br>to Position range setting (forward side)<br>-268435455 to 268435455 | 0               | —     |
| P063          | Multi-step position command 3    | Position range setting (reverse side)<br>to Position range setting (forward side)<br>-268435455 to 268435455 | 0               | —     |
| P064          | Multi-step position command 4    | Position range setting (reverse side)<br>to Position range setting (forward side)<br>-268435455 to 268435455 | 0               | —     |
| P065          | Multi-step position command 5    | Position range setting (reverse side)<br>to Position range setting (forward side)<br>-268435455 to 268435455 | 0               | —     |
| P066          | Multi-step position command 6    | Position range setting (reverse side)<br>to Position range setting (forward side)<br>-268435455 to 268435455 | 0               | —     |
| P067          | Multi-step position command 7    | Position range setting (reverse side)<br>to Position range setting (forward side)<br>-268435455 to 268435455 | 0               | —     |
| P068          | Zero return mode                 | 00: Low speed<br>01: High speed 1<br>02: High speed 2                                                        | 00              | —     |
| P069          | Zero return direction selection  | 00: FWD (Forward side)<br>01: REV (Reverse side)                                                             | 00              | —     |
| P070          | Low-speed zero return frequency  | 0.00 to 10.00                                                                                                | 0.00            | Hz    |
| P071          | High-speed zero return frequency | 0.00 to Maximum frequency                                                                                    | 0.00            | Hz    |

#### 4-3 Functions When PG Option Board (3G3AX-PG01) Is Used

| Parameter No. | Function name                                | Data                                                                                                                                                                                                                                                                                                                                                                                                         | Default setting | Unit |
|---------------|----------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|------|
| P072          | Position range specification (forward)       | 0 to 268435455: When APR2 is selected<br>0 to 1073741823: When HAPR is selected                                                                                                                                                                                                                                                                                                                              | 268435455       | —    |
| P073          | Position range specification (reverse)       | –268435455 to 0: When APR2 is selected<br>–1073741823 to 0: When HAPR is selected                                                                                                                                                                                                                                                                                                                            | –268435455      | —    |
| P074          | Teaching selection                           | 00: X00 (Multi-step position command 0 (P060))<br>01: X01 (Multi-step position command 1 (P061))<br>02: X02 (Multi-step position command 2 (P062))<br>03: X03 (Multi-step position command 3 (P063))<br>04: X04 (Multi-step position command 4 (P064))<br>05: X05 (Multi-step position command 5 (P065))<br>06: X06 (Multi-step position command 6 (P066))<br>07: X07 (Multi-step position command 7 (P067)) | 00              | —    |
| C169          | Multi-step speed/position determination time | 0 to 200: × 10 ms                                                                                                                                                                                                                                                                                                                                                                                            | 0               | ms   |
| d029          | Position command monitor                     | –1073741823 to 1073741823 when HAPR is selected<br>–268435456 to 268435456 when APR2 is selected                                                                                                                                                                                                                                                                                                             | —               | —    |
| d030          | Current position monitor                     | –1073741823 to 1073741823 when HAPR is selected<br>–268435456 to 268435456 when APR2 is selected                                                                                                                                                                                                                                                                                                             | —               | —    |
| C001 to C008  | Multi-function inputs 1 to 8 selection       | 45: ORT (orientation)<br>54: SON (servo ON)<br>66: CP1 (position command selection 1)<br>67: CP2 (position command selection 2)<br>68: CP3 (position command selection 3)<br>69: ORL (zero return limit signal)<br>70: ORG (zero return startup signal)<br>71: FOT (forward driving stop)<br>72: ROT (reverse driving stop)<br>73: SPD (speed/position switching)                                            | —               | —    |
| C102          | Reset selection                              | 03: Trip RESET (Trip reset only)                                                                                                                                                                                                                                                                                                                                                                             | 00              | —    |



## Absolute Position Control Operation



In the absolute position control mode, the Inverter moves to the target position according to the following parameter settings, and is then set in the position servo lock status.

- Position command
- Speed command (frequency reference)
- Acceleration/Deceleration time

(The servo lock status is retained until the RUN command is turned off.)

The frequency reference and acceleration/deceleration command for absolute position control conform to the items selected when the RUN command is turned on.

If the position command is set to a low value, the Inverter may stop deceleration and perform positioning before the speed command value is reached.

In the absolute position control mode, the direction of RUN command (FW or RV) does not refer to the rotating direction. The FW or RV signal starts or stops the Inverter. The Inverter runs forward when "Target position - Current position" is a positive value, or runs in reverse when it is a negative value.

If you do not perform zero return operation, (to be described later), the position at power-on is regarded as the origin (position = 0).

When position command is set to "0", positioning is performed when the RUN command is turned on.

In reset selection C102, select "03" (trip reset only).

\* If reset selection C102 is not set to "03", turning on the Inverter's reset terminal (or RESET key) clears the current position counter. To operate the Inverter by using the current position count value after resetting a trip by turning on the reset terminal (or RESET key), be sure to set reset selection C102 to "03".

If PCLR is allocated, turning on the PCLR terminal clears the current position counter.

(The internal position deviation counter is simultaneously cleared.)

The absolute position control mode disables the ATR terminal. (Torque control is disabled.)

The absolute position control mode disables the STAT terminal. (Pulse train position control is disabled.)

The absolute position control mode disables the orientation function.

(However, the ORT terminal is used for teaching, as described later.)

## Multi-step Position Switching Function (CP1/CP2/CP3)

By allocating "66" to "68" (CP1 to CP3) to any of multi-function inputs 1 to 8 (C001 to C008), you can select multi-step positions 0 to 7.

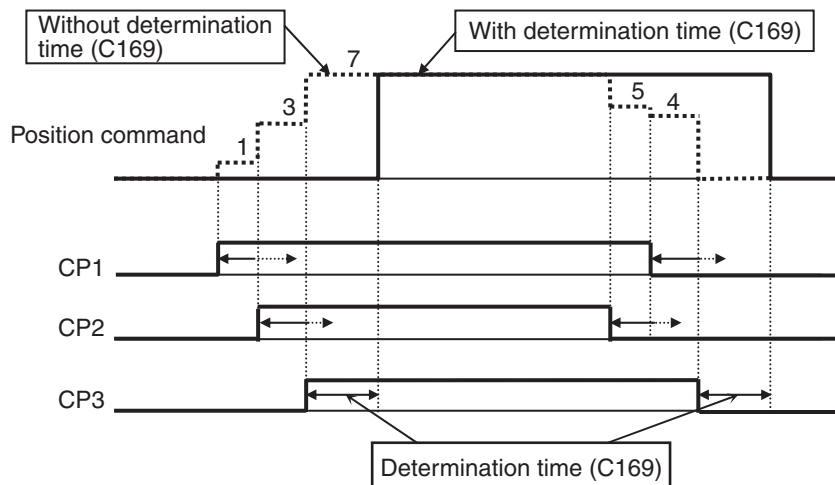
Set position commands in multi-step position commands 0 to 7 (P060 to P067).

If no position command is allocated to the terminals, multi-step position command 0 (P060) is defined as the position command.

| Position command      | CP3 | CP2 | CP1 |
|-----------------------|-----|-----|-----|
| Multi-step position 0 | 0   | 0   | 0   |
| Multi-step position 1 | 0   | 0   | 1   |
| Multi-step position 2 | 0   | 1   | 0   |
| Multi-step position 3 | 0   | 1   | 1   |
| Multi-step position 4 | 1   | 0   | 0   |
| Multi-step position 5 | 1   | 0   | 1   |
| Multi-step position 6 | 1   | 1   | 0   |
| Multi-step position 7 | 1   | 1   | 1   |

When you input a multi-step position command, you can set the wait time until the terminal input is determined. This prevents the transition status from being applied before it is determined.

You can adjust the determination time in multi-step speed/position determination time C169. If no input is made during the time set in C169, the data is determined after the set time elapses. (Note that the longer the determination time, the slower the input response.)



## Speed/Position Switching Function (SPD)

Allocate 73 (SPD) to one of the multi-function inputs.

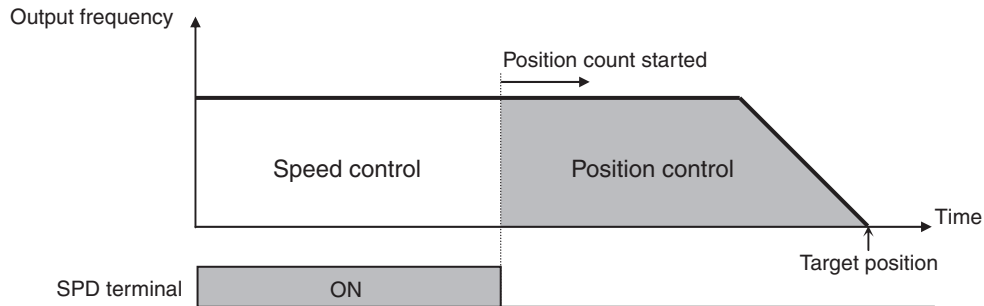
While the SPD terminal is turned on, the current position counter is retained at "0". Therefore, if the SPD terminal is turned off during operation, the Inverter shifts to the position control mode. (Speed/Position switching)

At this time, if the position command is "0", the Inverter immediately stops.

(Hunting may occur, depending on the position loop gain setting.)

While the SPD terminal is turned on, the Inverter runs in the direction based on the RUN command.

When shifting from speed control to position control, be careful about the polarity sign of the RUN command.



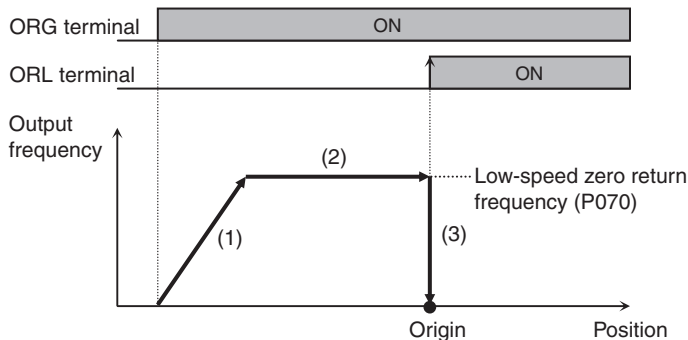
## Zero Return Function

This function performs three types of zero return operations depending on the setting of zero return mode P068. When zero return is complete, the current position is cleared to zero.

You can select the zero return direction in zero return direction selection P069.

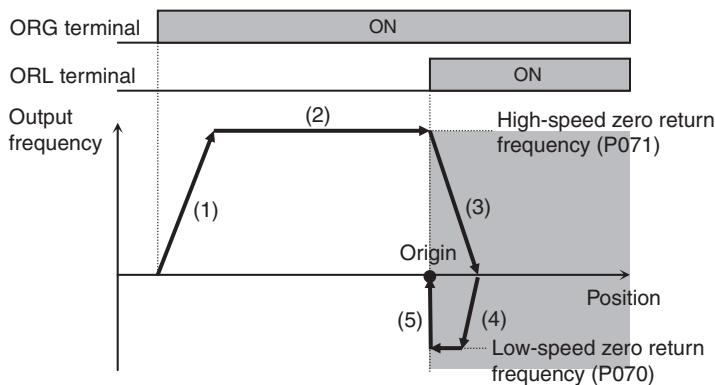
If zero return is not performed, the Inverter performs position control with the position at power-on defined as the origin.

### <Low-speed zero return (P068 = 00)>



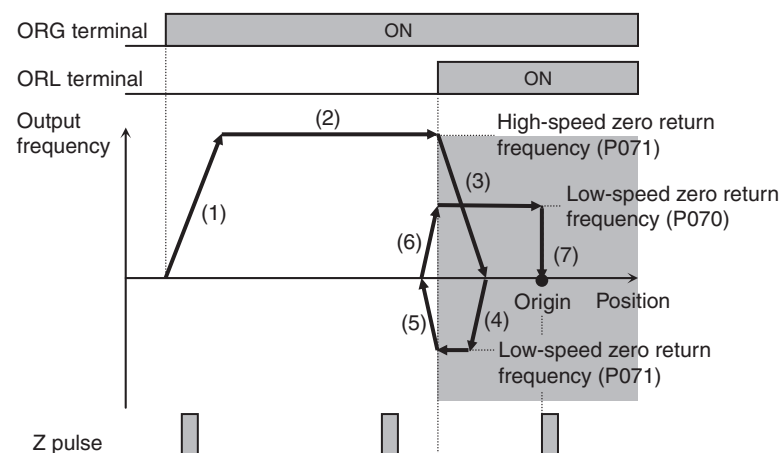
- (1) The Inverter accelerates to the low-speed zero return frequency according to the acceleration time setting.
- (2) The Inverter runs at the low-speed zero return speed.
- (3) The Inverter performs positioning when the ORL signal is input.

### <High-speed zero return 1 (P068 = 01)>



- (1) The Inverter accelerates to the high-speed zero return frequency according to the acceleration time setting.
- (2) The Inverter runs at the high-speed zero return frequency.
- (3) The Inverter starts deceleration when the ORL signal is turned on.
- (4) The Inverter runs in reverse at the low-speed zero return frequency.
- (5) The Inverter performs positioning when the ORL signal is turned off.

### <High-speed zero return 2 (P068 = 02)>



- (1) The Inverter accelerates to the high-speed zero return frequency according to the acceleration time setting.
- (2) The Inverter runs at the high-speed zero return frequency.
- (3) The Inverter starts deceleration when the ORL signal is turned on.
- (4) The Inverter runs in reverse at the low-speed zero return frequency.
- (5) The Inverter starts deceleration when the ORL signal is turned off.
- (6) The Inverter runs forward at the low-speed zero return frequency.
- (7) The Inverter performs positioning at the first Z-pulse position after the ORL signal is turned on.

## Forward/Reverse Run Stop Function (FOT/ROT)

With a signal from the control range limit switch, this function prevents the Inverter from running outside the specified operation range.

The torque limit is set to 10% on the forward side when the FOT terminal is turned on, and on the reverse side when the ROT terminal is turned on.

This function can be used as the limit switch at the machine end. To do so, allocate "71" (FOT) and "72" (ROT) to any of multi-function inputs 1 to 8 (C001 to C008).

## Position Range Setting Function

Set a forward/reverse position control range in position range setting (forward) P072 and position range setting (reverse) P073. If the current position counter exceeds the setting range, a position control range trip (E63.\* or E73.\*) occurs, and the Inverter goes into free-run status.

The upper limit setting of multi-step position commands 0 to 7 (P060 to P067) is limited by this control range setting.

(You cannot set a position command beyond the position range.)

## Teaching Function

This function starts or stops the motor at a desired position and stores the current position as a position command in a desired position command area.

Allocate "45" (ORT) to any of multi-function inputs 1 to 8 (C001 to C008).

When V2 control mode selection P012 is set to "02" (absolute position control) or "03" (high-resolution absolute position control), the relevant terminal serves as a teaching terminal.

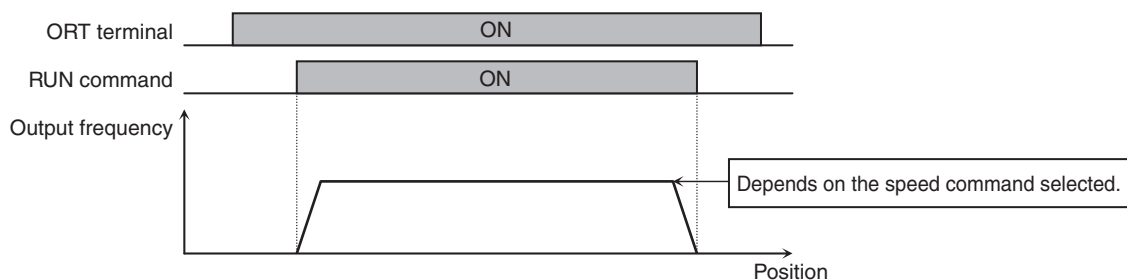
|                   |                          |
|-------------------|--------------------------|
| Related functions | C001 to C008, P012, P074 |
|-------------------|--------------------------|

### <Teaching Procedure>

(1) In teaching selection P074, select the position command you want to set.

(2) Move the workpiece.

- Input the RUN command with the ORT terminal turned on. At this time, the speed command and acceleration/deceleration time conform to the currently selected parameters.



\* If the Inverter control circuit (Ro, To) is turned on, teaching is enabled.

The current position counter operates even if the workpiece is moved by an external device.

Teaching is therefore enabled even while the Inverter is stopped.

Note: Make sure that the power supplies (R/L1, S/L2, T/L3) for the Inverter power circuit are shut off or that the Inverter's outputs (U/T1, V/T2, W/T3) are disconnected from the motor. Not doing so may result in injury and/or damage to the equipment.

(3) When the target position is reached, press the Enter key on the Digital Operator. Press the key on the data display screen (the PRG LED indicator is lit).

- (4) The current position is set to the area corresponding to the position command source set in teaching selection P074.  
(However, the P074 setting is not stored. After the power is shut off or after reset, this parameter is indicated as "00" (x00).)

| P074 set values | Position commands to be set         |
|-----------------|-------------------------------------|
| 00              | P060: Multi-step position command 0 |
| 01              | P061: Multi-step position command 1 |
| 02              | P062: Multi-step position command 2 |
| 03              | P063: Multi-step position command 3 |
| 04              | P064: Multi-step position command 4 |
| 05              | P065: Multi-step position command 5 |
| 06              | P066: Multi-step position command 6 |
| 07              | P067: Multi-step position command 7 |

## Servo ON Function

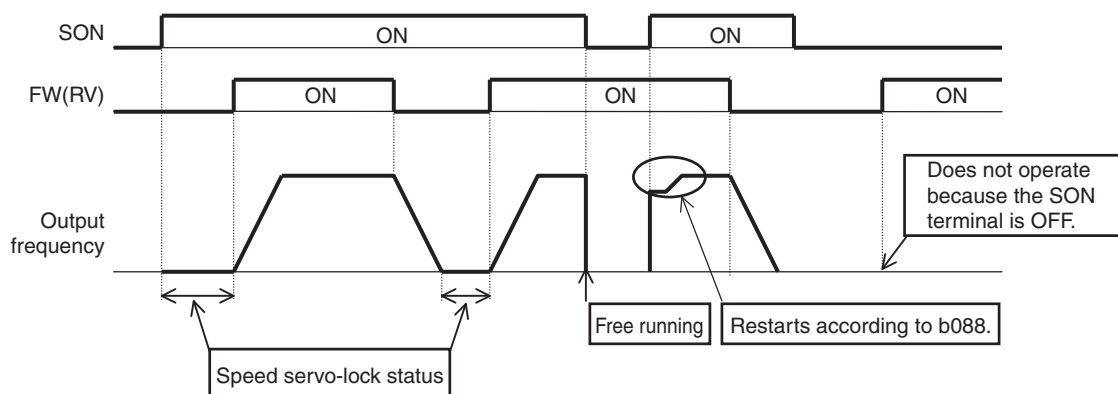
This function brings the Inverter into speed servo lock status via an input terminal when "05" (sensor vector control) is selected in V/f characteristics selection A044.

Allocate 54 (SON) to the desired multi-function input.

The Inverter does not accept the RUN command unless the SON terminal is turned on when SON is allocated.

If the SON terminal is turned off during operation, the Inverter goes into free-run status. When the SON terminal is turned on again, the Inverter restarts according to the setting of free-run stop selection b088.

This function cannot be simultaneously used with the preliminary excitation function (55: FOC). If FOC and SON are both allocated to multi-function input terminals, priority is given to FOC, and SON is disabled.



Related functions

A044, C001 to C008

## Pulse Train Frequency Input

This function allows you to use a pulse train input to the SAP-SAN terminals as frequency reference or PID feedback value in each control mode.

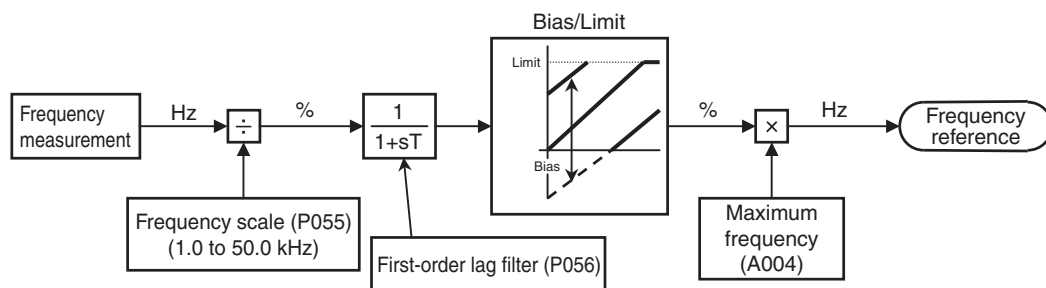
(This function can be used in all control modes.)

Set the input frequency at the maximum frequency in pulse train frequency scale P055.

The analog input start/end function cannot be used. To limit the input frequency, use pulse train frequency bias amount P057 and pulse train frequency limit P058.

| Parameter No. | Function name                              | Data                                                            | Default setting | Unit |
|---------------|--------------------------------------------|-----------------------------------------------------------------|-----------------|------|
| P055          | Pulse train frequency scale                | 1.0 to 50.0: Set the input frequency at the maximum frequency.  | 25.0            | kHz  |
| P056          | Pulse train frequency filter time constant | 0.01 to 2.00: Set a filter time constant for pulse train input. | 0.10            | s    |
| P057          | Pulse train frequency bias amount          | -100 to 100                                                     | 0               | %    |
| P058          | Pulse train frequency limit                | 0 to 100                                                        | 100             | %    |
| A001          | Frequency reference selection              | 06: Pulse train frequency                                       | 01              | —    |
| A076          | PID feedback selection                     | 03: Pulse (Pulse train frequency)                               | 00              |      |
| A141          | Operation frequency input A setting        | 07: Pulse (Pulse train frequency)                               | 02              |      |
| A142          | Operation frequency input B setting        | 07: Pulse (Pulse train frequency)                               | 03              |      |

### Pulse train frequency processing block



Note: The SWENC switch on PG Board is available for "OFF: encoder disconnection detection disabled".

## 4-4 Communication Function

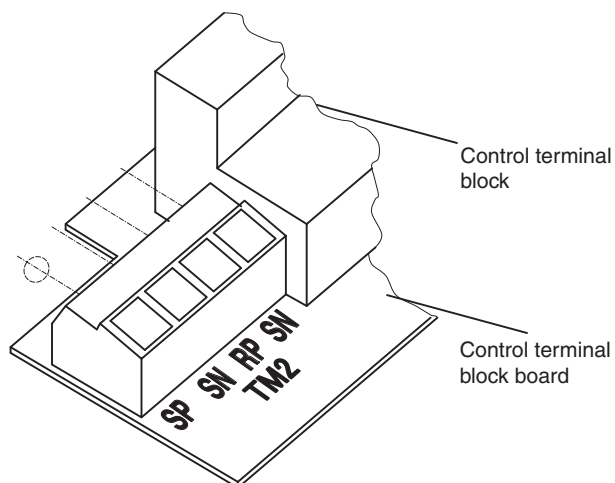
- This function allows the Inverter to communicate with an external controller via the RS485 interface from the TM2 terminal on the Inverter's control terminal block board.

### ■ Communication Specifications

| Item                 | ASCII method                                      | ModBus-RTU method                           | Note                                             |
|----------------------|---------------------------------------------------|---------------------------------------------|--------------------------------------------------|
| Transmission speed   | 2400/4800/9600/19200 bps                          |                                             | Select using the Digital Operator.               |
| Communication method | Half-duplex communication                         |                                             |                                                  |
| Synchronous system   | Start-stop synchronous system                     | Asynchronous system                         |                                                  |
| Transmission code    | ASCII code                                        | Binary                                      |                                                  |
| Transmission mode    | LSB first                                         |                                             |                                                  |
| Compatible interface | RS-485                                            |                                             |                                                  |
| Data bit length      | 7 or 8 bits                                       | 8 bits                                      | Select using the Digital Operator.               |
| Parity               | No parity/Even/Odd                                |                                             | Select using the Digital Operator.               |
| Stop bit length      | 1 or 2 bits                                       |                                             | Select using the Digital Operator.               |
| Starting method      | One-side start using host command                 |                                             |                                                  |
| Wait time            | 10 to 1000 [ms]                                   | 0 to 1000 [ms]                              | Set using the Digital Operator.                  |
| Connection           | 1:N (N = 32 max.)                                 |                                             | Use the Digital Operator to select a station No. |
| Error check          | Overrun/Framing<br>BCC/Vertical/Horizontal parity | Overrun/Framing<br>CRC-16/Horizontal parity |                                                  |

#### <RS485 Port Specifications and Connections>

For the RS485 communication function, use the TM2 terminal on the control terminal block board.



| Terminal abbreviations | Description                            |
|------------------------|----------------------------------------|
| SP                     | Transmission/Reception (+)             |
| SN                     | Transmission/Reception (-)             |
| RP                     | Termination resistor enabling terminal |
| SN                     | Termination resistor enabling terminal |

The following wires are recommended for TM2:

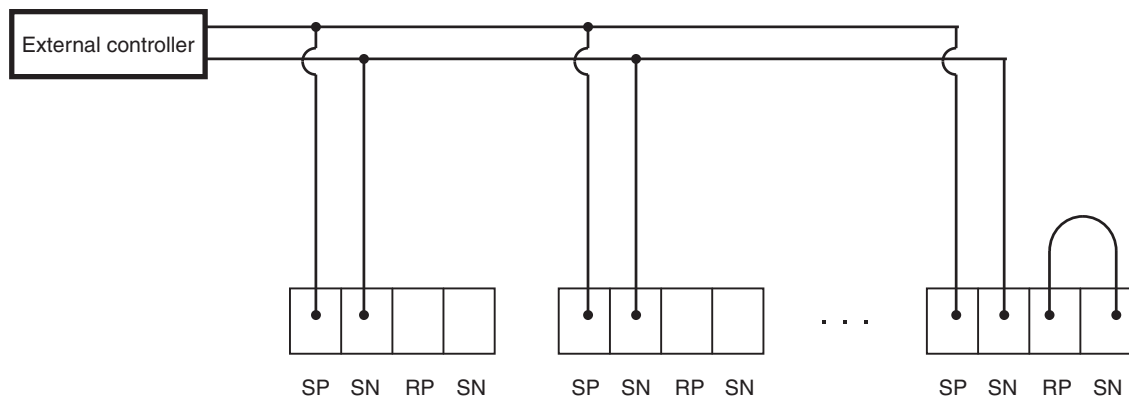


|                                        |                                                                                                                   |
|----------------------------------------|-------------------------------------------------------------------------------------------------------------------|
| Single wire                            | 0.14 to 1.5 mm <sup>2</sup><br>(If two equal-sized wires are connected to one pole: 0.14 to 0.5 mm <sup>2</sup> ) |
| Stranded wire                          | 0.14 to 1.0 mm <sup>2</sup><br>(If two equal-sized wires are connected to one pole: 0.14 to 0.2 mm <sup>2</sup> ) |
| Stranded wire with solderless terminal | 0.25 to 0.5 mm <sup>2</sup>                                                                                       |
| Wire strip length                      | 5 mm                                                                                                              |
| Tightening torque                      | 0.22 to 0.25 N•m (screw size: M2)                                                                                 |

•Connection

Connect the Inverters parallel to each other, as shown below. For the termination Inverter, short-circuit the RP and SN terminals. (Also, if the RS485 communication function is used with a single Inverter, the RP and SN terminals must be short-circuited.)

Short-circuiting the RP and SN terminals activates the termination resistor inside the control terminal block board, suppressing signal reflection.



## ■Setting

RS485 communication requires the following settings.

| Parameter No. | Function name                                          | Data                                                                                                                                          | Default setting | Unit |
|---------------|--------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|-----------------|------|
| C071          | Communication speed selection<br>(Baud rate selection) | 02: Loop-back test<br>03: 2400 bps<br>04: 4800 bps<br>05: 9600 bps<br>06: 19200 bps                                                           | 05              | —    |
| C072          | Communication station No. selection                    | 1 to 247                                                                                                                                      | 1               | —    |
| C073          | Communication bit length selection                     | 7: 7-bit<br>8: 8-bit                                                                                                                          | 8               | —    |
| C074          | Communication parity selection                         | 00: No parity<br>01: Even<br>02: Odd                                                                                                          | 00              | —    |
| C075          | Communication stop bit selection                       | 1: 1-bit<br>2: 2-bit                                                                                                                          | 1               | —    |
| C076          | Communication error selection                          | 00: Trip<br>01: Decel-Trip (Trip after deceleration stop)<br>02: Ignore<br>03: Free-RUN (Free-run stop)<br>04: Decel-Stop (Deceleration stop) | 02              | —    |
| C077          | Communication error timeout                            | 0.00 to 99.99: Communication disconnection judgment time                                                                                      | 0.00            | s    |

| Parameter No.     | Function name                  | Data                                                   | Default setting | Unit |
|-------------------|--------------------------------|--------------------------------------------------------|-----------------|------|
| C078              | Communication wait time        | 0 to 1000: Time to wait for response from the Inverter | 0               | ms   |
| C079              | Communication method selection | 00: ASCII<br>01: ModBus-RTU                            | 01              | —    |
| Related functions |                                | A001, A002                                             |                 |      |

### ■ Communication Test Mode

- The communication test mode allows you to check the RS485 communication line (hardware).

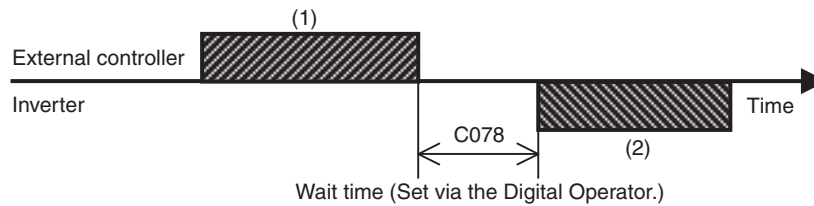
(Communication Test Mode Procedure)

- (1) Before conducting a loop-back test, disconnect the cable from TM2 on the control terminal block board.
- (2) Set the following parameter via the Digital Operator.
  - Set C071 (communication speed selection) to "02" (loop-back test).
- (3) Turn off the Inverter, and turn it on again. The check will start.
- (4) After the check is complete, the Digital Operator displays the following code:
  - OK: LoopBack OK
  - NG: LoopBack NG
- (5) Press the RESET button on the Digital Operator or on the copy unit to show the basic setting screen. Reset the parameter that you changed in step (2) to a desired setting.

## ASCII Method

### ■Communication Procedure

- The following shows the communication procedure between the Inverter and external controller.



(1): Indicates a frame sent from the external controller to the Inverter.

(2): Indicates a frame sent back from the Inverter to the external controller.

Frame (2) is response output from the Inverter after reception of frame (1). It is not an active output. Below is each frame format (command).

#### Command List

| Command | Description                                    | Communication with all stations | Note                                                               |
|---------|------------------------------------------------|---------------------------------|--------------------------------------------------------------------|
| 00      | Inputs forward/reverse/stop command.           | Available                       | Enabled only when b084 is set to "01" or "02". (Clears trip data.) |
| 01      | Sets frequency reference.                      | Available                       |                                                                    |
| 02      | Sets multi-function input terminal status.     | Available                       |                                                                    |
| 03      | Reads all monitor data.                        | Not available                   |                                                                    |
| 04      | Reads the Inverter status.                     | Not available                   |                                                                    |
| 05      | Reads trip data.                               | Not available                   |                                                                    |
| 06      | Reads a parameter.                             | Not available                   |                                                                    |
| 07      | Sets a parameter.                              | Available                       |                                                                    |
| 08      | Initializes each set value.                    | Available                       |                                                                    |
| 09      | Checks if a set value can be stored in EEPROM. | Not available                   |                                                                    |
| 0A      | Stores a set value in EEPROM.                  | Available                       |                                                                    |
| 0B      | Re-calculates internal parameters.             | Available                       |                                                                    |

The following describes each command.

## &lt;Command 00&gt;

Inputs the forward/reverse/stop command. (To use this command, set A002 to "03" (RS485).)

## •Transmission frame

Frame format

| STX | Station No. | Command | Data | BCC | CR |
|-----|-------------|---------|------|-----|----|
|-----|-------------|---------|------|-----|----|

|             | Description                        | Data size | Setting                                                       |
|-------------|------------------------------------|-----------|---------------------------------------------------------------|
| STX         | Control code (Start of TeXt)       | 1 byte    | STX (0x02)                                                    |
| Station No. | Station No. of the target Inverter | 2 bytes   | 01 to 32, and FF (Communication with all stations)            |
| Command     | Transmission command               | 2 bytes   | 00                                                            |
| Data        | Transmission data                  | 1 byte    | *                                                             |
| BCC         | Block check code                   | 2 bytes   | Exclusive OR from station No. to data. (Refer to page 4-163.) |
| CR          | Control code (Carriage Return)     | 1 byte    | CR (0x0D)                                                     |

\*

| Data | Description     | Note |
|------|-----------------|------|
| 0    | Stop command    |      |
| 1    | Forward command |      |
| 2    | Reverse command |      |

(Example) To send a forward command to station 01

(STX)01|00|1|(BCC)|(CR) ASCII conversion 02|30 31|30 30|31|33 30|0D

←→

## •Response frame

Normal response: Refer to page 4-161.

Error response: Refer to page 4-161.

## &lt;Command 01&gt;

Sets frequency reference. (To use this command, set A001 to "03" (RS485).)

## •Transmission frame

Frame format

| STX | Station No. | Command | Data | BCC | CR |
|-----|-------------|---------|------|-----|----|
|-----|-------------|---------|------|-----|----|

|             | Description                            | Data size | Setting                                                       |
|-------------|----------------------------------------|-----------|---------------------------------------------------------------|
| STX         | Control code (Start of TeXt)           | 1 byte    | STX (0x02)                                                    |
| Station No. | Station No. of the target Inverter     | 2 bytes   | 01 to 32, and FF (Communication with all stations)            |
| Command     | Transmission command                   | 2 bytes   | 01                                                            |
| Data        | Transmission data (Decimal ASCII code) | 6 bytes   | *                                                             |
| BCC         | Block check code                       | 2 bytes   | Exclusive OR from station No. to data. (Refer to page 4-163.) |
| CR          | Control code (Carriage Return)         | 1 byte    | CR (0x0D)                                                     |

\* To set "5 Hz" for station 01

(STX)01|01|000500|(BCC)|(CR)

ASCII conversion 02|30 31|30 31|30 30 35 30 30|30 35|0D

→

Note 1: Data is a value obtained by multiplying the set value by 100.

(Example) 5 (Hz) → 500 → 000500 ASCII conversion 30 30 30 35 30 30  
→

Note 2: To use the data as PID control feedback data, set "1" in the MSB of the data.

(Example) 5 (%) → 500 → 100500 ASCII conversion 31 30 30 35 30 30  
→

•Response frame

Normal response: Refer to page 4-161.

Error response: Refer to page 4-161.

<Command 02>

Sets multi-function input terminal status.

•Transmission frame

Frame format

| STX | Station No. | Command | Data | BCC | CR |
|-----|-------------|---------|------|-----|----|
|-----|-------------|---------|------|-----|----|

|             | Description                        | Data size | Setting                                                       |
|-------------|------------------------------------|-----------|---------------------------------------------------------------|
| STX         | Control code (Start of TeXt)       | 1 byte    | STX (0x02)                                                    |
| Station No. | Station No. of the target Inverter | 2 bytes   | 01 to 32, and FF (Communication with all stations)            |
| Command     | Transmission command               | 2 bytes   | 02                                                            |
| Data        | Transmission data                  | 16 bytes  | *                                                             |
| BCC         | Block check code                   | 2 bytes   | Exclusive OR from station No. to data. (Refer to page 4-163.) |
| CR          | Control code (Carriage Return)     | 1 byte    | CR (0x0D)                                                     |

\* Data (hexadecimal) and description of multi-function terminals (For details, refer to "Multi-function Input Selection" (page 4-79).)

| Data (hex)       | Description                             | Data (hex)       | Description                                    |
|------------------|-----------------------------------------|------------------|------------------------------------------------|
| 0000000000000001 | FWD : Forward                           | 0000001000000000 | SF1 : Multi-step speed setting bit 1           |
| 0000000000000002 | RV : Reverse                            | 0000002000000000 | SF2 : Multi-step speed setting bit 2           |
| 0000000000000004 | CF1 : Multi-step speed setting binary 1 | 0000004000000000 | SF3 : Multi-step speed setting bit 3           |
| 0000000000000008 | CF2 : Multi-step speed setting binary 2 | 0000008000000000 | SF4 : Multi-step speed setting bit 4           |
| 0000000000000010 | CF3 : Multi-step speed setting binary 3 | 0000001000000000 | SF5 : Multi-step speed setting bit 5           |
| 0000000000000020 | CF4 : Multi-step speed setting binary 4 | 0000002000000000 | SF6 : Multi-step speed setting bit 6           |
| 0000000000000040 | JG : Jogging                            | 0000004000000000 | SF7 : Multi-step speed setting bit 7           |
| 0000000000000080 | DB : External DC injection braking      | 0000008000000000 | OLR : Overload limit switching                 |
| 0000000000000100 | SET : 2nd control                       | 0000100000000000 | TL : Torque limit enabled                      |
| 0000000000000200 | 2CH : 2-step acceleration/deceleration  | 0000200000000000 | TRQ1 : Torque limit switching 1                |
| 0000000000000400 | —                                       | 0000400000000000 | TRQ2 : Torque limit switching 2                |
| 0000000000000800 | FRS : Free-run stop                     | 0000800000000000 | PPI : P/PI switching                           |
| 0000000000001000 | EXT : External trip                     | 0001000000000000 | BOK : Brake confirmation                       |
| 0000000000002000 | USP : USP function                      | 0002000000000000 | ORT : Orientation                              |
| 0000000000004000 | CS : Commercial switching               | 0004000000000000 | LAC : LAD cancel                               |
| 0000000000008000 | SFT : Soft lock                         | 0008000000000000 | PCLR : Position deviation clear                |
| 0000000000010000 | AT : Analog input switching             | 0010000000000000 | STAT : Pulse train position command permission |
| 0000000000020000 | SET3 : 3rd control                      | 0020000000000000 | —                                              |
| 0000000000040000 | RS : Reset                              | 0040000000000000 | ADD : Frequency addition                       |
| 0000000000080000 | —                                       | 0080000000000000 | F-TM : Forced terminal block                   |
| 0000000000100000 | STA : 3-wire start                      | 0010000000000000 | ATR : Torque command input permission          |
| 0000000000200000 | STP : 3-wire stop                       | 0020000000000000 | KHC : Integrated power clear                   |
| 0000000000400000 | F/R : 3-wire forward/reverse            | 0040000000000000 | SON : Servo ON                                 |
| 0000000000800000 | PID : PID enabled/disabled              | 0080000000000000 | FOC : Preliminary excitation                   |
| 0000000001000000 | PIDC : PID integral reset               | 0100000000000000 | MI1 : Drive Programming input 1                |
| 0000000002000000 | —                                       | 0200000000000000 | MI2 : Drive Programming input 2                |
| 0000000004000000 | CAS : Control gain switching            | 0400000000000000 | MI3 : Drive Programming input 3                |
| 0000000008000000 | UP : UP/DWN function accelerated        | 0800000000000000 | MI4 : Drive Programming input 4                |
| 0000000010000000 | DWN : UP/DWN function decelerated       | 1000000000000000 | MI5 : Drive Programming input 5                |
| 0000000020000000 | UDC : UP/DWN function data clear        | 2000000000000000 | MI6 : Drive Programming input 6                |
| 0000000040000000 | —                                       | 4000000000000000 | MI7 : Drive Programming input 7                |
| 0000000080000000 | OPE : Forced operator                   | 8000000000000000 | MI8 : Drive Programming input 8                |

\* Data (hexadecimal) and description of multi-function terminals corresponding to 12 commands (For details, refer to "Multi-function Input Terminal Function".)

| Data (hex)       | Description                       | Data (hex)       | Description |
|------------------|-----------------------------------|------------------|-------------|
| 0000000000000001 | —                                 | 0000000100000000 | —           |
| 0000000000000002 | AHD: Analog command held          | 0000000200000000 | —           |
| 0000000000000004 | CP1: Position command selection 1 | 0000000400000000 | —           |
| 0000000000000008 | CP2: Position command selection 2 | 0000000800000000 | —           |
| 0000000000000010 | CP3: Position command selection 3 | 0000001000000000 | —           |
| 0000000000000020 | ORL: Zero return limit signal     | 0000002000000000 | —           |
| 0000000000000040 | ORG: Zero return startup signal   | 0000004000000000 | —           |
| 0000000000000080 | FOT: Forward driving stop         | 0000008000000000 | —           |
| 0000000000000100 | ROT: Reverse driving stop         | 0000010000000000 | —           |
| 0000000000000200 | SPD: Speed/Position switching     | 0000020000000000 | —           |
| 0000000000000400 | PCNT: Pulse counter               | 0000040000000000 | —           |
| 0000000000000800 | PCC: Pulse counter clear          | 0000080000000000 | —           |
| 0000000000001000 | —                                 | 0000100000000000 | —           |
| 0000000000002000 | —                                 | 0000200000000000 | —           |
| 0000000000004000 | —                                 | 0000400000000000 | —           |
| 0000000000008000 | —                                 | 0000800000000000 | —           |
| 0000000000010000 | —                                 | 0001000000000000 | —           |
| 0000000000020000 | —                                 | 0002000000000000 | —           |
| 0000000000040000 | —                                 | 0004000000000000 | —           |
| 0000000000080000 | —                                 | 0008000000000000 | —           |
| 0000000000100000 | —                                 | 0010000000000000 | —           |
| 0000000000200000 | —                                 | 0020000000000000 | —           |
| 0000000000400000 | —                                 | 0040000000000000 | —           |
| 0000000000800000 | —                                 | 0080000000000000 | —           |
| 0000000001000000 | —                                 | 0100000000000000 | —           |
| 0000000002000000 | —                                 | 0200000000000000 | —           |
| 0000000004000000 | —                                 | 0400000000000000 | —           |
| 0000000008000000 | —                                 | 0800000000000000 | —           |
| 0000000010000000 | —                                 | 1000000000000000 | —           |
| 0000000020000000 | —                                 | 2000000000000000 | —           |
| 0000000040000000 | —                                 | 4000000000000000 | —           |
| 0000000080000000 | —                                 | 8000000000000000 | —           |

(Example) To enable "Forward", "Multi-step speed 1", and "Multi-step speed 2" for the Inverter with station No. 01  
 $0x0000000000000001 + 0x0000000000000004 + 0x0000000000000008$   
 $= 0x000000000000000D$   
 The transmission frame is therefore:  
 (STX)|01|02|000000000000000D|(BCC)|(CR)

## •Response frame

Positive response: Refer to page 4-161.

Negative response: Refer to page 4-161.

&lt;Command 03&gt;

Reads all monitor data.

## •Transmission frame

Frame format

| STX | Station No. | Command | BCC | CR |
|-----|-------------|---------|-----|----|
|-----|-------------|---------|-----|----|

|             | Description                        | Data size | Setting                                                       |
|-------------|------------------------------------|-----------|---------------------------------------------------------------|
| STX         | Control code (Start of TeXt)       | 1 byte    | STX (0x02)                                                    |
| Station No. | Station No. of the target Inverter | 2 bytes   | 01 to 32                                                      |
| Command     | Transmission command               | 2 bytes   | 03                                                            |
| BCC         | Block check code                   | 2 bytes   | Exclusive OR from station No. to data. (Refer to page 4-163.) |
| CR          | Control code (Carriage Return)     | 1 byte    | CR (0x0D)                                                     |

## •Response frame

Frame format

| STX | Station No. | Data | BCC | CR |
|-----|-------------|------|-----|----|
|-----|-------------|------|-----|----|

|             | Description                        | Data size | Setting                                                       |
|-------------|------------------------------------|-----------|---------------------------------------------------------------|
| STX         | Control code (Start of Text)       | 1 byte    | STX (0x02)                                                    |
| Station No. | Station No. of the target Inverter | 2 bytes   | 01 to 32                                                      |
| Data        | Data                               | 104 bytes | *                                                             |
| BCC         | Block check code                   | 2 bytes   | Exclusive OR from station No. to data. (Refer to page 4-163.) |
| CR          | Control code (Carriage Return)     | 1 byte    | CR (0x0D)                                                     |



\* Each monitor value

| Monitor item                  | Unit | Magnification | Data size | Description                                           |       |
|-------------------------------|------|---------------|-----------|-------------------------------------------------------|-------|
| Output frequency              | Hz   | × 100         | 8 bytes   | Decimal ASCII code                                    |       |
| Output current                | A    | × 10          | 8 bytes   | Decimal ASCII code                                    |       |
| Rotation direction            | —    | —             | 8 bytes   | 0: Stop, 1: Forward, 2: Reverse                       |       |
| PID feedback monitor          | %    | × 100         | 8 bytes   | Decimal ASCII code                                    |       |
| Multi-function input monitor  | —    | —             | 8 bytes   | See *1.                                               |       |
| Multi-function output monitor | —    | —             | 8 bytes   | See *2.                                               | → MSB |
| Frequency conversion monitor  | —    | × 100         | 8 bytes   | Decimal ASCII code                                    | LSB ← |
| Output torque                 | %    | × 1           | 8 bytes   | Decimal ASCII code                                    |       |
| Output voltage monitor        | V    | × 10          | 8 bytes   | Decimal ASCII code                                    |       |
| Power monitor                 | kW   | × 10          | 8 bytes   | Decimal ASCII code                                    |       |
| —                             | —    | —             | 8 bytes   | "00000000" is stored. (Preliminary data storage area) |       |
| RUN time monitor              | h    | × 1           | 8 bytes   | Decimal ASCII code                                    |       |
| ON time monitor               | h    | × 1           | 8 bytes   | Decimal ASCII code                                    |       |

\*1. Multi-function input terminal monitor

| Item        | Data     |
|-------------|----------|
| 1 terminal  | 00000001 |
| 2 terminal  | 00000002 |
| 3 terminal  | 00000004 |
| 4 terminal  | 00000008 |
| 5 terminal  | 00000010 |
| 6 terminal  | 00000020 |
| 7 terminal  | 00000040 |
| 8 terminal  | 00000080 |
| FW terminal | 00000100 |

\*2. Multi-function output terminal monitor

| Item           | Data     |
|----------------|----------|
| 11 terminal    | 00000001 |
| 12 terminal    | 00000002 |
| 13 terminal    | 00000004 |
| 14 terminal    | 00000008 |
| 15 terminal    | 00000010 |
| Relay terminal | 00000020 |

&lt;Command 04&gt;

Reads the Inverter status.

## •Transmission frame

Frame format

| STX | Station No. | Command | BCC | CR |
|-----|-------------|---------|-----|----|
|-----|-------------|---------|-----|----|

|             | Description                        | Data size | Setting                                                       |
|-------------|------------------------------------|-----------|---------------------------------------------------------------|
| STX         | Control code (Start of TeXt)       | 1 byte    | STX (0x02)                                                    |
| Station No. | Station No. of the target Inverter | 2 bytes   | 01 to 32                                                      |
| Command     | Transmission command               | 2 bytes   | 04                                                            |
| BCC         | Block check code                   | 2 bytes   | Exclusive OR from station No. to data. (Refer to page 4-163.) |
| CR          | Control code (Carriage Return)     | 1 byte    | CR (0x0D)                                                     |

## •Response frame

Frame format

| STX | Station No. | Data | BCC | CR |
|-----|-------------|------|-----|----|
|-----|-------------|------|-----|----|

|             | Description                        | Data size | Setting                                                       |
|-------------|------------------------------------|-----------|---------------------------------------------------------------|
| STX         | Control code (Start of TeXt)       | 1 byte    | STX (0x02)                                                    |
| Station No. | Station No. of the target Inverter | 2 bytes   | 01 to 32                                                      |
| Data        | Data                               | 8 bytes   | *                                                             |
| BCC         | Block check code                   | 2 bytes   | Exclusive OR from station No. to data. (Refer to page 4-163.) |
| CR          | Control code (Carriage Return)     | 1 byte    | CR (0x0D)                                                     |

\* Inverter status data includes the following three elements (A, B, and C).

Data

| Status A | Status B | Status C | 00 (Reserved) |
|----------|----------|----------|---------------|
|----------|----------|----------|---------------|

Inverter status A

| Code | Status         |
|------|----------------|
| 00   | Initial status |
| 01   | -              |
| 02   | During stop    |
| 03   | During RUN     |
| 04   | During FRS     |
| 05   | During JG      |
| 06   | During DB      |
| 07   | During retry   |
| 08   | During trip    |
| 09   | During UV      |

Inverter status B

| Code | Status      |
|------|-------------|
| 00   | During stop |
| 01   | During RUN  |
| 02   | During trip |

Inverter status C

| Code | Status             |
|------|--------------------|
| 00   | -                  |
| 01   | Stop               |
| 02   | Deceleration       |
| 03   | Constant speed     |
| 04   | Acceleration       |
| 05   | Forward            |
| 06   | Reverse            |
| 07   | Forward to reverse |
| 08   | Reverse to forward |
| 09   | Forward run start  |
| 10   | Reverse run start  |

<Command 05>

Reads trip data.

•Transmission frame

Frame format

| STX | Station No. | Command | BCC | CR |
|-----|-------------|---------|-----|----|
|-----|-------------|---------|-----|----|

|             | Description                        | Data size | Setting                                                       |
|-------------|------------------------------------|-----------|---------------------------------------------------------------|
| STX         | Control code (Start of TeXt)       | 1 byte    | STX (0x02)                                                    |
| Station No. | Station No. of the target Inverter | 2 bytes   | 01 to 32                                                      |
| Command     | Transmission command               | 2 bytes   | 05                                                            |
| BCC         | Block check code                   | 2 bytes   | Exclusive OR from station No. to data. (Refer to page 4-163.) |
| CR          | Control code (Carriage Return)     | 1 byte    | CR (0x0D)                                                     |

## •Response frame

Frame format

| STX | Station No. | Data | BCC | CR |
|-----|-------------|------|-----|----|
|-----|-------------|------|-----|----|

|             | Description                                 | Data size | Setting                                                       |
|-------------|---------------------------------------------|-----------|---------------------------------------------------------------|
| STX         | Control code (Start of TeXt)                | 1 byte    | STX (0x02)                                                    |
| Station No. | Station No. of the target Inverter          | 2 bytes   | 01 to 32                                                      |
| Data        | Each monitor's data at the time of tripping | 440 bytes | *                                                             |
| BCC         | Block check code                            | 2 bytes   | Exclusive OR from station No. to data. (Refer to page 4-163.) |
| CR          | Control code (Carriage Return)              | 1 byte    | CR (0x0D)                                                     |

\* Each trip monitor stores the past six trips, together with total trip count (8 bytes).

|             |             |       |             |
|-------------|-------------|-------|-------------|
| Total count | Trip data 1 | ..... | Trip data 6 |
|-------------|-------------|-------|-------------|

| Monitor item      | Unit | Magnification | Data size | Note               |          |
|-------------------|------|---------------|-----------|--------------------|----------|
| Trip factor       | —    | —             | 8 bytes   | Code display       |          |
| Inverter status A | —    | —             | 8 bytes   |                    |          |
| Inverter status B | —    | —             | 8 bytes   | See "Command 04".  |          |
| Inverter status C | —    | —             | 8 bytes   |                    | →<br>MSB |
| Output frequency  | Hz   | × 10          | 8 bytes   | Decimal ASCII code |          |
| Total RUN time    | h    | × 1           | 8 bytes   | Decimal ASCII code | ←<br>LSB |
| Output current    | A    | × 10          | 8 bytes   | Decimal ASCII code |          |
| DC voltage        | V    | × 10          | 8 bytes   | Decimal ASCII code |          |
| Power ON time     | h    | × 1           | 8 bytes   | Decimal ASCII code |          |

## &lt;Command 06&gt;

Reads a setting item.

## •Transmission frame

Frame format

| STX | Station No. | Command | Parameter | BCC | CR |
|-----|-------------|---------|-----------|-----|----|
|-----|-------------|---------|-----------|-----|----|

|             | Description                        | Data size | Setting                                                       |
|-------------|------------------------------------|-----------|---------------------------------------------------------------|
| STX         | Control code (Start of TeXt)       | 1 byte    | STX (0x02)                                                    |
| Station No. | Station No. of the target Inverter | 2 bytes   | 01 to 32                                                      |
| Command     | Transmission command               | 2 bytes   | 06                                                            |
| Parameter   | Parameter No. for data             | 4 bytes   | *                                                             |
| BCC         | Block check code                   | 2 bytes   | Exclusive OR from station No. to data. (Refer to page 4-163.) |
| CR          | Control code (Carriage Return)     | 1 byte    | CR (0x0D)                                                     |

\* All parameters except F001 and U001 to U012 are retrieved.

- Response frame  
Positive response

Frame format

| STX | Station No. | ACK | Data | BCC | CR |
|-----|-------------|-----|------|-----|----|
|-----|-------------|-----|------|-----|----|

|             | Description                        | Data size | Setting                                                       |
|-------------|------------------------------------|-----------|---------------------------------------------------------------|
| STX         | Control code (Start of TeXt)       | 1 byte    | STX (0x02)                                                    |
| Station No. | Station No. of the target Inverter | 2 bytes   | 01 to 32                                                      |
| ACK         | Control code (ACKnowledge)         | 1 byte    | ACK (0x06)                                                    |
| Data        | Data (Decimal ASCII code)          | 8 bytes   | *                                                             |
| BCC         | Block check code                   | 2 bytes   | Exclusive OR from station No. to data. (Refer to page 4-163.) |
| CR          | Control code (Carriage Return)     | 1 byte    | CR (0x0D)                                                     |

\* If the data is a selected item, the corresponding code data is received/transmitted.  
Data on H003 and H203 (motor capacity selection) are the following code data.

| Code data                           | 00     | 01   | 02  | 03   | 04   | 05  | 06  | 07  | 08  | 09  | 10  |
|-------------------------------------|--------|------|-----|------|------|-----|-----|-----|-----|-----|-----|
| Domestic/USA mode (b085 = 00 or 02) | 0.2 kW | —    | 0.4 | —    | 0.75 | —   | 1.5 | 2.2 | —   | 3.7 | —   |
| EU mode (b085 = 01)                 | 0.2 kW | 0.37 | —   | 0.55 | 0.75 | 1.1 | 1.5 | 2.2 | 3.0 | —   | 4.0 |
| Code data                           | 11     | 12   | 13  | 14   | 15   | 16  | 17  | 18  | 19  | 20  | 21  |
| Domestic/USA mode (b085 = 00 or 02) | 5.5 kW | 7.5  | 11  | 15   | 18.5 | 22  | 30  | 37  | 45  | 55  | 75  |
| EU mode (b085 = 01)                 | 5.5 kW | 7.5  | 11  | 15   | 18.5 | 22  | 30  | 37  | 45  | 55  | 75  |
| Code data                           | 22     | 23   | 24  | 25   | 26   |     |     |     |     |     |     |
| Domestic/USA mode (b085 = 00 or 02) | 90 kW  | 110  | 132 | 150  | 160  |     |     |     |     |     |     |
| EU mode (b085 = 01)                 | 90 kW  | 110  | 132 | 150  | 160  |     |     |     |     |     |     |

- If the data is a numeric value, refer to the function code list.  
(Example) When acceleration time F002 is set to 30.00 sec, the data is "3000".  
Negative response: Refer to page 4-161.

## &lt;Command 07&gt;

Writes data to a specified setting item.

## •Transmission frame

Frame format

| STX | Station No. | Command | Parameter | Data | BCC | CR |
|-----|-------------|---------|-----------|------|-----|----|
|-----|-------------|---------|-----------|------|-----|----|

|             | Description                            | Data size | Setting                                                       |
|-------------|----------------------------------------|-----------|---------------------------------------------------------------|
| STX         | Control code (Start of TeXt)           | 1 byte    | STX (0x02)                                                    |
| Station No. | Station No. of the target Inverter     | 2 bytes   | 01 to 32, and FF (Communication with all stations)            |
| Command     | Transmission command                   | 2 bytes   | 07                                                            |
| Parameter   | Parameter No. for data                 | 4 bytes   | *1                                                            |
| Data        | Parameter data<br>(Decimal ASCII code) | 8 bytes   | *2                                                            |
| BCC         | Block check code                       | 2 bytes   | Exclusive OR from station No. to data. (Refer to page 4-163.) |
| CR          | Control code (Carriage Return)         | 1 byte    | CR (0x0D)                                                     |

\*1 Allowable parameter ranges are shown below.

From F002, A001, b001, C001, H001, and P001 (For F001, use command 01.)

\*2 Refer to command 06.

## •Response frame

Positive response: Refer to page 4-161.

Negative response: Refer to page 4-161.

## &lt;Command 08&gt;

Initializes each set value.

Initialization conforms to the setting of initialization selection b084. If b084 is "00", the trip data is cleared.

## •Transmission frame

Frame format

| STX | Station No. | Command | BCC | CR |
|-----|-------------|---------|-----|----|
|-----|-------------|---------|-----|----|

|             | Description                        | Data size | Setting                                                       |
|-------------|------------------------------------|-----------|---------------------------------------------------------------|
| STX         | Control code (Start of TeXt)       | 1 byte    | STX (0x02)                                                    |
| Station No. | Station No. of the target Inverter | 2 bytes   | 01 to 32, and FF (Communication with all stations)            |
| Command     | Transmission command               | 2 bytes   | 08                                                            |
| BCC         | Block check code                   | 2 bytes   | Exclusive OR from station No. to data. (Refer to page 4-163.) |
| CR          | Control code (Carriage Return)     | 1 byte    | CR (0x0D)                                                     |

## •Response frame

Positive response: Refer to page 4-161.

Negative response: Refer to page 4-161.

## &lt;Command 09&gt;

Checks if a set value can be stored in EEPROM.

## •Transmission frame

Frame format

| STX | Station No. | Command | BCC | CR |
|-----|-------------|---------|-----|----|
|-----|-------------|---------|-----|----|

|             | Description                        | Data size | Setting                                                       |
|-------------|------------------------------------|-----------|---------------------------------------------------------------|
| STX         | Control code (Start of TeXt)       | 1 byte    | STX (0x02)                                                    |
| Station No. | Station No. of the target Inverter | 2 bytes   | 01 to 32                                                      |
| Command     | Transmission command               | 2 bytes   | 09                                                            |
| BCC         | Block check code                   | 2 bytes   | Exclusive OR from station No. to data. (Refer to page 4-163.) |
| CR          | Control code (Carriage Return)     | 1 byte    | CR (0x0D)                                                     |

## •Response frame

Frame format

| STX | Station No. | ACK | Data | BCC | CR |
|-----|-------------|-----|------|-----|----|
|-----|-------------|-----|------|-----|----|

|             | Description                        | Data size | Setting                                                       |
|-------------|------------------------------------|-----------|---------------------------------------------------------------|
| STX         | Control code (Start of TeXt)       | 1 byte    | STX (0x02)                                                    |
| Station No. | Station No. of the target Inverter | 2 bytes   | 01 to 32                                                      |
| ACK         | Control code (ACKnowledge)         | 1 byte    | ACK (0x06)                                                    |
| Data        | Data                               | 2 bytes   | 01: Enabled                                                   |
| BCC         | Block check code                   | 2 bytes   | Exclusive OR from station No. to data. (Refer to page 4-163.) |
| CR          | Control code (Carriage Return)     | 1 byte    | CR (0x0D)                                                     |

Negative response: Refer to page 4-161.

## &lt;Command 0A&gt;

Stores a set value in EEPROM.

## •Transmission frame

Frame format

| STX | Station No. | Command | BCC | CR |
|-----|-------------|---------|-----|----|
|-----|-------------|---------|-----|----|

|             | Description                        | Data size | Setting                                                       |
|-------------|------------------------------------|-----------|---------------------------------------------------------------|
| STX         | Control code (Start of TeXt)       | 1 byte    | STX (0x02)                                                    |
| Station No. | Station No. of the target Inverter | 2 bytes   | 01 to 32                                                      |
| Command     | Transmission command               | 2 bytes   | 0A                                                            |
| BCC         | Block check code                   | 2 bytes   | Exclusive OR from station No. to data. (Refer to page 4-163.) |
| CR          | Control code (Carriage Return)     | 1 byte    | CR (0x0D)                                                     |

## •Response frame

Positive response: Refer to page 4-161.

Negative response: Refer to page 4-161.

&lt;Command 0B&gt;

Re-calculates internal parameters.

Recalculation is required when the base frequency and H\*\*\* parameters are changed via RS485 communication.

- Transmission frame

Frame format

|     |             |         |     |    |
|-----|-------------|---------|-----|----|
| STX | Station No. | Command | BCC | CR |
|-----|-------------|---------|-----|----|

|             | Description                        | Data size | Setting                                                       |
|-------------|------------------------------------|-----------|---------------------------------------------------------------|
| STX         | Control code (Start of TeXt)       | 1 byte    | STX (0x02)                                                    |
| Station No. | Station No. of the target Inverter | 2 bytes   | 01 to 32                                                      |
| Command     | Transmission command               | 2 bytes   | 0B                                                            |
| BCC         | Block check code                   | 2 bytes   | Exclusive OR from station No. to data. (Refer to page 4-163.) |
| CR          | Control code (Carriage Return)     | 1 byte    | CR (0x0D)                                                     |

- Response frame

Positive response: Refer to page 4-161.

Negative response: Refer to page 4-161.

## ■Positive/Negative Responses

&lt;Positive Response&gt;

- Response frame

Frame format

|     |             |     |     |    |
|-----|-------------|-----|-----|----|
| STX | Station No. | ACK | BCC | CR |
|-----|-------------|-----|-----|----|

|             | Description                        | Data size | Setting                                                       |
|-------------|------------------------------------|-----------|---------------------------------------------------------------|
| STX         | Control code (Start of TeXt)       | 1 byte    | STX (0x02)                                                    |
| Station No. | Station No. of the target Inverter | 2 bytes   | 01 to 32                                                      |
| ACK         | Control code (ACKnowledge)         | 1 byte    | ACK (0x06)                                                    |
| BCC         | Block check code                   | 2 bytes   | Exclusive OR from station No. to data. (Refer to page 4-163.) |
| CR          | Control code (Carriage Return)     | 1 byte    | CR (0x0D)                                                     |



&lt;Negative Response&gt;

## •Response frame

Frame format

|     |             |     |            |     |    |
|-----|-------------|-----|------------|-----|----|
| STX | Station No. | NAK | Error code | BCC | CR |
|-----|-------------|-----|------------|-----|----|

|             | Description                         | Data size | Setting                                                       |
|-------------|-------------------------------------|-----------|---------------------------------------------------------------|
| STX         | Control code (Start of TeXt)        | 1 byte    | STX (0x02)                                                    |
| Station No. | Station No. of the target Inverter  | 2 bytes   | 01 to 32                                                      |
| NAK         | Control code (Negative AcKnowledge) | 1 byte    | NAK (0x15)                                                    |
| Error code  | Communication error status          | 2 bytes   | *                                                             |
| BCC         | Block check code                    | 2 bytes   | Exclusive OR from station No. to data. (Refer to page 4-163.) |
| CR          | Control code (Carriage Return)      | 1 byte    | CR (0x0D)                                                     |

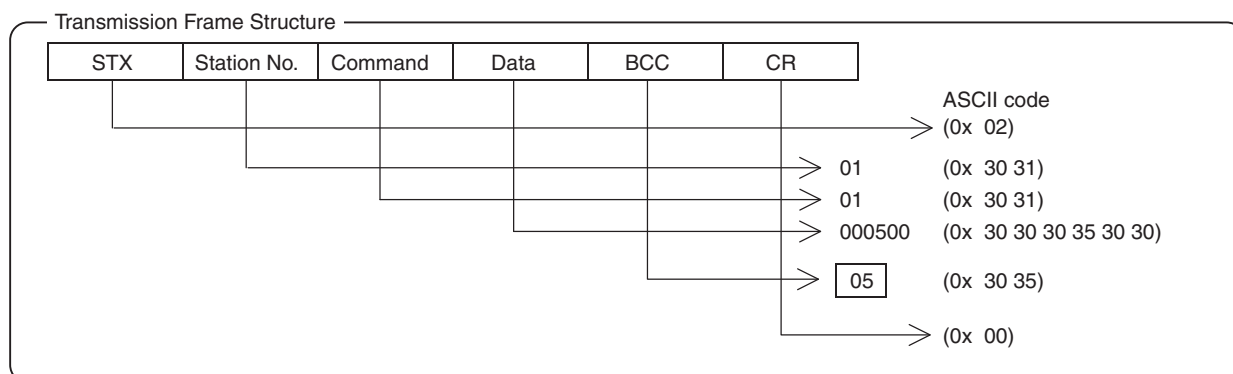
\* Error Code List

| Error code | Description                    |
|------------|--------------------------------|
| 01H        | Parity error                   |
| 02H        | Checksum error                 |
| 03H        | Framing error                  |
| 04H        | Overrun error                  |
| 05H        | Protocol error                 |
| 06H        | ASCII code error               |
| 07H        | Receiving buffer overrun error |
| 08H        | Receiving timeout error        |
| —          | —                              |
| —          | —                              |
| 11H        | Command invalid error          |
| 12H        | —                              |
| 13H        | Execution disabled error       |
| 14H        | —                              |
| 15H        | —                              |
| 16H        | Parameter invalid error        |
| 17H        | —                              |

During communication with all stations, the Inverter sends no response.

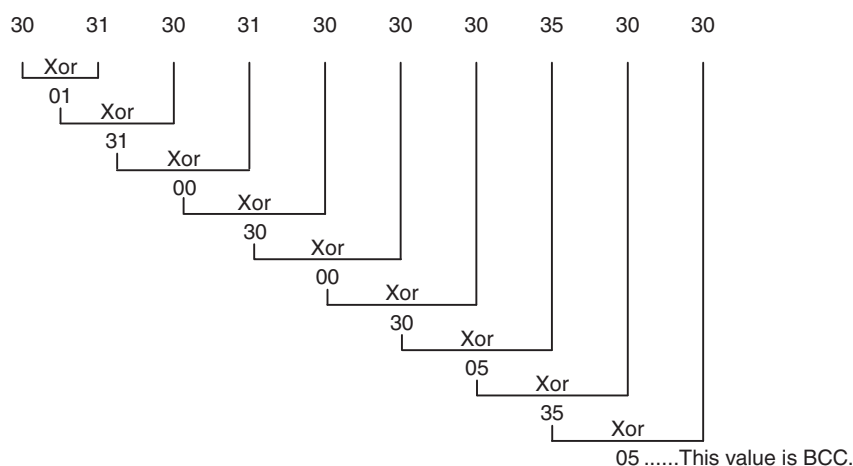
## 4

(Example) To set "5 Hz" using command 01 (frequency reference setting) (When the target station No. is "01")



To determine BCC, the Inverter performs ASCII conversion from the station No. to data, and calculates a result of the exclusive OR (Xor) per byte.

For the above transmission frame, BCC is calculated as follows:



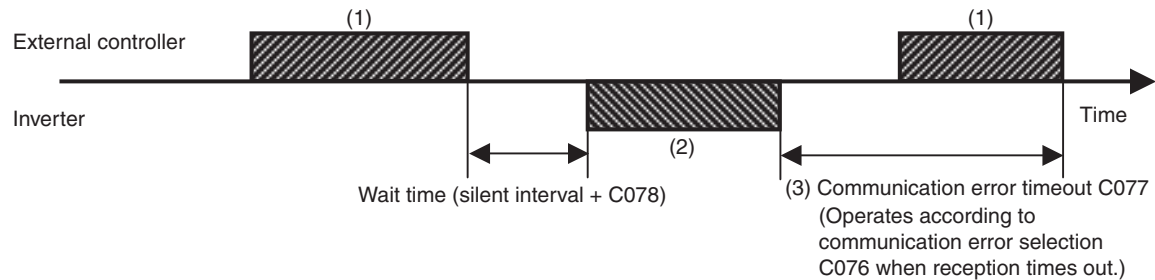
(Appendix) ASCII Code Conversion Table

| Text data | ASCII code |
|-----------|------------|
| STX       | 2          |
| ACK       | 6          |
| CR        | 0D         |
| NAK       | 15         |
| 0         | 30         |
| 1         | 31         |
| 2         | 32         |
| 3         | 33         |
| 4         | 34         |
| 5         | 35         |
| 6         | 36         |
| 7         | 37         |
| 8         | 38         |
| 9         | 39         |

| Text data | ASCII code |
|-----------|------------|
| A         | 41         |
| B         | 42         |
| C         | 43         |
| D         | 44         |
| E         | 45         |
| F         | 46         |
| H         | 48         |
| P         | 50         |
| b         | 62         |

## ModBus-RTU Method

Follow the procedures below in regards to communication between the external controller and the Inverter.



- (1) : Frame to be sent from the external control device to the Inverter (Query)  
 (2) : Frame to be returned from the Inverter to the external controller (Response)  
 (3) : Unless the Inverter completes reception of a query from the host within the time set in C077 after the Inverter completes a response (response transmission), the Inverter becomes ready to receive the first data again. In this case, the Inverter sends no response.

Also, the Inverter's operation conforms to the setting of communication error selection C076. For details, refer to the following table.

The receiving timeout monitor starts after the first transmission/reception is performed after power-on or reset. Receiving timeout is inactive until reception or transmission is performed.

| Parameter No. | Function name                 | Data                                                                                                                                                                                                                                                                                                                                                                          | Default setting | Unit |
|---------------|-------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|------|
| C076          | Communication error selection | 00: Trip<br>(Trip after receiving timeout [E41])<br>01: Decel-Trip<br>(Deceleration stop after receiving timeout. Trip after stop [E41])<br>02: Ignore<br>(No trip and no alarm output)<br>03: Free-RUN<br>(Free-run stop after receiving timeout. No trip and no alarm output)<br>04: Decel-Stop<br>(Deceleration stop after receiving timeout. No trip and no alarm output) | 02              | —    |
| C077          | Communication error timeout   | 0.00 to 99.99:<br>Time before receiving timeout                                                                                                                                                                                                                                                                                                                               | 0.00            | —    |
| C078          | Communication wait time       | 0 to 1000: Wait time until response starts after reception is completed (excluding silent interval)                                                                                                                                                                                                                                                                           | 0               | —    |

Response from the Inverter (Frame 2) is output as return after the Inverter receives the query (Frame 1), not output independently.

Below is each frame format (command).

#### Message Configuration: Query

|                           |
|---------------------------|
| Header (Silent interval)  |
| Slave address             |
| Function code             |
| Data                      |
| Error check               |
| Trailer (Silent interval) |

##### <Slave Address>

- Pre-set numbers ranging from 1 to 247 in each Inverter (slave). (Only the Inverter having the same slave address as the query takes in the corresponding query.)
- Broadcasting can be performed by setting the slave address to "0".
- Data call or loop-back cannot be performed while broadcasting.

##### <Data>

- Sends the function command.
- The RX corresponds with the following data formats used in the ModBus.

| Data name        | Description                                                  |
|------------------|--------------------------------------------------------------|
| Coil             | 2-value data (1-bit long) that can be referred to or changed |
| Holding register | 16-bit long data that can be referred to or changed          |

##### <Function Code>

- Specifies the function for the Inverter to perform.
- Below are the function codes supported by the RX.

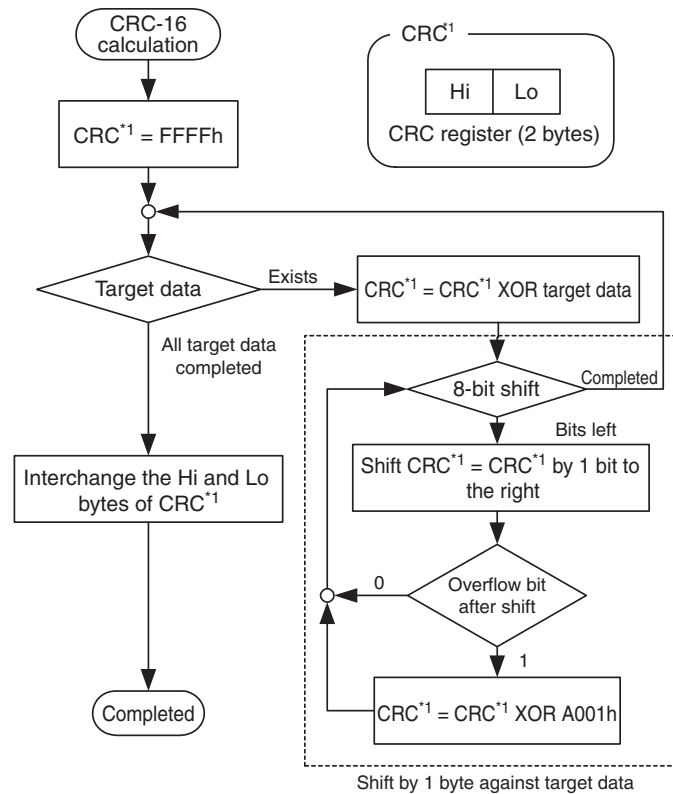
##### Function Code

| Function code | Function                          | Maximum number of data bytes in 1 message | Maximum data number in 1 message |
|---------------|-----------------------------------|-------------------------------------------|----------------------------------|
| 01h           | Reading coil status               | 4                                         | 32 coils (in bits)               |
| 03h           | Reading holding register content  | 8                                         | 4 registers (in bytes)           |
| 05h           | Writing into the coil             | 2                                         | 1 coil (in bits)                 |
| 06h           | Writing into the holding register | 2                                         | 1 register (in bytes)            |
| 08h           | Loop-back test                    | —                                         |                                  |
| 0Fh           | Writing into multiple coils       | 4                                         | 32 coils (in bits)               |
| 10h           | Writing into multiple registers   | 8                                         | 4 registers (in bytes)           |

##### <Error Check>

- CRC (Cyclic Redundancy Check) is used for the ModBus-RTU error check.
- The CRC code is a 16-bit data generated for the block of random length data in the 8-bit unit.
- To prepare the CRC code, use a generation polynomial of CRC-16 ( $X^{16} + X^{15} + X^2 + 1$ ).

## CRC-16 Calculation Example



## &lt;Header and Trailer (Silent Interval)&gt;

- Wait time from receiving the query from the master to the response by the Inverter.
- Be sure to provide 3.5 characters (24 bits) as the wait time. If the length does not reach 3.5 characters, the Inverter does not respond.
- The actual communication wait time is the total of the silent interval (3.5-character length) and C078 (communication wait time) setting.

## Message Configuration: Response

## &lt;Total Communication Time&gt;

- The time from receiving query to the response by the Inverter is the total of the silent interval (3.5-character length) and C078 (communication wait time) setting.
- If sending another query to the Inverter after receiving the response, be sure to provide the silent interval length (3.5 characters) at the minimum.

## &lt;Normal Response&gt;

- If the query is the loop-back function code (08h), the Inverter sends back a response of the same content as the query.
- If the query is the function code to be written into the holding register or coil (05h, 06h, 0Fh, 10h), the Inverter sends back the query as it is in response.
- If the query is the function code to be read from the holding register or coil (01h, 03h), the Inverter makes the slave address and function code the same as the query and attaches the read data to the query.

<Abnormal Response>  
Field Configuration

|                |
|----------------|
| Slave address  |
| Function code  |
| Exception code |
| CRC-16         |

- If an error (aside from a communication error) is found in the query content, the Inverter returns exception responses without performing any operation.
- To determine the cause of an error, check the function code of the response. The function code of the exception response is the value of the query function code to which 80h is added.
- Check the details of the error with the exception code.

### Exception code

| Code | Description                                                                                                                                                                                                                                                                                                                                                             |
|------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 01h  | An unsupported function has been specified.                                                                                                                                                                                                                                                                                                                             |
| 02h  | Specified address does not exist.                                                                                                                                                                                                                                                                                                                                       |
| 03h  | Specified data has an unacceptable format.                                                                                                                                                                                                                                                                                                                              |
| 21h  | Data is out of the Inverter's range for writing into the holding register.                                                                                                                                                                                                                                                                                              |
| 22h  | <p>The Inverter does not allow this function.</p> <ul style="list-style-type: none"> <li>• Has attempted to change the register that cannot be changed during operation.</li> <li>• Has issued the enter command during operation (UV).</li> <li>• Has written into the register during trip (UV).</li> <li>• Has written into the read-only register (coil)</li> </ul> |

<No Response>

The Inverter ignores the query and does not respond if:

- The broadcast is received.
- A communication error is detected in receiving a query.
- The query slave address does not correspond with the slave address set for the Inverter.
- The time interval between 2 pieces of data that configure the message is less than a 3.5-character length.
- Query data length is inappropriate.

Note: If the timer is set in the master to monitor response, but no response is returned within the set time period, send the same query again.

## ■ Explanation of Each Function Code

<Reading Coil Status [01h]>

Reads out the coil status (ON/OFF).

(Example)

Read multi-function input terminals 1 to 6 on the Inverter with slave address 8.

Refer to the following table for the multi-function input terminal status.

| Multi-function input terminals | 1  | 2  | 3  | 4   | 5  | 6   |
|--------------------------------|----|----|----|-----|----|-----|
| Coil No.                       | 7  | 8  | 9  | 10  | 11 | 12  |
| Terminal status                | ON | ON | ON | OFF | ON | OFF |

Coils 13 and 14 are OFF.

Query

| No. | Field name                            | Example (HEX) |
|-----|---------------------------------------|---------------|
| 1   | Slave address <sup>*1</sup>           | 08            |
| 2   | Function code                         | 01            |
| 3   | Coil start number (MSB) <sup>*2</sup> | 00            |
| 4   | Coil start number (LSB) <sup>*2</sup> | 06            |
| 5   | Number of coils (MSB) <sup>*3</sup>   | 00            |
| 6   | Number of coils (LSB) <sup>*3</sup>   | 06            |
| 7   | CRC-16 (MSB)                          | 5C            |
| 8   | CRC-16 (LSB)                          | 90            |

Response

| No. | Field name              | Example (HEX) |
|-----|-------------------------|---------------|
| 1   | Slave address           | 08            |
| 2   | Function code           | 01            |
| 3   | Number of data bytes    | 01            |
| 4   | Coil data <sup>*4</sup> | 17            |
| 5   | CRC-16 (MSB)            | 12            |
| 6   | CRC-16 (LSB)            | 1A            |

<sup>\*4</sup>. Transfers data by the number of data bytes.

<sup>\*1</sup>. Broadcasting cannot be performed.

<sup>\*2</sup>. Note that the start number is reduced by 1.

<sup>\*3</sup>. When specifying the value of 0 or over 32 for the number of reading coils, the error code "3h" is replied.

The data received as the response shows the status of coils 7 to 14. The data received here, "17h = 00010111b", should be read with coil 7 as LSB, as follows:

| Coil No.    | 14  | 13  | 12  | 11 | 10  | 9  | 8  | 7  |
|-------------|-----|-----|-----|----|-----|----|----|----|
| Coil status | OFF | OFF | OFF | ON | OFF | ON | ON | ON |

If the read coil exceeds the defined coil range in the final coil data, such coil data is regarded as "0" and sent.

If the coil status reading command has not been performed normally, refer to the "Exception Response" section.

## &lt;Reading Holding Register Content [03h]&gt;

Reads consecutively the specified number of holding register contents from the specified holding register address.

(Example)

Read past trip data from the Inverter with slave address 5.

Below is the data on past three trips:

| RX command               | d081 (Previous factor) | d081 (Previous Inverter status) |
|--------------------------|------------------------|---------------------------------|
| Holding register No.     | 0012h                  | 0013h                           |
| Trip factor (high-order) | Overvoltage (E07)      | During deceleration (02)        |

## Query

| No. | Field name                                | Example (HEX) |
|-----|-------------------------------------------|---------------|
| 1   | Slave address <sup>*1</sup>               | 05            |
| 2   | Function code                             | 03            |
| 3   | Register start number (MSB) <sup>*2</sup> | 00            |
| 4   | Register start number (LSB) <sup>*2</sup> | 11            |
| 5   | Number of holding registers (MSB)         | 00            |
| 6   | Number of holding registers (LSB)         | 02            |
| 7   | CRC-16 (MSB)                              | 95            |
| 8   | CRC-16 (LSB)                              | 8A            |

\*1. Broadcasting cannot be performed.

\*2. Note that the start number is reduced by 1.

## Response

| No. | Field name                         | Example (HEX) |
|-----|------------------------------------|---------------|
| 1   | Slave address                      | 05            |
| 2   | Function code                      | 03            |
| 3   | Number of data bytes <sup>*3</sup> | 04            |
| 4   | Register start number (MSB)        | 00            |
| 5   | Register start number (LSB)        | 07            |
| 6   | Register start number +1 (MSB)     | 00            |
| 7   | Register start number +1 (LSB)     | 02            |
| 8   | CRC-16 (MSB)                       | 36            |
| 9   | CRC-16 (LSB)                       | 37            |

\*3. Transfers data by the number of data bytes. In this example, the Inverter sends response data on two holding registers (4 bytes).

Read the data received in response, as follows:

| Response buffer               | 4                | 5        | 6                   | 7        |
|-------------------------------|------------------|----------|---------------------|----------|
| Holding register start number | +0 (MSB)         | +0 (LSB) | +1 (MSB)            | +1 (LSB) |
| Response data                 | 00h              | 07h      | 00h                 | 02h      |
| Trip cause                    | Overvoltage trip |          | During deceleration |          |

If the holding register content has not been read out normally, refer to the "Exception Response" section.



## &lt;Writing Into the Coil [05h]&gt;

Writes into one coil.

The following table shows the coil status change.

|                   | Coil status |          |
|-------------------|-------------|----------|
|                   | OFF → ON    | ON → OFF |
| Change data (MSB) | FFh         | 00h      |
| Change data (LSB) | 00h         | 00h      |

(Example)

Issue the RUN command to the Inverter with slave address 10.

To run the Inverter, set "03" in A002. The coil number of the RUN command is "1".

## Query

| No. | Field name                            | Example (HEX) |
|-----|---------------------------------------|---------------|
| 1   | Slave address <sup>*1</sup>           | 0A            |
| 2   | Function code                         | 05            |
| 3   | Coil start number (MSB) <sup>*2</sup> | 00            |
| 4   | Coil start number (LSB) <sup>*2</sup> | 00            |
| 5   | Change data (MSB)                     | FF            |
| 6   | Change data (LSB)                     | 00            |
| 7   | CRC-16 (MSB)                          | 8D            |
| 8   | CRC-16 (LSB)                          | 41            |

\*1. There is no response for broadcasting.

\*2. Note that the start number is reduced by 1.

## Response

| No. | Field name              | Example (HEX) |
|-----|-------------------------|---------------|
| 1   | Slave address           | 0A            |
| 2   | Function code           | 05            |
| 3   | Coil start number (MSB) | 00            |
| 4   | Coil start number (LSB) | 00            |
| 5   | Change data (MSB)       | FF            |
| 6   | Change data (LSB)       | 00            |
| 7   | CRC-16 (MSB)            | 8D            |
| 8   | CRC-16 (LSB)            | 41            |

If writing into the coil cannot be performed normally, refer to the "Exception Response" section.

### <Writing Into the Holding Register [06h]>

Writes data into the specified holding register.

(Example)

Write 50 Hz into the Inverter with slave address 5 as the base frequency (A003).

The data resolution of the holding register "1203h" of the base frequency (A003) is 1 Hz. To set 50 Hz, set the change data to "50 (0032h)".

#### Query

| No. | Field name                                 | Example (HEX) |
|-----|--------------------------------------------|---------------|
| 1   | Slave address * <sup>1</sup>               | 05            |
| 2   | Function code                              | 06            |
| 3   | Register start number (MSB) * <sup>2</sup> | 12            |
| 4   | Register start number (LSB) * <sup>2</sup> | 02            |
| 5   | Change data (MSB)                          | 00            |
| 6   | Change data (LSB)                          | 32            |
| 7   | CRC-16 (MSB)                               | AD            |
| 8   | CRC-16 (LSB)                               | 23            |

\*1. There is no response for broadcasting.

\*2. Note that the start number is reduced by 1.

#### Response

| No. | Field name                  | Example (HEX) |
|-----|-----------------------------|---------------|
| 1   | Slave address               | 05            |
| 2   | Function code               | 06            |
| 3   | Register start number (MSB) | 12            |
| 4   | Register start number (LSB) | 02            |
| 5   | Change data (MSB)           | 00            |
| 6   | Change data (LSB)           | 32            |
| 7   | CRC-16 (MSB)                | AD            |
| 8   | CRC-16 (LSB)                | 23            |

If writing into the holding register cannot be performed normally, refer to the "Exception Response" section.

### <Loop-back Test [08h]>

Used to check the communications between master and slave. A random value can be used for test data.

(Example)

Loop-back test to the Inverter with slave address 1

#### Query

| No. | Field name                | Example (HEX) |
|-----|---------------------------|---------------|
| 1   | Slave address *           | 01            |
| 2   | Function code             | 08            |
| 3   | Diagnostic sub code (MSB) | 00            |
| 4   | Diagnostic sub code (LSB) | 00            |
| 5   | Data (MSB)                | Random        |
| 6   | Data (LSB)                | Random        |
| 7   | CRC-16 (MSB)              | CRC           |
| 8   | CRC-16 (LSB)              | CRC           |

\* Broadcasting cannot be performed.

#### Response

| No. | Field name                | Example (HEX) |
|-----|---------------------------|---------------|
| 1   | Slave address             | 01            |
| 2   | Function code             | 08            |
| 3   | Diagnostic sub code (MSB) | 00            |
| 4   | Diagnostic sub code (LSB) | 00            |
| 5   | Data (MSB)                | Random        |
| 6   | Data (LSB)                | Random        |
| 7   | CRC-16 (MSB)              | CRC           |
| 8   | CRC-16 (LSB)              | CRC           |

The diagnostic sub code corresponds only with the query data echo (00h, 00h), not any other commands.

## &lt;Writing Into Multiple Coils [0Fh]&gt;

Rewrites consecutive multiple coils.

(Example)

Change the status of multi-function input terminals 1 to 6 on the Inverter with slave address 5.

Set the multi-function input terminals as shown in the following table.

| Multi-function input terminals | 1  | 2  | 3  | 4   | 5  | 6   |
|--------------------------------|----|----|----|-----|----|-----|
| Coil No.                       | 7  | 8  | 9  | 10  | 11 | 12  |
| Terminal status                | ON | ON | ON | OFF | ON | OFF |

## Query

| No. | Field name                            | Example (HEX) |
|-----|---------------------------------------|---------------|
| 1   | Slave address <sup>*1</sup>           | 05            |
| 2   | Function code                         | 0F            |
| 3   | Coil start number (MSB) <sup>*2</sup> | 00            |
| 4   | Coil start number (LSB) <sup>*2</sup> | 06            |
| 5   | Number of coils (MSB)                 | 00            |
| 6   | Number of coils (LSB)                 | 06            |
| 7   | Number of bytes <sup>*3</sup>         | 02            |
| 8   | Change data (MSB) <sup>*3</sup>       | 17            |
| 9   | Change data (LSB) <sup>*3</sup>       | 00            |
| 10  | CRC-16 (MSB)                          | DB            |
| 11  | CRC-16 (LSB)                          | 3E            |

## Response

| No. | Field name              | Example (HEX) |
|-----|-------------------------|---------------|
| 1   | Slave address           | 05            |
| 2   | Function code           | 0F            |
| 3   | Coil start number (MSB) | 00            |
| 4   | Coil start number (LSB) | 06            |
| 5   | Number of coils (MSB)   | 00            |
| 6   | Number of coils (LSB)   | 06            |
| 7   | CRC-16 (MSB)            | 34            |
| 8   | CRC-16 (LSB)            | 4C            |

\*1. There is no response for broadcasting.

\*2. Note that the start number is reduced by 1.

\*3. Since the change data comprises of both MSB and LSB as a set, make the byte to be an even number by adding 1, even if the byte that actually needs to be changed is an odd number.

If writing into multiple coils cannot be performed normally, refer to the "Exception Response" section.

### <Writing Into Multiple Holding Register [10h]>

Writes into consecutive multiple holding registers.

(Example)

Set acceleration time 1 (F002) to "3000 sec." for the Inverter with slave address 1.

The data resolution of the holding register "1103h, 1104h" of acceleration time 1 (F002) is 0.01 seconds. To set to 3000 seconds, set data to "300000 (493E0h)".

#### Query

| No. | Field name                        | Example (HEX) |
|-----|-----------------------------------|---------------|
| 1   | Slave address <sup>*1</sup>       | 01            |
| 2   | Function code                     | 10            |
| 3   | Start address (MSB) <sup>*2</sup> | 11            |
| 4   | Start address (LSB) <sup>*2</sup> | 02            |
| 5   | Number of holding registers (MSB) | 00            |
| 6   | Number of holding registers (LSB) | 02            |
| 7   | Number of bytes <sup>*3</sup>     | 04            |
| 8   | Change data 1 (MSB)               | 00            |
| 9   | Change data 1 (LSB)               | 04            |
| 10  | Change data 2 (MSB)               | 93            |
| 11  | Change data 2 (LSB)               | E0            |
| 12  | CRC-16 (MSB)                      | 9E            |
| 13  | CRC-16 (LSB)                      | 9F            |

#### Response

| No. | Field name                        | Example (HEX) |
|-----|-----------------------------------|---------------|
| 1   | Slave address                     | 01            |
| 2   | Function code                     | 10            |
| 3   | Start address (MSB)               | 11            |
| 4   | Start address (LSB)               | 02            |
| 5   | Number of holding registers (MSB) | 00            |
| 6   | Number of holding registers (LSB) | 02            |
| 7   | CRC-16 (MSB)                      | E5            |
| 8   | CRC-16 (LSB)                      | 34            |

\*1. There is no response for broadcasting.

\*2. Note that the start address is reduced by 1.

\*3. Specifies the number of actual bytes to change, not the number of holding registers.

If writing into multiple holding registers cannot be performed normally, refer to the "Exception Response" section.

### <Exception Response>

The master requires the response for a query except for broadcast. Though the Inverter should return a response corresponding with the query, it returns an exception response if the query has an error.

The exception response has the field configuration shown in the following table.

| Field Configuration |
|---------------------|
| Slave address       |
| Function code       |
| Exception code      |
| CRC-16              |

The detailed field configuration is shown below. The function code of the exception response is the value of the query function code to which 80h is added. The exception code shows the cause of exception response.

| Function code |                    | Exception code |                                                                                 |
|---------------|--------------------|----------------|---------------------------------------------------------------------------------|
| Query         | Exception response | Code           | Description                                                                     |
| 01h           | 81h                | 01h            | An unsupported function has been specified.                                     |
| 03h           | 83h                | 02h            | Specified address does not exist.                                               |
| 05h           | 85h                | 03h            | Specified data has an unacceptable format.                                      |
| 06h           | 86h                | 21h            | Data is out of the Inverter's range for writing into the holding register.      |
| 0Fh           | 8Fh                | 22h            | The Inverter does not allow this function.                                      |
| 10h           | 90h                |                | • Has attempted to change the register that cannot be changed during operation. |
|               |                    |                | • Has issued the enter command during operation (UV).                           |
|               |                    |                | • Has written into the register during trip (UV).                               |
|               |                    |                | • Has written into the read-only register (coil).                               |

### ■ Saving the Change to the Holding Register (Enter Command)

Even if using the command to write into the holding register (06h) or into the consecutive holding registers (10h), no change can be saved in the Inverter's memory element. If the Inverter power shuts off without saving any changes, the holding register returns to the status before the changes were made. To save the holding register changes in the Inverter's memory element, the "Enter Command" must be issued according to the following procedure.

When the control parameters are changed, the motor parameters must be re-calculated. In this case, perform re-calculation with this register.

#### To issue the Enter command

Write all memory data into the holding register with the write command (06h), and write re-calculated motor parameters into holding register 0900h. Below are the values to be written into the holding register.

| Set value            | Description                                          |
|----------------------|------------------------------------------------------|
| 0000                 | Motor parameter re-calculation                       |
| 0001                 | Set value storage                                    |
| Other than the above | Motor parameter re-calculation and set value storage |

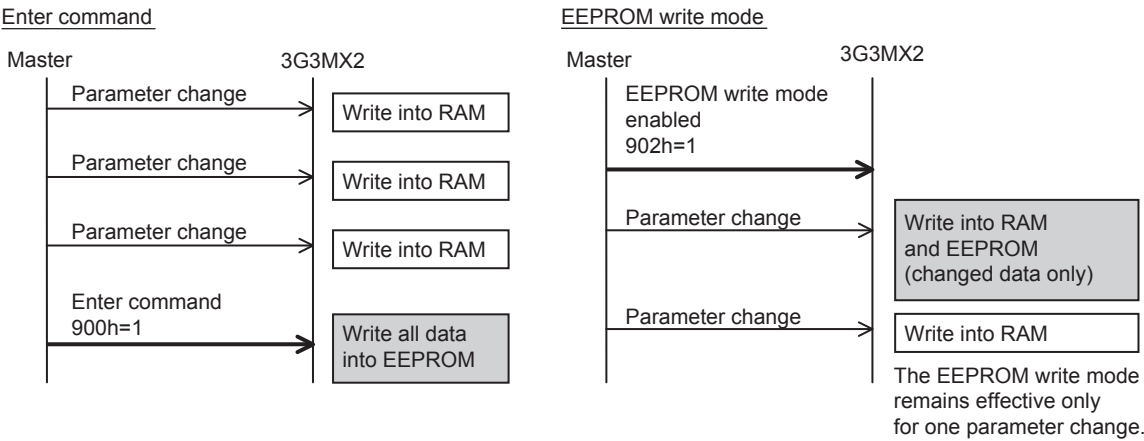
#### Note

- The Enter command needs considerable time. Monitor the data writing signal (coil number 0049h) to check whether the data is being written.
- Since the Inverter's memory element has a limit on the number of rewrites (approx. 100,000 times), the Inverter life may be shortened if enter commands are frequently used.

#### EEPROM Write Mode

- If the holding register write command (06h), etc. is used to write "1" into the holding register for EEPROM write mode (0902h), the EEPROM write mode will become active.
- If data is changed using the holding register write command (06h) after switching to the EEPROM write mode, the new data is written into both the volatile memory for operation (RAM) and nonvolatile memory for storage (EEPROM). At the same time, the EEPROM write mode is cancelled.
- If any command other than the holding register write command (06h) is received after switching to the EEPROM write mode, the EEPROM write mode is cancelled.

Difference between Enter Command and EEPROM Write Mode



## ■Register Number List

R/W in the list shows whether the coil or holding register accepts reading and/or writing.

R: Read only R/W: Read and write enabled

<Coil Number List>

| Coil No. | Item                                    | R/W | Description                                       |
|----------|-----------------------------------------|-----|---------------------------------------------------|
| 0000h    | Not used                                | —   |                                                   |
| 0001h    | RUN command                             | R/W | 1: Run<br>0: Stop (Enabled when A002 = 03)        |
| 0002h    | Rotation direction command              | R/W | 1: Reverse<br>0: Forward (Enabled when A002 = 03) |
| 0003h    | External trip (EXT)                     | R/W | 1: Trip                                           |
| 0004h    | Trip reset (RS)                         | R/W | 1: Reset                                          |
| 0005h    | Not used                                | —   |                                                   |
| 0006h    | Not used                                | —   |                                                   |
| 0007h    | Multi-function input terminal 1         | R/W | 1: ON<br>0: OFF *1                                |
| 0008h    | Multi-function input terminal 2         | R/W | 1: ON<br>0: OFF *1                                |
| 0009h    | Multi-function input terminal 3         | R/W | 1: ON<br>0: OFF *1                                |
| 000Ah    | Multi-function input terminal 4         | R/W | 1: ON<br>0: OFF *1                                |
| 000Bh    | Multi-function input terminal 5         | R/W | 1: ON<br>0: OFF *1                                |
| 000Ch    | Multi-function input terminal 6         | R/W | 1: ON<br>0: OFF *1                                |
| 000Dh    | Multi-function input terminal 7         | R/W | 1: ON<br>0: OFF *1                                |
| 000Eh    | Multi-function input terminal 8         | R/W | 1: ON<br>0: OFF *1                                |
| 000Fh    | Operation status                        | R   | 1: Run<br>0: Stop (Interlocked with d003)         |
| 0010h    | Rotation direction                      | R   | 1: Reverse<br>0: Forward (Interlocked with d003)  |
| 0011h    | Inverter ready                          | R   | 1: Ready<br>0: Not ready                          |
| 0012h    | Not used                                | —   |                                                   |
| 0013h    | RUN (during RUN)                        | R   | 1: During trip<br>0: Normal                       |
| 0014h    | FA1 (constant speed arrival signal)     | R   | 1: ON<br>0: OFF                                   |
| 0015h    | FA2 (over set frequency arrival signal) | R   | 1: ON<br>0: OFF                                   |

\*1. When either the control circuit terminal block or the coil is turned on, these settings are ON.

The control circuit terminal block has the priority for the multi-function input terminals.

If the master cannot reset the coil ON status because of communication disconnection, turn the control circuit terminal block from ON to OFF to turn off the coil.

\*2. The communications error is retained until a fault reset is input. (Can be reset during operation.)

## 4-4 Communication Function

4

Functions

| Coil No. | Item                                            | R/W | Description     |
|----------|-------------------------------------------------|-----|-----------------|
| 0016h    | OL (overload warning)                           | R   | 1: ON<br>0: OFF |
| 0017h    | OD (excessive PID deviation)                    | R   | 1: ON<br>0: OFF |
| 0018h    | AL (alarm output)                               | R   | 1: ON<br>0: OFF |
| 0019h    | FA3 (set-frequency-only arrival signal)         | R   | 1: ON<br>0: OFF |
| 001Ah    | OTQ (overtorque)                                | R   | 1: ON<br>0: OFF |
| 001Bh    | IP (signal during momentary power interruption) | R   | 1: ON<br>0: OFF |
| 001Ch    | UV (signal during undervoltage)                 | R   | 1: ON<br>0: OFF |
| 001Dh    | TRQ (torque limit)                              | R   | 1: ON<br>0: OFF |
| 001Eh    | RNT (RUN time over)                             | R   | 1: ON<br>0: OFF |
| 001Fh    | ONT (Power ON time over)                        | R   | 1: ON<br>0: OFF |
| 0020h    | THM (thermal warning)                           | R   | 1: ON<br>0: OFF |
| 0021h    | Not used                                        | —   |                 |
| 0022h    | Not used                                        | —   |                 |
| 0023h    | Not used                                        | —   |                 |
| 0024h    | Not used                                        | —   |                 |
| 0025h    | Not used                                        | —   |                 |
| 0026h    | BRK (brake release)                             | R   | 1: ON<br>0: OFF |
| 0027h    | BER (brake error)                               | R   | 1: ON<br>0: OFF |
| 0028h    | ZS (0 Hz signal)                                | R   | 1: ON<br>0: OFF |
| 0029h    | DSE (excessive speed deviation)                 | R   | 1: ON<br>0: OFF |
| 002Ah    | POK (position ready)                            | R   | 1: ON<br>0: OFF |
| 002Bh    | FA4 (set frequency exceeded 2)                  | R   | 1: ON<br>0: OFF |
| 002Ch    | FA5 (set frequency only 2)                      | R   | 1: ON<br>0: OFF |
| 002Dh    | OL2 (overload warning 2)                        | R   | 1: ON<br>0: OFF |

\*1. When either the control circuit terminal block or the coil is turned on, these settings are ON.

The control circuit terminal block has the priority for the multi-function input terminals.

If the master cannot reset the coil ON status because of communication disconnection, turn the control circuit terminal block from ON to OFF to turn off the coil.

\*2. The communications error is retained until a fault reset is input. (Can be reset during operation.)



| Coil No. | Item                                     | R/W | Description     |
|----------|------------------------------------------|-----|-----------------|
| 002Eh    | ODc (analog O disconnection detection)   | R   | 1: ON<br>0: OFF |
| 002Fh    | OIDc (analog OI disconnection detection) | R   | 1: ON<br>0: OFF |
| 0030h    | O2Dc (analog O2 disconnection detection) | R   | 1: ON<br>0: OFF |
| 0031h    | Not used                                 | —   |                 |
| 0032h    | FBV (PID FB status output)               | R   | 1: ON<br>0: OFF |
| 0033h    | NDc (network error)                      | R   | 1: ON<br>0: OFF |
| 0034h    | LOG1 (logic operation output 1)          | R   | 1: ON<br>0: OFF |
| 0035h    | LOG2 (logic operation output 2)          | R   | 1: ON<br>0: OFF |
| 0036h    | LOG3 (logic operation output 3)          | R   | 1: ON<br>0: OFF |
| 0037h    | LOG4 (logic operation output 4)          | R   | 1: ON<br>0: OFF |
| 0038h    | LOG5 (logic operation output 5)          | R   | 1: ON<br>0: OFF |
| 0039h    | LOG6 (logic operation output 6)          | R   | 1: ON<br>0: OFF |
| 003Ah    | WAC (capacitor life warning signal)      | R   | 1: ON<br>0: OFF |
| 003Bh    | WAF (cooling fan life warning signal)    | R   | 1: ON<br>0: OFF |
| 003Ch    | FR (starting contact signal)             | R   | 1: ON<br>0: OFF |
| 003Dh    | OHF (fin overheat warning)               | R   | 1: ON<br>0: OFF |
| 003Eh    | LOC (light load detection signal)        | R   | 1: ON<br>0: OFF |
| 003Fh    | MO1 (Drive Programming output 1)         | R/W | 1: ON<br>0: OFF |
| 0040h    | MO2 (Drive Programming output 2)         | R/W | 1: ON<br>0: OFF |
| 0041h    | MO3 (Drive Programming output 3)         | R/W | 1: ON<br>0: OFF |
| 0042h    | MO4 (Drive Programming output 4)         | R/W | 1: ON<br>0: OFF |
| 0043h    | MO5 (Drive Programming output 5)         | R/W | 1: ON<br>0: OFF |

\*1. When either the control circuit terminal block or the coil is turned on, these settings are ON.

The control circuit terminal block has the priority for the multi-function input terminals.

If the master cannot reset the coil ON status because of communication disconnection, turn the control circuit terminal block from ON to OFF to turn off the coil.

\*2. The communications error is retained until a fault reset is input. (Can be reset during operation.)

## 4-4 Communication Function

4

Functions

| Coil No. | Item                             | R/W | Description                |
|----------|----------------------------------|-----|----------------------------|
| 0044h    | MO6 (Drive Programming output 6) | R/W | 1: ON<br>0: OFF            |
| 0045h    | IRDY (operation ready signal)    | R   | 1: ON<br>0: OFF            |
| 0046h    | FWR (forward run signal)         | R   | 1: ON<br>0: OFF            |
| 0047h    | RVR (reverse run signal)         | R   | 1: ON<br>0: OFF            |
| 0048h    | MJA (fatal fault signal)         | R   | 1: ON<br>0: OFF            |
| 0049h    | During data write                | R   | 1: Writing<br>0: Normal    |
| 004Ah    | CRC error                        | R   | 1: Error<br>0: No error *2 |
| 004Bh    | Overrun error                    | R   | 1: Error<br>0: No error *2 |
| 004Ch    | Framing error                    | R   | 1: Error<br>0: No error *2 |
| 004Dh    | Parity error                     | R   | 1: Error<br>0: No error *2 |
| 004Eh    | Checksum error                   | R   | 1: Error<br>0: No error *2 |
| 004Fh    | Not used                         | —   |                            |
| 0050h    | WCO<br>(window comparator O)     | R   | 1: ON<br>0: OFF            |
| 0050h    | WCOI<br>(window comparator OI)   | R   | 1: ON<br>0: OFF            |
| 0052h    | WCO2<br>(window comparator O2)   | R   | 1: ON<br>0: OFF            |

\*1. When either the control circuit terminal block or the coil is turned on, these settings are ON.

The control circuit terminal block has the priority for the multi-function input terminals.

If the master cannot reset the coil ON status because of communication disconnection, turn the control circuit terminal block from ON to OFF to turn off the coil.

\*2. The communications error is retained until a fault reset is input. (Can be reset during operation.)

## &lt;Holding Register Number List (Frequency Reference and Trip Monitor)&gt;

| Register No.   | Function name                    | Function code | R/W | Monitor and setting parameters                                                                                                                                                                            | Resolution |
|----------------|----------------------------------|---------------|-----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| 0001h          | Output frequency setting/monitor | F001 (HIGH)   | R/W | 0.00 to 400.00<br>(Enabled when A001 = 03)                                                                                                                                                                | 0.01 [Hz]  |
| 0002h          |                                  | F001 (LOW)    | R/W |                                                                                                                                                                                                           |            |
| 0003h          | Inverter status A                | —             | R   | 0: Initial status<br>1: —<br>2: Stop<br>3: RUN<br>4: Free-run stop<br>5: Jogging<br>6: DC injection braking<br>7: Retry<br>8: Trip<br>9: During UV                                                        | —          |
| 0004h          | Inverter status B                | —             | R   | 0: During stop<br>1: During RUN<br>2: During trip                                                                                                                                                         | —          |
| 0005h          | Inverter status C                | —             | R   | 0: —<br>1: Stop<br>2: Deceleration<br>3: Constant speed<br>4: Acceleration<br>5: Forward<br>6: Reverse<br>7: Forward to reverse<br>8: Reverse to forward<br>9: Forward run start<br>10: Reverse run start | —          |
| 0006h          | PID feedback                     | —             | R/W | 0 to 10000                                                                                                                                                                                                | 0.01 [%]   |
| 0007h to 0010h | Not used                         | —             | —   |                                                                                                                                                                                                           | —          |
| 0011h          | Fault frequency monitor          | d080          | R   | 0 to 65535                                                                                                                                                                                                | 1 [time]   |
| 0012h          | Fault monitor 1 factor           | d081          | R   | See "Inverter Trip Factor List" (page 4-183).                                                                                                                                                             | —          |
| 0013h          | Fault monitor 1 Inverter status  |               |     | See "Inverter Trip Factor List" (page 4-183).                                                                                                                                                             | —          |
| 0014h          | Fault monitor 1 frequency (HIGH) |               |     | 0.00 to 400.00                                                                                                                                                                                            | 0.01 [Hz]  |
| 0015h          | Fault monitor 1 frequency (LOW)  |               |     |                                                                                                                                                                                                           |            |
| 0016h          | Fault monitor 1 current          |               |     | Output current value at the time of tripping                                                                                                                                                              | 0.1 [A]    |
| 0017h          | Fault monitor 1 voltage          |               |     | DC input voltage at the time of tripping                                                                                                                                                                  | 1 [V]      |
| 0018h          | Fault monitor 1 RUN time (HIGH)  |               |     | Total RUN time before the trip                                                                                                                                                                            | 1 [h]      |
| 0019h          | Fault monitor 1 RUN time (LOW)   |               |     |                                                                                                                                                                                                           |            |
| 001Ah          | Fault monitor 1 ON time (HIGH)   |               |     | Total power ON time before the trip                                                                                                                                                                       | 1 [h]      |
| 001Bh          | Fault monitor 1 ON time (LOW)    |               |     |                                                                                                                                                                                                           |            |

Note 1: The Inverter's rated current is "1000".

Note 2: If the set value is "10000" (100.0 sec) or more, the value in the second decimal place is ignored.

| Register No. | Function name                    | Function code | R/W | Monitor and setting parameters                | Resolution |
|--------------|----------------------------------|---------------|-----|-----------------------------------------------|------------|
| 001Ch        | Fault monitor 2 factor           | d082          | R   | See "Inverter Trip Factor List" (page 4-183). | —          |
| 001Dh        | Fault monitor 2 Inverter status  |               |     | See "Inverter Trip Factor List" (page 4-183). | —          |
| 001Eh        | Fault monitor 2 frequency (HIGH) |               |     | 0.00 to 400.00                                | 0.01 [Hz]  |
| 001Fh        | Fault monitor 2 frequency (LOW)  |               |     |                                               |            |
| 0020h        | Fault monitor 2 current          |               |     | Output current value at the time of tripping  | 0.1 [A]    |
| 0021h        | Fault monitor 2 voltage          |               |     | DC input voltage at the time of tripping      | 1 [V]      |
| 0022h        | Fault monitor 2 RUN time (HIGH)  |               |     | Total RUN time before the trip                | 1 [h]      |
| 0023h        | Fault monitor 2 RUN time (LOW)   |               |     |                                               |            |
| 0024h        | Fault monitor 2 ON time (HIGH)   |               |     | Total power ON time before the trip           | 1 [h]      |
| 0025h        | Fault monitor 2 ON time (LOW)    |               |     |                                               |            |
| 0026h        | Fault monitor 3 factor           | d083          | R   | See "Inverter Trip Factor List" (page 4-183). | —          |
| 0027h        | Fault monitor 3 Inverter status  |               |     | See "Inverter Trip Factor List" (page 4-183). | —          |
| 0028h        | Fault monitor 3 frequency (HIGH) |               |     | 0.00 to 400.00                                | 0.01 [Hz]  |
| 0029h        | Fault monitor 3 frequency (LOW)  |               |     |                                               |            |
| 002Ah        | Fault monitor 3 current          |               |     | Output current value at the time of tripping  | 0.1 [A]    |
| 002Bh        | Fault monitor 3 voltage          |               |     | DC input voltage at the time of tripping      | 1 [V]      |
| 002Ch        | Fault monitor 3 RUN time (HIGH)  |               |     | Total RUN time before the trip                | 1 [h]      |
| 002Dh        | Fault monitor 3 RUN time (LOW)   |               |     |                                               |            |
| 002Eh        | Fault monitor 3 ON time (HIGH)   |               |     | Total power ON time before the trip           | 1 [h]      |
| 002Fh        | Fault monitor 3 ON time (LOW)    |               |     |                                               |            |
| 0030h        | Fault monitor 4 factor           | d084          | R   | See "Inverter Trip Factor List" (page 4-183). | —          |
| 0031h        | Fault monitor 4 Inverter status  |               |     | See "Inverter Trip Factor List" (page 4-183). | —          |
| 0032h        | Fault monitor 4 frequency (HIGH) |               |     | 0.00 to 400.00                                | 0.01 [Hz]  |
| 0033h        | Fault monitor 4 frequency (LOW)  |               |     |                                               |            |
| 0034h        | Fault monitor 4 current          |               |     | Output current value at the time of tripping  | 0.1 [A]    |
| 0035h        | Fault monitor 4 voltage          |               |     | DC input voltage at the time of tripping      | 1 [V]      |
| 0036h        | Fault monitor 4 RUN time (HIGH)  |               |     | Total RUN time before the trip                | 1 [h]      |
| 0037h        | Fault monitor 4 RUN time (LOW)   |               |     |                                               |            |
| 0038h        | Fault monitor 4 ON time (HIGH)   |               |     | Total power ON time before the trip           | 1 [h]      |
| 0039h        | Fault monitor 4 ON time (LOW)    |               |     |                                               |            |

Note 1: The Inverter's rated current is "1000".

Note 2: If the set value is "10000" (100.0 sec) or more, the value in the second decimal place is ignored.

| Register No.   | Function name                    | Function code | R/W | Monitor and setting parameters                                                                                                                   | Resolution |
|----------------|----------------------------------|---------------|-----|--------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| 003Ah          | Fault monitor 5 factor           | d085          | R   | See "Inverter Trip Factor List" (page 4-183).                                                                                                    | —          |
| 003Bh          | Fault monitor 5 Inverter status  |               |     | See "Inverter Trip Factor List" (page 4-183).                                                                                                    | —          |
| 003Ch          | Fault monitor 5 frequency (HIGH) |               |     | 0.00 to 400.00                                                                                                                                   | 0.01 [Hz]  |
| 003Dh          | Fault monitor 5 frequency (LOW)  |               |     |                                                                                                                                                  |            |
| 003Eh          | Fault monitor 5 current          |               |     | Output current value at the time of tripping                                                                                                     | 0.1 [A]    |
| 003Fh          | Fault monitor 5 voltage          |               |     | DC input voltage at the time of tripping                                                                                                         | 1 [V]      |
| 0040h          | Fault monitor 5 RUN time (HIGH)  |               |     | Total RUN time before the trip                                                                                                                   | 1 [h]      |
| 0041h          | Fault monitor 5 RUN time (LOW)   |               |     |                                                                                                                                                  |            |
| 0042h          | Fault monitor 5 ON time (HIGH)   |               |     | Total power ON time before the trip                                                                                                              | 1 [h]      |
| 0043h          | Fault monitor 5 ON time (LOW)    |               |     |                                                                                                                                                  |            |
| 0044h          | Fault monitor 6 factor           | d086          | R   | See "Inverter Trip Factor List" (page 4-183).                                                                                                    | —          |
| 0045h          | Fault monitor 6 Inverter status  |               |     | See "Inverter Trip Factor List" (page 4-183).                                                                                                    | —          |
| 0046h          | Fault monitor 6 frequency (HIGH) |               |     | 0.00 to 400.00                                                                                                                                   | 0.01 [Hz]  |
| 0047h          | Fault monitor 6 frequency (LOW)  |               |     |                                                                                                                                                  |            |
| 0048h          | Fault monitor 6 current          |               |     | Output current value at the time of tripping                                                                                                     | 0.1 [A]    |
| 0049h          | Fault monitor 6 voltage          |               |     | DC input voltage at the time of tripping                                                                                                         | 1 [V]      |
| 004Ah          | Fault monitor 6 RUN time (HIGH)  |               |     | Total RUN time before the trip                                                                                                                   | 1 [h]      |
| 004Bh          | Fault monitor 6 RUN time (LOW)   |               |     |                                                                                                                                                  |            |
| 004Ch          | Fault monitor 6 ON time (HIGH)   |               |     | Total power ON time before the trip                                                                                                              | 1 [h]      |
| 004Dh          | Fault monitor 6 ON time (LOW)    |               |     |                                                                                                                                                  |            |
| 004Eh          | Warning monitor                  | d090          | R   | Warning code<br>0 to 385                                                                                                                         | —          |
| 004Fh to 08FFh | Not used                         | —             | —   |                                                                                                                                                  | —          |
| 0900h          | EEPROM write                     | —             | W   | 0000: Motor parameter recalculation<br>0001: Set value storage in EEPROM<br>Other: Motor parameter recalculation and set value storage in EEPROM | —          |
| 0901h to 1000h | Not used                         | —             | —   |                                                                                                                                                  | —          |
| 1F01h          | Coil control word                | —             | R/W | Register coil 0001h to 000Fh                                                                                                                     | —          |
| 1E01h          | Coil status word                 | —             | R   | Register coil 0010h to 001Fh                                                                                                                     | —          |

Note 1: The Inverter's rated current is "1000".

Note 2: If the set value is "10000" (100.0 sec) or more, the value in the second decimal place is ignored.

## 4-4 Communication Function

Inverter Trip Factor List

| Trip factor high-order (factor)                     |          | Trip factor low-order (Inverter status) |      |
|-----------------------------------------------------|----------|-----------------------------------------|------|
| Name                                                | Code     | Name                                    | Code |
| No trip factor                                      | 0        | During reset                            | 0    |
| Overcurrent protection during constant speed        | 1        | During stop                             | 1    |
| Overvoltage protection during deceleration          | 2        | During deceleration                     | 2    |
| Overcurrent protection during acceleration          | 3        | During constant speed                   | 3    |
| Overcurrent protection during stop                  | 4        | During acceleration                     | 4    |
| Overload protection                                 | 5        | Operates at frequency = 0               | 5    |
| Braking resistor overload protection                | 6        | During startup                          | 6    |
| Overvoltage protection                              | 7        | During DB                               | 7    |
| EEPROM error                                        | 8        | During overload limit                   | 8    |
| Undervoltage protection                             | 9        | During SON/FOC                          | 9    |
| CT error                                            | 10       |                                         |      |
| CPU error                                           | 11       |                                         |      |
| External trip                                       | 12       |                                         |      |
| USP error                                           | 13       |                                         |      |
| Grounding protection                                | 14       |                                         |      |
| Incoming overvoltage protection                     | 15       |                                         |      |
| Momentary power interruption protection             | 16       |                                         |      |
| Power module abnormal temperature (during FAN stop) | 20       |                                         |      |
| Power module abnormal temperature                   | 21       |                                         |      |
| Gate array communications error                     | 23       |                                         |      |
| Input phase loss protection                         | 24       |                                         |      |
| Main circuit error                                  | 25       |                                         |      |
| IGBT error                                          | 30       |                                         |      |
| Thermistor error                                    | 35       |                                         |      |
| Brake error addition                                | 36       |                                         |      |
| Emergency shutoff error                             | 37       |                                         |      |
| Low-speed-range electronic thermal                  | 38       |                                         |      |
| Option 1 errors 0 to 9                              | 60 to 69 |                                         |      |
| Option 2 errors 0 to 9                              | 70 to 79 |                                         |      |

4

Functions

## &lt;Holding Register Number List (Monitor)&gt;

| Register No. | Function name                               | Function code | R/W | Monitor and setting parameters                                                                                | Rresolution |
|--------------|---------------------------------------------|---------------|-----|---------------------------------------------------------------------------------------------------------------|-------------|
| 1001h        | Output frequency monitor                    | d001 (HIGH)   | R   | 0.00 to 400.00                                                                                                | 0.01 [Hz]   |
| 1002h        |                                             | d001 (LOW)    |     |                                                                                                               |             |
| 1003h        | Output current monitor                      | d002          | R   | 0.0 to 9999.0                                                                                                 | 0.1 [A]     |
| 1004h        | Rotation direction monitor                  | d003          | R   | FWD: Forward<br>STOP: Stop<br>REV: Reverse                                                                    | —           |
| 1005h        | PID feedback value monitor                  | d004 (HIGH)   | R   | 0.00 to 999000.00                                                                                             | —           |
| 1006h        |                                             | d004 (LOW)    |     |                                                                                                               |             |
| 1007h        | Multi-function input monitor                | d005          | R   | 2 <sup>^</sup> 0: Terminal 1 to 2 <sup>^</sup> 7: Terminal 8<br>2 <sup>^</sup> 8: Terminal FW                 | —           |
| 1008h        | Multi-function output monitor               | d006          | R   | 2 <sup>^</sup> 0: Terminal 11 to 2 <sup>^</sup> 4: Terminal 15<br>2 <sup>^</sup> 6: Relay terminal            | —           |
| 1009h        | Output frequency monitor (after conversion) | d007 (HIGH)   | R   | 0.00 to 39960.00                                                                                              | 0.01        |
| 100Ah        |                                             | d007 (LOW)    |     |                                                                                                               |             |
| 100Bh        | Real frequency monitor                      | d008 (HIGH)   | R   | -400.00 to 400.00                                                                                             | 0.01 [Hz]   |
| 100Ch        |                                             | d008 (LOW)    | R   |                                                                                                               |             |
| 100Dh        | Torque reference monitor                    | d009          | R   | -200 to 200                                                                                                   | 1 [%]       |
| 100Eh        | Torque bias monitor                         | d010          | R   | -200 to 200                                                                                                   | 1 [%]       |
| 100Fh        | Not used                                    | —             | —   |                                                                                                               | —           |
| 1010h        | Output torque monitor                       | d012          | R   | -200 to 200                                                                                                   | 1 [%]       |
| 1011h        | Output voltage monitor                      | d013          | R   | 0.0 to 600.0                                                                                                  | 0.1 [V]     |
| 1012h        | Input power monitor                         | d014          | R   | 0.0 to 999.9                                                                                                  | [kW]        |
| 1013h        | Integrated power monitor                    | d015 (HIGH)   | R   | 0.0 to 999999.9                                                                                               | 0.1 [h]     |
| 1014h        |                                             | d015 (LOW)    |     |                                                                                                               |             |
| 1015h        | Total RUN time                              | d016 (HIGH)   | R   | 0 to 999999                                                                                                   | 1 [h]       |
| 1016h        |                                             | d016 (LOW)    |     |                                                                                                               |             |
| 1017h        | Power ON time monitor                       | d017 (HIGH)   | R   | 0 to 999999                                                                                                   | 1 [h]       |
| 1018h        |                                             | d017 (LOW)    |     |                                                                                                               |             |
| 1019h        | Fin temperature monitor                     | d018          | R   | -020. to 200.0                                                                                                | 0.1 [°C]    |
| 101Ah        | Motor temperature monitor                   | d019          | R   | -020. to 200.0                                                                                                | 0.1 [°C]    |
| 101Bh        | Not used                                    | —             | —   |                                                                                                               | —           |
| 101Ch        |                                             |               |     |                                                                                                               |             |
| 101Dh        | Life assessment monitor                     | d022          | R   | 2 <sup>^</sup> 0: Capacitor on the main circuit board<br>2 <sup>^</sup> 1: Cooling fan rotation speed reduced | —           |

## 4-4 Communication Function

4

Functions

| Register No.   | Function name                          | Function code | R/W | Monitor and setting parameters                  | Resolution |
|----------------|----------------------------------------|---------------|-----|-------------------------------------------------|------------|
| 101Eh to 1025h | Not used                               | —             | —   |                                                 | —          |
| 1026h          | DC voltage monitor                     | d102          | R   | 0.0 to 999.9                                    | 0.1 [V]    |
| 1027h          | Regenerative braking load rate monitor | d103          | R   | 0.0 to 100.0                                    | 0.1 [%]    |
| 1028h          | Electronic thermal monitor             | d104          | R   | 0.0 to 100.0                                    | 0.1 [%]    |
| 1029h to 102Dh | Not used                               | —             | —   |                                                 | —          |
| 102Eh          | User monitor 0                         | d025 (HIGH)   | R   | -2147483647 to 2147483647                       | 1          |
| 102Fh          |                                        | d025 (LOW)    |     |                                                 |            |
| 1030h          | User monitor 1                         | d026 (HIGH)   | R   | -2147483647 to 2147483647                       | 1          |
| 1031h          |                                        | d026 (LOW)    |     |                                                 |            |
| 1032h          | User monitor 2                         | d027 (HIGH)   | R   | -2147483647 to 2147483647                       | 1          |
| 1033h          |                                        | d027 (LOW)    |     |                                                 |            |
| 1034h          | Pulse counter monitor                  | d028 (HIGH)   | R   | 0 to 2147483647                                 | 1          |
| 1035h          |                                        | d028 (LOW)    | R   |                                                 |            |
| 1036h          | Position command monitor               | d029 (HIGH)   | R   | -1073741823 to 1073741823 when HAPR is selected | 1          |
| 1037h          |                                        | d029 (LOW)    | R   | -268435456 to 268435456 when APR2 is selected   |            |
| 1038h          | Current position monitor               | d030 (HIGH)   | R   | -1073741823 to 1073741823 when HAPR is selected | 1          |
| 1039h          |                                        | d030 (LOW)    | R   | -268435456 to 268435456 when APR2 is selected   |            |
| 103Ah to 1102h | Not used                               | —             | —   | —                                               | —          |
| 1057h          | Inverter mode                          | d060          | R/W | 00 to 01                                        | —          |

<Holding Register Number List>

| Register No. | Function name       | Function code | R/W | Monitor and setting parameters | Resolution |
|--------------|---------------------|---------------|-----|--------------------------------|------------|
| 1103h        | Acceleration time 1 | F002 (HIGH)   | R/W | 0.01 to 3600.00                | 0.01 [s]   |
| 1104h        |                     | F002 (LOW)    |     |                                |            |
| 1105h        | Deceleration time 1 | F003 (HIGH)   | R/W | 0.01 to 3600.00                | 0.01 [s]   |
| 1106h        |                     | F003 (LOW)    |     |                                |            |



| Register No.   | Function name                         | Function code | R/W | Monitor and setting parameters         | Resolution |
|----------------|---------------------------------------|---------------|-----|----------------------------------------|------------|
| 1107h          | Operator rotation direction selection | F004          | R/W | 00: FWD (Forward)<br>01: REV (Reverse) | —          |
| 1108h to 1200h | Not used                              | —             | —   |                                        | —          |

&lt;Holding Register Number List (Function Mode)&gt;

| Register No.   | Function name                 | Function code | R/W | Monitor and setting parameters                                                                                                                                                                                                                                                                 | Resolution |
|----------------|-------------------------------|---------------|-----|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| 1201h          | Frequency reference selection | A001          | R/W | 00: VR (Digital Operator (FREQ adjuster))<br>01: Terminal<br>02: Digital Operator (F001)<br>03: RS485 (ModBus communication)<br>04: Option 1<br>05: Option 2<br>06: Pulse train frequency<br>07: EzSQ (Drive Programming)<br>10: (Math) Operation function result                              | —          |
| 1202h          | RUN command selection         | A002          | R/W | 01: Terminal<br>02: Digital Operator (F001)<br>03: RS485 (ModBus communication)<br>04: Option 1<br>05: Option 2                                                                                                                                                                                | —          |
| 1203h          | Base frequency                | A003          | R/W | 30 to Max. frequency                                                                                                                                                                                                                                                                           | 1 [Hz]     |
| 1204h          | Maximum frequency             | A004          | R/W | 30 to 400                                                                                                                                                                                                                                                                                      | 1 [Hz]     |
| 1205h          | O/OI selection                | A005          | R/W | 00: [O]/[O2] Switches between O/OI terminal<br>01: [O]/[O2] Switches between O/O2 terminal AT<br>02: [O]/VR Switches between O/FREQ adjuster via terminal AT<br>03: [OI]/VR Switches between OI/FREQ adjuster via terminal AT<br>04: [O2]/VR Switches between O2/FREQ adjuster via terminal AT | —          |
| 1206h          | O2 selection                  | A006          | R/W | 0: [O2] only<br>1: [O/OI-P] auxiliary frequency reference (not reversible)<br>2: [O/OI-PM] auxiliary frequency reference (reversible)<br>3: [OFF] O2 disabled                                                                                                                                  | —          |
| 1207h to 120Ah | Not used                      | —             | —   |                                                                                                                                                                                                                                                                                                | —          |
| 120Bh          | O start frequency             | A011 (HIGH)   | R/W | 0.00 to 400.00                                                                                                                                                                                                                                                                                 | 0.01 [Hz]  |
| 120Ch          |                               | A011 (LOW)    |     |                                                                                                                                                                                                                                                                                                |            |
| 120Dh          | O end frequency               | A012 (HIGH)   | R/W | 0.00 to 400.00                                                                                                                                                                                                                                                                                 | 0.01 [Hz]  |
| 120Eh          |                               | A012 (LOW)    |     |                                                                                                                                                                                                                                                                                                |            |
| 120Fh          | O start ratio                 | A013          | R/W | 0 to 100                                                                                                                                                                                                                                                                                       | 1 [%]      |

| Register No. | Function name                      | Function code | R/W | Monitor and setting parameters                                                               | Resolution |
|--------------|------------------------------------|---------------|-----|----------------------------------------------------------------------------------------------|------------|
| 1210h        | O end ratio                        | A014          | R/W | 0 to 100                                                                                     | 1 [%]      |
| 1211h        | O start selection                  | A015          | R/W | 00: External start frequency (A011 set value)<br>01: 0 Hz                                    | —          |
| 1212h        | O, O2, OI sampling                 | A016          | R/W | 1 to 30<br>31: 500-ms filter with a hysteresis of $\pm 0.1$ Hz                               | 1          |
| 1213h        | Drive Programming (EzSQ) Selection | A017          | R/W | 00: Disable<br>01: [PRG] start<br>02: Always ON                                              | —          |
| 1213h        | Not used                           | —             | —   |                                                                                              | —          |
| 1214h        | Not used                           | —             | —   |                                                                                              | —          |
| 1215h        | Multi-step speed selection         | A019          | R/W | 00: Binary: 16-step selection with 4 terminals<br>01: Bit: 8-step selection with 7 terminals | —          |
| 1216h        | Multi-step speed reference 0       | A020 (HIGH)   | R/W | 0/Starting frequency to Max. frequency                                                       | 0.01 [Hz]  |
| 1217h        |                                    | A020 (LOW)    | R/W |                                                                                              |            |
| 1218h        | Multi-step speed reference 1       | A021 (HIGH)   | R/W | 0/Starting frequency to Max. frequency                                                       | 0.01 [Hz]  |
| 1219h        |                                    | A021 (LOW)    | R/W |                                                                                              |            |
| 121Ah        | Multi-step speed reference 2       | A022 (HIGH)   | R/W | 0/Starting frequency to Max. frequency                                                       | 0.01 [Hz]  |
| 121Bh        |                                    | A022 (LOW)    | R/W |                                                                                              |            |
| 121Ch        | Multi-step speed reference 3       | A023 (HIGH)   | R/W | 0/Starting frequency to Max. frequency                                                       | 0.01 [Hz]  |
| 121Dh        |                                    | A023 (LOW)    | R/W |                                                                                              |            |
| 121Eh        | Multi-step speed reference 4       | A024 (HIGH)   | R/W | 0/Starting frequency to Max. frequency                                                       | 0.01 [Hz]  |
| 121Fh        |                                    | A024 (LOW)    | R/W |                                                                                              |            |
| 1220h        | Multi-step speed reference 5       | A025 (HIGH)   | R/W | 0/Starting frequency to Max. frequency                                                       | 0.01 [Hz]  |
| 1221h        |                                    | A025 (LOW)    | R/W |                                                                                              |            |
| 1222h        | Multi-step speed reference 6       | A026 (HIGH)   | R/W | 0/Starting frequency to Max. frequency                                                       | 0.01 [Hz]  |
| 1223h        |                                    | A026 (LOW)    | R/W |                                                                                              |            |
| 1224h        | Multi-step speed reference 7       | A027 (HIGH)   | R/W | 0/Starting frequency to Max. frequency                                                       | 0.01 [Hz]  |
| 1225h        |                                    | A027 (LOW)    | R/W |                                                                                              |            |

| Register No. | Function name                 | Function code | R/W | Monitor and setting parameters                                                                                                                                                                                                                                                                                                                                                                                                       | Resolution |
|--------------|-------------------------------|---------------|-----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| 1226h        | Multi-step speed reference 8  | A028 (HIGH)   | R/W | 0/Starting frequency to Max. frequency                                                                                                                                                                                                                                                                                                                                                                                               | 0.01 [Hz]  |
| 1227h        |                               | A028 (LOW)    | R/W |                                                                                                                                                                                                                                                                                                                                                                                                                                      |            |
| 1228h        | Multi-step speed reference 9  | A029 (HIGH)   | R/W | 0/Starting frequency to Max. frequency                                                                                                                                                                                                                                                                                                                                                                                               | 0.01 [Hz]  |
| 1229h        |                               | A029 (LOW)    | R/W |                                                                                                                                                                                                                                                                                                                                                                                                                                      |            |
| 122Ah        | Multi-step speed reference 10 | A030 (HIGH)   | R/W | 0/Starting frequency to Max. frequency                                                                                                                                                                                                                                                                                                                                                                                               | 0.01 [Hz]  |
| 122Bh        |                               | A030 (LOW)    | R/W |                                                                                                                                                                                                                                                                                                                                                                                                                                      |            |
| 122Ch        | Multi-step speed reference 11 | A031 (HIGH)   | R/W | 0/Starting frequency to Max. frequency                                                                                                                                                                                                                                                                                                                                                                                               | 0.01 [Hz]  |
| 122Dh        |                               | A031 (LOW)    | R/W |                                                                                                                                                                                                                                                                                                                                                                                                                                      |            |
| 122Eh        | Multi-step speed reference 12 | A032 (HIGH)   | R/W | 0/Starting frequency to Max. frequency                                                                                                                                                                                                                                                                                                                                                                                               | 0.01 [Hz]  |
| 122Fh        |                               | A032 (LOW)    | R/W |                                                                                                                                                                                                                                                                                                                                                                                                                                      |            |
| 1230h        | Multi-step speed reference 13 | A033 (HIGH)   | R/W | 0/Starting frequency to Max. frequency                                                                                                                                                                                                                                                                                                                                                                                               | 0.01 [Hz]  |
| 1231h        |                               | A033 (LOW)    | R/W |                                                                                                                                                                                                                                                                                                                                                                                                                                      |            |
| 1232h        | Multi-step speed reference 14 | A034 (HIGH)   | R/W | 0/Starting frequency to Max. frequency                                                                                                                                                                                                                                                                                                                                                                                               | 0.01 [Hz]  |
| 1233h        |                               | A034 (LOW)    | R/W |                                                                                                                                                                                                                                                                                                                                                                                                                                      |            |
| 1234h        | Multi-step speed reference 15 | A035 (HIGH)   | R/W | 0/Starting frequency to Max. frequency                                                                                                                                                                                                                                                                                                                                                                                               | 0.01 [Hz]  |
| 1235h        |                               | A035 (LOW)    | R/W |                                                                                                                                                                                                                                                                                                                                                                                                                                      |            |
| 1236h        | Not used                      | —             | —   |                                                                                                                                                                                                                                                                                                                                                                                                                                      | —          |
| 1237h        | Not used                      | —             | —   |                                                                                                                                                                                                                                                                                                                                                                                                                                      | —          |
| 1238h        | Jogging frequency             | A038          | R/W | Starting frequency to 999                                                                                                                                                                                                                                                                                                                                                                                                            | 0.01 [Hz]  |
| 1239h        | Jogging stop selection        | A039          | R/W | 00: FRS (Free-running on jogging stop/ Disabled in operation)<br>01: DEC (Deceleration stop on jogging stop/Disabled in operation)<br>02: DB (DC injection braking on jogging stop/Disabled in operation)<br>03: FRS (RUN) (Free running on jogging stop/Enabled in operation)<br>04: DEC (RUN) (Deceleration stop on jogging stop/Enabled in operation)<br>05: DB (RUN) (DC injection braking on jogging stop/Enabled in operation) | —          |
| 123Ah        | Not used                      | —             | —   |                                                                                                                                                                                                                                                                                                                                                                                                                                      | —          |

| Register No.   | Function name                                    | Function code | R/W | Monitor and setting parameters                                                                                                                                                                                                                      | Resolution |
|----------------|--------------------------------------------------|---------------|-----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| 123Bh          | Torque boost selection                           | A041          | R/W | 00: Manual torque boost<br>01: Automatic torque boost                                                                                                                                                                                               | —          |
| 123Ch          | Manual torque boost voltage                      | A042          | R/W | 0.0 to 20.0                                                                                                                                                                                                                                         | 0.1 [%]    |
| 123Dh          | Manual torque boost frequency                    | A043          | R/W | 0.0 to 50.0                                                                                                                                                                                                                                         | 0.1 [%]    |
| 123Eh          | V/f characteristics selection                    | A044          | R/W | 00: VC (Constant torque characteristics)<br>01: VP (Special reduced torque characteristics)<br>02: Free V/f (characteristics)<br>03: SLV (Sensorless vector control)<br>04: 0SLV (0-Hz sensorless vector control)<br>05: V2 (Sensor vector control) | —          |
| 123Fh          | Output voltage gain                              | A045          | R/W | 20 to 100                                                                                                                                                                                                                                           | 1 [%]      |
| 1240h          | Automatic torque boost voltage compensation gain | A046          | R/W | 0 to 255                                                                                                                                                                                                                                            | 1 [%]      |
| 1241h          | Automatic torque boost slip compensation gain    | A047          | R/W | 0 to 255                                                                                                                                                                                                                                            | 1 [%]      |
| 1242h to 1244h | Not used                                         | —             | —   |                                                                                                                                                                                                                                                     | —          |
| 1245h          | DC injection braking selection                   | A051          | R/W | 00: OFF (Disabled)<br>01: ON (Enabled)<br>02: ON (FQ) (Frequency control [A052 set value])                                                                                                                                                          | —          |
| 1246h          | DC injection braking frequency                   | A052          | R/W | 0.00 to 400.00                                                                                                                                                                                                                                      | 0.01 [Hz]  |
| 1247h          | DC injection braking delay time                  | A053          | R/W | 0.0 to 5.0                                                                                                                                                                                                                                          | 0.1 [s]    |
| 1248h          | DC injection braking power                       | A054          | R/W | 0 to 100 (0.4 to 55 kW)<br>0 to 80 (75 to 132 kW)                                                                                                                                                                                                   | 1 [%]      |
| 1249h          | DC injection braking time                        | A055          | R/W | 0.0 to 60.0                                                                                                                                                                                                                                         | 0.1 [s]    |
| 124Ah          | DC injection braking method selection            | A056          | R/W | 00: Edge operation<br>01: Level operation                                                                                                                                                                                                           | —          |
| 124Bh          | Startup DC injection braking power               | A057          | R/W | 0 to 100 (0.4 to 55 kW)<br>0 to 80 (75 to 132 kW)                                                                                                                                                                                                   | 1 [%]      |
| 124Ch          | Startup DC injection braking time                | A058          | R/W | 0.0 to 60.0                                                                                                                                                                                                                                         | 0.1 [s]    |
| 124Dh          | DC injection braking carrier frequency           | A059          | R/W | 0.5 to 15.0 (0.4 to 55 kW)<br>0.5 to 10.0 (75 to 132 kW)                                                                                                                                                                                            | 0.1 [kHz]  |
| 124Eh          | Not used                                         | —             | —   |                                                                                                                                                                                                                                                     | —          |
| 124Fh          | Frequency upper limit                            | A061 (HIGH)   | R/W | 0.00/Frequency lower limit to Max. frequency                                                                                                                                                                                                        | 0.01 [Hz]  |
| 1250h          |                                                  | A061 (LOW)    | R/W |                                                                                                                                                                                                                                                     |            |
| 1251h          | Frequency lower limit                            | A062 (HIGH)   | R/W | 0.00/Starting frequency to Frequency upper limit                                                                                                                                                                                                    | 0.01 [Hz]  |
| 1252h          |                                                  | A062 (LOW)    | R/W |                                                                                                                                                                                                                                                     |            |

| Register No. | Function name               | Function code | R/W | Monitor and setting parameters                                                                                                   | Resolution |
|--------------|-----------------------------|---------------|-----|----------------------------------------------------------------------------------------------------------------------------------|------------|
| 1253h        | Jump frequency 1            | A063 (HIGH)   | R/W | 0.00 to 400.00                                                                                                                   | 0.01 [Hz]  |
| 1254h        |                             | A063 (LOW)    | R/W |                                                                                                                                  |            |
| 1255h        | Jump frequency width 1      | A064          | R/W | 0.00 to 10.00                                                                                                                    | 0.01 [Hz]  |
| 1256h        | Jump frequency 2            | A065 (HIGH)   | R/W | 0.00 to 400.00                                                                                                                   | 0.01 [Hz]  |
| 1257h        |                             | A065 (LOW)    | R/W |                                                                                                                                  |            |
| 1258h        | Jump frequency width 2      | A066          | R/W | 0.00 to 10.00                                                                                                                    | 0.01 [Hz]  |
| 1259h        | Jump frequency 3            | A067 (HIGH)   | R/W | 0.00 to 400.00                                                                                                                   | 0.01 [Hz]  |
| 125Ah        |                             | A067 (LOW)    | R/W |                                                                                                                                  |            |
| 125Bh        | Jump frequency width 3      | A068          | R/W | 0.00 to 10.00                                                                                                                    | 0.01 [Hz]  |
| 125Ch        | Acceleration stop frequency | A069 (HIGH)   | R/W | 0.00 to 400.00                                                                                                                   | 0.01 [Hz]  |
| 125Dh        |                             | A069 (LOW)    | R/W |                                                                                                                                  |            |
| 125Eh        | Acceleration stop time      | A070          | R/W | 0.0 to 60.0                                                                                                                      | 0.1 [s]    |
| 125Fh        | PID selection               | A071          | R/W | 00: OFF (Disabled)<br>01: ON (+) (Enabled)<br>02: ON (+/-) (Reverse output enabled)                                              | —          |
| 1260h        | PID P gain                  | A072          | R/W | 0.2 to 5.0                                                                                                                       | 0.1        |
| 1261h        | PID I gain                  | A073          | R/W | 0.0 to 3600.0                                                                                                                    | 0.1 [s]    |
| 1262h        | PID D gain                  | A074          | R/W | 0.00 to 100.00                                                                                                                   | 0.01 [s]   |
| 1263h        | PID scale                   | A075          | R/W | 0.01 to 99.99                                                                                                                    | 0.01       |
| 1264h        | PID feedback selection      | A076          | R/W | 00: OI<br>01: O<br>02: Modbus (RS485 communication)<br>03: Pulse (Pulse train frequency)<br>10: Math (Operation function output) | —          |
| 1265h        | Reverse PID function        | A077          | R/W | 00: OFF (Deviation = Target value - Feedback value)<br>01: ON (Deviation = Feedback value - Target value)                        | —          |
| 1266h        | PID output limit function   | A078          | R/W | 0.0 to 100.0                                                                                                                     | 0.1 [s]    |
| 1267h        | PID feedforward selection   | A079          | R/W | 00: Disabled<br>01: O<br>02: OI<br>03: O2                                                                                        | —          |
| 1268h        | Not used                    | —             | —   |                                                                                                                                  | —          |
| 1269h        | AVR selection               | A081          | R/W | 00: Always ON<br>01: Always OFF<br>02: OFF during deceleration                                                                   | —          |

| Register No.         | Function name                                  | Function code  | R/W | Monitor and setting parameters                                                                                                                                   | Resolution   |
|----------------------|------------------------------------------------|----------------|-----|------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|
| 126Ah                | AVR voltage selection                          | A082           | R/W | 200-V class: 0 (200)<br>1 (215)<br>2 (220)<br>3 (230)<br>4 (240)<br>400-V class: 5 (380)<br>6 (400)<br>7 (415)<br>8 (440)<br>9 (460)<br>10 (480)                 | —            |
| 126Bh                | Not used                                       | —              | —   |                                                                                                                                                                  | —            |
| 126Ch                | Not used                                       | —              | —   |                                                                                                                                                                  | —            |
| 126Dh                | RUN mode selection                             | A085           | R/W | 00: Normal operation<br>01: Energy-saving operation<br>02: Automatic operation                                                                                   | —            |
| 126Eh                | Energy-saving response/<br>accuracy adjustment | A086           | R/W | 0.0 to 100.0                                                                                                                                                     | 0.1 [%]      |
| 126Fh<br>to<br>1273h | Not used                                       | —              | —   |                                                                                                                                                                  | —            |
| 1274h                | Acceleration time 2                            | A092<br>(HIGH) | R/W | 0.01 to 3600.00                                                                                                                                                  | 0.01 [s]     |
| 1275h                |                                                | A092<br>(LOW)  | R/W |                                                                                                                                                                  |              |
| 1276h                | Deceleration time 2                            | A093<br>(HIGH) | R/W | 0.01 to 3600.00                                                                                                                                                  | 0.01 [s]     |
| 1277h                |                                                | A093<br>(LOW)  | R/W |                                                                                                                                                                  |              |
| 1278h                | 2-step acceleration/<br>deceleration selection | A094           | R/W | 00: 2CH-Terminal (Switched via<br>multifunction input 09)<br>01: Preset FQ (Switched by setting)<br>02: FWD-REV (Enabled only when<br>switching forward/reverse) | —            |
| 1279h                | 2-step acceleration<br>frequency               | A095<br>(HIGH) | R/W | 0.00 to 400.00                                                                                                                                                   | 0.01<br>[Hz] |
| 127Ah                |                                                | A095<br>(LOW)  | R/W |                                                                                                                                                                  |              |
| 127Bh                | 2-step deceleration<br>frequency               | A096<br>(HIGH) | R/W | 0.00 to 400.00                                                                                                                                                   | 0.01<br>[Hz] |
| 127Ch                |                                                | A096<br>(LOW)  | R/W |                                                                                                                                                                  |              |
| 127Dh                | Acceleration pattern<br>selection              | A097           | R/W | 00: Line<br>01: S-curve<br>02: U-curve<br>03: inv.U curve<br>04: EL-S curve                                                                                      | —            |
| 127Eh                | Deceleration pattern<br>selection              | A098           | R/W | 00: Line<br>01: S-curve<br>02: U-curve<br>03: inv.U curve<br>04: EL-S curve                                                                                      | —            |

| Register No.   | Function name                       | Function code | R/W | Monitor and setting parameters                                                                                                                                                                                                       | Resolution |
|----------------|-------------------------------------|---------------|-----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| 127Fh          | Not used                            | —             | —   |                                                                                                                                                                                                                                      | —          |
| 1280h          | Not used                            | —             | —   |                                                                                                                                                                                                                                      | —          |
| 1281h          | OI start frequency                  | A101 (HIGH)   | R/W | 0.00 to 400.00                                                                                                                                                                                                                       | 0.01 [Hz]  |
| 1282h          |                                     | A101 (LOW)    | R/W |                                                                                                                                                                                                                                      |            |
| 1283h          | OI end frequency                    | A102 (HIGH)   | R/W | 0.00 to 400.00                                                                                                                                                                                                                       | 0.01 [Hz]  |
| 1284h          |                                     | A102 (LOW)    | R/W |                                                                                                                                                                                                                                      |            |
| 1285h          | OI start ratio                      | A103          | R/W | 0 to OI end ratio                                                                                                                                                                                                                    | 1 [%]      |
| 1286h          | OI end ratio                        | A104          | R/W | OI start ratio to 100                                                                                                                                                                                                                | 1 [%]      |
| 1287h          | OI start selection                  | A105          | R/W | 00: Start FQ (Use OI start frequency [A101])<br>01: 0 Hz                                                                                                                                                                             | —          |
| 1288h to 128Ch | Not used                            | —             | —   |                                                                                                                                                                                                                                      | —          |
| 128Dh          | O2 start frequency                  | A111 (HIGH)   | R/W | -400.00 to 400.00                                                                                                                                                                                                                    | 0.01 [Hz]  |
| 128Eh          |                                     | A111 (LOW)    | R/W |                                                                                                                                                                                                                                      |            |
| 128Fh          | O2 end frequency                    | A112 (HIGH)   | R/W | -400.00 to 400.00                                                                                                                                                                                                                    | 0.01 [Hz]  |
| 1290h          |                                     | A112 (LOW)    | R/W |                                                                                                                                                                                                                                      |            |
| 1291h          | O2 start ratio                      | A113          | R/W | -100 to O2 end ratio                                                                                                                                                                                                                 | 1 [%]      |
| 1292h          | O2 end ratio                        | A114          | R/W | O2 start ratio to 100                                                                                                                                                                                                                | 1 [%]      |
| 1293h to 12A4h | Not used                            | —             | —   |                                                                                                                                                                                                                                      | —          |
| 12A5h          | Acceleration curve parameter        | A131          | R/W | 01: Small curve to 10: Large curve                                                                                                                                                                                                   | —          |
| 12A6h          | Deceleration curve parameter        | A132          | R/W | 01: Small curve to 10: Large curve                                                                                                                                                                                                   | —          |
| 12A7h to 12AEh | Not used                            | —             | —   |                                                                                                                                                                                                                                      | —          |
| 12AFh          | Operation frequency input A setting | A141          | R/W | 00: Operator (Digital Operator (F001))<br>01: VR (Digital Operator (FREQ adjuster))<br>02: O (Input O)<br>03: OI (Input OI)<br>04: Modbus (RS485 communication)<br>05: Option 1<br>06: Option 2<br>07: Pulse (Pulse train frequency) | —          |

| Register No.   | Function name                                                        | Function code | R/W | Monitor and setting parameters                                                                                                                                                                                                       | Resolution |
|----------------|----------------------------------------------------------------------|---------------|-----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| 12B0h          | Operation frequency input B setting                                  | A142          | R/W | 00: Operator (Digital Operator (F001))<br>01: VR (Digital Operator (FREQ adjuster))<br>02: O (Input O)<br>03: OI (Input OI)<br>04: Modbus (RS485 communication)<br>05: Option 1<br>06: Option 2<br>07: Pulse (Pulse train frequency) | —          |
| 12B1h          | Operator selection                                                   | A143          | R/W | 00: ADD (Addition (A + B))<br>01: SUB (Subtraction (A - B))<br>02: MUL (Multiplication (A × B))                                                                                                                                      | —          |
| 12B2h          | Not used                                                             | —             | —   |                                                                                                                                                                                                                                      | —          |
| 12B3h          | Frequency addition amount                                            | A145 (HIGH)   | R/W | 0.00 to 400.00                                                                                                                                                                                                                       | 0.01 [Hz]  |
| 12B4h          |                                                                      | A145 (LOW)    | R/W |                                                                                                                                                                                                                                      |            |
| 12B5h          | Frequency addition direction                                         | A146          | R/W | 00: ADD (Frequency reference + A145)<br>01: SUB (Frequency reference - A145)                                                                                                                                                         | —          |
| 12B6h to 12B8h | Not used                                                             | —             | —   |                                                                                                                                                                                                                                      | —          |
| 12B9h          | EL-S-curve ratio 1 during acceleration                               | A150          | R/W | 0 to 50                                                                                                                                                                                                                              | 1 [%]      |
| 12BAh          | EL-S-curve ratio 2 during acceleration                               | A151          | R/W | 0 to 50                                                                                                                                                                                                                              | 1 [%]      |
| 12BBh          | EL-S-curve ratio 1 during deceleration                               | A152          | R/W | 0 to 50                                                                                                                                                                                                                              | 1 [%]      |
| 12BCh          | EL-S-curve ratio 2 during deceleration                               | A153          | R/W | 0 to 50                                                                                                                                                                                                                              | 1 [%]      |
| 12BDh to 1300h | Not used                                                             | —             | —   |                                                                                                                                                                                                                                      | —          |
| 1301h          | Retry selection                                                      | b001          | R/W | 00: TRIP (Alarm)<br>01: 0-Hz start<br>02: f-match (Frequency matching start)<br>03: f-match Trip (Trip after frequency matching deceleration stop)<br>04: Actv. f-match (Active Frequency Matching restart)                          | —          |
| 1302h          | Allowable momentary power interruption time                          | b002          | R/W | 0.3 to 25.0                                                                                                                                                                                                                          | 0.1 [s]    |
| 1303h          | Retry wait time                                                      | b003          | R/W | 0.3 to 100.0                                                                                                                                                                                                                         | 0.1 [s]    |
| 1304h          | Momentary power interruption/undervoltage trip during stop selection | b004          | R/W | 00: OFF (Disabled)<br>01: ON (Enabled)<br>02: Decel-OFF (Disabled during stop and deceleration stop)                                                                                                                                 | —          |
| 1305h          | Momentary power interruption retry time selection                    | b005          | R/W | 00: 16 times<br>01: No limit                                                                                                                                                                                                         | —          |
| 1306h          | Input phase loss protection selection                                | b006          | R/W | 00: OFF (Disabled)<br>01: ON (Enabled)                                                                                                                                                                                               | —          |



| Register No. | Function name                                    | Function code | R/W | Monitor and setting parameters                                                                                                                                                                                                                           | Resolution |
|--------------|--------------------------------------------------|---------------|-----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| 1307h        | Frequency matching lower limit frequency setting | b007 (HIGH)   | R/W | 0.00 to 400.00                                                                                                                                                                                                                                           | 0.01 [Hz]  |
| 1308h        |                                                  | b007 (LOW)    | R/W |                                                                                                                                                                                                                                                          |            |
| 1309h        | Trip retry selection                             | b008          | R/W | 00: TRIP (Alarm)<br>01: 0-Hz start<br>02: f-match (Frequency matching start)<br>03: f-match Trip (Trip after frequency matching deceleration stop)<br>04: Actv. f-match (Active Frequency Matching restart)                                              | —          |
| 130Ah        | Undervoltage retry time selection                | b009          | R/W | 00: 16 times<br>01: No limit                                                                                                                                                                                                                             | —          |
| 130Bh        | Overvoltage/overcurrent retry time selection     | b010          | R/W | 1 to 3                                                                                                                                                                                                                                                   | —          |
| 130Ch        | Trip retry wait time                             | b011          | R/W | 0.3 to 100.0                                                                                                                                                                                                                                             | 0.1 [s]    |
| 130Dh        | Electronic thermal level                         | b012          | R/W | 0.20 x Rated current to 1.00 x Rated current                                                                                                                                                                                                             | 0.1 [A]    |
| 130Eh        | Electronic thermal characteristics selection     | b013          | R/W | 00: Reduced TRQ (Reduced torque characteristics)<br>01: Const TRQ (Constant torque characteristics)<br>02: Free set (Free setting)                                                                                                                       | —          |
| 130Fh        | Not used                                         | —             | —   |                                                                                                                                                                                                                                                          | —          |
| 1310h        | Free setting, electronic thermal frequency 1     | b015          | R/W | 0 to 400                                                                                                                                                                                                                                                 | 1 [Hz]     |
| 1311h        | Free setting, electronic thermal current 1       | b016          | R/W | 0.0 to Rated current                                                                                                                                                                                                                                     | 0.1 [A]    |
| 1312h        | Free setting, electronic thermal frequency 2     | b017          | R/W | 0 to 400                                                                                                                                                                                                                                                 | 1 [Hz]     |
| 1313h        | Free setting, electronic thermal current 2       | b018          | R/W | 0.0 to Rated current                                                                                                                                                                                                                                     | 0.1 [A]    |
| 1314h        | Free setting, electronic thermal frequency 3     | b019          | R/W | 0 to 400                                                                                                                                                                                                                                                 | 1 [Hz]     |
| 1315h        | Free setting, electronic thermal current 3       | b020          | R/W | 0.0 to Rated current                                                                                                                                                                                                                                     | 0.1 [A]    |
| 1316h        | Overload limit selection                         | b021          | R/W | 00: OFF (Disabled)<br>01: ON-Acc/Cnst (Enabled in acceleration/constant speed operation)<br>02: ON-Cnst (Enabled during constant speed operation)<br>03: ON-A/C (R) (Enabled in acceleration/constant speed operation (accelerates during regeneration)) | —          |
| 1317h        | Overload limit level                             | b022          | R/W | 0.20 x Rated current to 2.00 x Rated current (0.4 to 55 kW)<br>0.20 x Rated current to 1.80 x Rated current (75 to 132 kW)                                                                                                                               | 0.1 [A]    |
| 1318h        | Overload limit parameter                         | b023          | R/W | 0.10 to 30.00                                                                                                                                                                                                                                            | 0.01 [s]   |

| Register No. | Function name                                           | Function code | R/W | Monitor and setting parameters                                                                                                                                                                                                                                                                                                                                                                                                                                | Resolution |
|--------------|---------------------------------------------------------|---------------|-----|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| 1319h        | Overload limit selection 2                              | b024          | R/W | 00: OFF (Disabled)<br>01: ON-Acc/Cnst (Enabled in acceleration/constant speed operation)<br>02: ON-Cnst (Enabled during constant speed operation)<br>03: ON-A/C (R) (Enabled in acceleration/constant speed operation (accelerates during regeneration))                                                                                                                                                                                                      | —          |
| 131Ah        | Overload limit level 2                                  | b025          | R/W | 0.20 x Rated current to 2.00 x Rated current (0.4 to 55 kW)<br>0.20 x Rated current to 1.80 x Rated current (75 to 132 kW)                                                                                                                                                                                                                                                                                                                                    | 0.1 [A]    |
| 131Bh        | Overload limit parameter 2                              | b026          | R/W | 0.10 to 30.00                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 0.01 [s]   |
| 131Ch        | Overcurrent suppression function                        | b027          | R/W | 00: OFF (Disabled)<br>01: ON (Enabled)                                                                                                                                                                                                                                                                                                                                                                                                                        | —          |
| 131Dh        | Active Frequency Matching restart level                 | b028          | R/W | 0.20 x Rated current to 2.00 x Rated current (0.4 to 55 kW)<br>0.20 x Rated current to 1.80 x Rated current (75 to 132 kW)                                                                                                                                                                                                                                                                                                                                    | 0.1 [A]    |
| 131Eh        | Active Frequency Matching restart parameter             | b029          | R/W | 0.10 to 30.00                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 0.01 [s]   |
| 131Fh        | Starting frequency at Active Frequency Matching restart | b030          | R/W | 00: Off FQ (Frequency at interruption)<br>01: Max.FQ (Max. frequency)<br>02: Set FQ (Set frequency)                                                                                                                                                                                                                                                                                                                                                           | —          |
| 1320h        | Soft lock selection                                     | b031          | R/W | 00: Lock (SFT) (Data other than b031 cannot be changed when terminal SFT is ON)<br>01: Only FQ (SFT) (Data other than b031 and the specified frequency parameter cannot be changed when terminal SFT is ON)<br>02: Lock (Data other than b031 cannot be changed)<br>03: Only FQ (Data other than b031 and the specified frequency parameter cannot be changed)<br>10: RUN chg mode (Data other than parameters changeable during operation cannot be changed) | —          |
| 1321h        | Not used                                                | —             | —   |                                                                                                                                                                                                                                                                                                                                                                                                                                                               | —          |
| 1322h        | Not used                                                | —             | —   |                                                                                                                                                                                                                                                                                                                                                                                                                                                               | —          |
| 1323h        | RUN time/Power ON time setting                          | b034 (HIGH)   | R/W | 0 to 65535                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 1 [h]      |
| 1324h        |                                                         | b034 (LOW)    | R/W |                                                                                                                                                                                                                                                                                                                                                                                                                                                               |            |
| 1325h        | Rotation direction limit selection                      | b035          | R/W | 00: FREE (Forward and Reverse are enabled)<br>01: FWD (Only Forward is enabled)<br>02: REV (Only Reverse is enabled)                                                                                                                                                                                                                                                                                                                                          | —          |
| 1326h        | Reduced voltage startup selection                       | b036          | R/W | 0: (Reduced voltage startup time: Short) to 255: (Reduced voltage startup time: Long)                                                                                                                                                                                                                                                                                                                                                                         | —          |

| Register No.   | Function name                                                                    | Function code | R/W | Monitor and setting parameters                                                                                                                                                | Resolution |
|----------------|----------------------------------------------------------------------------------|---------------|-----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| 1327h          | Display selection                                                                | b037          | R/W | 00: All (Complete display)<br>01: Utilized (Individual display of functions)<br>02: User (User setting)<br>03: Compare (Data comparison display)<br>04: Basic (Basic display) | —          |
| 1328h          | Initial screen selection                                                         | b038          | R/W | 000 to 202                                                                                                                                                                    | —          |
| 1329h          | User parameter automatic setting function selection                              | b039          | R/W | 00: OFF (Disabled)<br>01: ON (Enabled)                                                                                                                                        | —          |
| 132Ah          | Torque limit selection                                                           | b040          | R/W | 00: 4-quadrant (Four-quadrant separate setting)<br>01: TRQ input (Terminal switch)<br>02: [O] input (Analog Input)<br>03: Option 1<br>04: Option 2                            | —          |
| 132Bh          | Torque limit 1<br>(Four-quadrant mode forward power running)                     | b041          | R/W | 0 to 200 (0.4 to 55 kW)/<br>0 to 180 (75 to 132 kW)<br>no (Torque limit disabled)                                                                                             | 1 [%]      |
| 132Ch          | Torque limit 2<br>(Four-quadrant mode reversed regeneration)                     | b042          | R/W | 0 to 200 (0.4 to 55 kW)/<br>0 to 180 (75 to 132 kW)<br>no (Torque limit disabled)                                                                                             | 1 [%]      |
| 132Dh          | Torque limit 3<br>(Four-quadrant mode reversed power running)                    | b043          | R/W | 0 to 200 (0.4 to 55 kW)/<br>0 to 180 (75 to 132 kW)<br>no (Torque limit disabled)                                                                                             | 1 [%]      |
| 132Eh          | Torque limit 4<br>(Four-quadrant mode forward regeneration)                      | b044          | R/W | 0 to 200 (0.4 to 55 kW)/<br>0 to 180 (75 to 132 kW)<br>no (Torque limit disabled)                                                                                             | 1 [%]      |
| 132Fh          | Torque LADSTOP selection                                                         | b045          | R/W | 00: OFF (Disabled)<br>01: ON (Enabled)                                                                                                                                        | —          |
| 1330h          | Reverse rotation prevention selection                                            | b046          | R/W | 00: OFF (Disabled)<br>01: ON (Enabled)                                                                                                                                        | —          |
| 1331h to 1332h | Not used                                                                         | —             | —   |                                                                                                                                                                               | —          |
| 1333h          | Dual rate selection                                                              | b049          | R/W | 00: CT (Constant torque)<br>01: VT (Variable torque)                                                                                                                          | —          |
| 1334h          | Selection of non-stop function at momentary power interruption                   | b050          | R/W | 00: OFF (Disabled)<br>01: V-Cnst (STOP) (Enabled (Deceleration stop))<br>02: NS1 (Enabled (without recovery))<br>03: NS2 (Enabled (with recovery))                            | —          |
| 1335h          | Starting voltage of non-stop function at momentary power interruption            | b051          | R/W | 0.0 to 1000.0                                                                                                                                                                 | 0.1 [V]    |
| 1336h          | Starting deceleration level of non-stop function at momentary power interruption | b052          | R/W | 0.0 to 1000.0                                                                                                                                                                 | 0.1 [V]    |
| 1337h          | Deceleration time of non-stop function at momentary power interruption           | b053 (HIGH)   | R/W | 0.01 to 3600.00                                                                                                                                                               | 0.01 [s]   |
| 1338h          |                                                                                  | b053 (LOW)    | R/W |                                                                                                                                                                               |            |

| Register No.   | Function name                                                                    | Function code | R/W | Monitor and setting parameters                                                                                                                            | Resolution |
|----------------|----------------------------------------------------------------------------------|---------------|-----|-----------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| 1339h          | Deceleration starting width of non-stop function at momentary power interruption | b054          | R/W | 0.00 to 10.00                                                                                                                                             | 0.01 [Hz]  |
| 133Ah          | Proportional gain setting of non-stop function at momentary power interruption   | b055          | R/W | 0.00 to 2.55                                                                                                                                              | 0.01       |
| 133Bh          | Integral time setting of non-stop function at momentary power interruption       | b056          | R/W | 0.000 to 65.535                                                                                                                                           | 0.001 [s]  |
| 133Ch to 133Eh | Not used                                                                         | —             | —   |                                                                                                                                                           | —          |
| 133Fh          | Window comparator O upper limit level                                            | b060          | R/W | Set an upper limit level.<br>Setting range: 0 to 100<br>Lower limit: Lower limit level + Hysteresis width $\times 2$                                      | 1 [%]      |
| 1340h          | Window comparator O lower limit level                                            | b061          | R/W | Set a lower limit level.<br>Setting range: 0 to 100<br>Upper limit: Upper limit level - Hysteresis width $\times 2$                                       | 1 [%]      |
| 1341h          | Window comparator O hysteresis width                                             | b062          | R/W | Set a hysteresis width for the upper and lower limit levels.<br>Setting range: 0 to 10<br>Upper limit: (Upper limit level - Lower limit level) $\times 2$ | 1 [%]      |
| 1342h          | Window comparator OI upper limit level                                           | b063          | R/W | Set an upper limit level.<br>Setting range: 0 to 100<br>Lower limit: Lower limit level + Hysteresis width $\times 2$                                      | 1 [%]      |
| 1343h          | Window comparator OI lower limit level                                           | b064          | R/W | Set a lower limit level.<br>Setting range: 0 to 100<br>Upper limit: Upper limit level - Hysteresis width $\times 2$                                       | 1 [%]      |
| 1344h          | Window comparator OI hysteresis width                                            | b065          | R/W | Set a hysteresis width for the upper and lower limit levels.<br>Setting range: 0 to 10<br>Upper limit: (Upper limit level - Lower limit level) $\times 2$ | 1 [%]      |
| 1345h          | Window comparator O2 upper limit level                                           | b066          | R/W | Set an upper limit level.<br>Setting range: -100 to 100<br>Lower limit: Lower limit level + Hysteresis width $\times 2$                                   | 1 [%]      |
| 1346h          | Window comparator O2 lower limit level                                           | b067          | R/W | Set a lower limit level.<br>Setting range: -100 to 100<br>Upper limit: Upper limit level - Hysteresis width $\times 2$                                    | 1 [%]      |
| 1347h          | Window comparator O2 hysteresis width                                            | b068          | R/W | Set a hysteresis width for the upper and lower limit levels.<br>Setting range: 0 to 10<br>Upper limit: (Upper limit level - Lower limit level) $\times 2$ | 1 [%]      |

| Register No.  | Function name                               | Function code | R/W | Monitor and setting parameters                                                                                                                                                                                                                                               | Resolution |
|---------------|---------------------------------------------|---------------|-----|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| 1348h         | Not used                                    | —             | —   |                                                                                                                                                                                                                                                                              | —          |
| 1349h         | Analog operation level at O disconnection   | b070          | R/W | 0 to 100/no (ignored)                                                                                                                                                                                                                                                        | 1 [%]      |
| 134Ah         | Analog operation level at OI disconnection  | b071          | R/W | 0 to 100/no (ignored)                                                                                                                                                                                                                                                        | 1 [%]      |
| 134Bh         | Analog operation level at O2 disconnection  | b072          | R/W | -100 to 100/no (ignored)                                                                                                                                                                                                                                                     | 1 [%]      |
| 134Ch to 1350 | Not used                                    | —             | —   |                                                                                                                                                                                                                                                                              | —          |
| 1351h         | Integrated power clear                      | b078          | R/W | Cleared with the Enter key after changing to 01                                                                                                                                                                                                                              | —          |
| 1352h         | Integrated power display gain               | b079          | R/W | 1 to 1000                                                                                                                                                                                                                                                                    | 1          |
| 1353h         | Not used                                    | —             | —   |                                                                                                                                                                                                                                                                              | —          |
| 1354h         | Not used                                    | —             | —   |                                                                                                                                                                                                                                                                              | —          |
| 1355h         | Starting frequency                          | b082          | R/W | 0.10 to 9.99                                                                                                                                                                                                                                                                 | 0.01 [Hz]  |
| 1356h         | Carrier frequency                           | b083          | R/W | 0.5 to 15.0 (0.4 to 55 kW)<br>0.5 to 10.0 (75 to 132 kW)                                                                                                                                                                                                                     | 0.1 [kHz]  |
| 1357h         | Initialization selection                    | b084          | R/W | 00: no (Clears the trip monitor)<br>01: Trip data (Initializes data)<br>02: Parameters (Clears the trip monitor and initializes data)<br>03: Trip+Param (Clears the trip monitor and parameters)<br>04: Trp+Prm+EzSQ (Clears the trip monitor, parameters and Drive Program) | —          |
| 1358h         | Initialization parameter selection          | b085          | R/W | 01<br>*Do not change.                                                                                                                                                                                                                                                        | —          |
| 1359h         | Frequency conversion coefficient            | b086          | R/W | 0.1 to 99.9                                                                                                                                                                                                                                                                  | 0.1        |
| 135Ah         | STOP key selection                          | b087          | R/W | 00: ON (Enabled)<br>01: OFF (Disabled)<br>02: Only RESET (Disabled only during stop)                                                                                                                                                                                         | —          |
| 135Bh         | Free-run stop selection                     | b088          | R/W | 00: 0-Hz start<br>01: f-match (Frequency matching start)<br>02: Actv. f-match (Active Frequency Matching restart)                                                                                                                                                            | —          |
| 135Ch         | Automatic carrier reduction                 | b089          | R/W | 00: OFF (Disabled)<br>01: ON (Enabled)                                                                                                                                                                                                                                       | —          |
| 135Dh         | Usage rate of regenerative braking function | b090          | R/W | 0.0 to 100.0                                                                                                                                                                                                                                                                 | 0.1 [%]    |
| 135Eh         | Stop selection                              | b091          | R/W | 00: Decel-Stop (Deceleration → Stop)<br>01: Free-RUN (Free-run stop)                                                                                                                                                                                                         | —          |
| 135Fh         | Cooling fan control                         | b092          | R/W | 00: Alws-ON (Always ON)<br>01: ON in RUN (ON during RUN)                                                                                                                                                                                                                     | —          |
| 1360h         | Not used                                    | —             | —   |                                                                                                                                                                                                                                                                              | —          |
| 1361h         | Not used                                    | —             | —   |                                                                                                                                                                                                                                                                              | —          |

## 4-4 Communication Function

4

Functions

| Register No.   | Function name                                     | Function code | R/W | Monitor and setting parameters                                                                                   | Resolution     |
|----------------|---------------------------------------------------|---------------|-----|------------------------------------------------------------------------------------------------------------------|----------------|
| 1362h          | Regenerative braking function operation selection | b095          | R/W | 00: OFF (Disabled)<br>01: RUN-ON (Enabled (Disabled during stop))<br>02: Alws-ON (Enabled (Enabled during stop)) | —              |
| 1363h          | Regenerative braking function ON level            | b096          | R/W | 330 to 380<br>660 to 760                                                                                         | 1 [V]          |
| 1364h          | Not used                                          | —             | —   |                                                                                                                  | —              |
| 1365h          | Thermistor selection                              | b098          | R/W | 00: Disabled<br>01: PTC enabled<br>02: NTC enabled                                                               | —              |
| 1366h          | Thermistor error level                            | b099          | R/W | 0 to 9999                                                                                                        | 1 [ $\Omega$ ] |
| 1367h          | Free V/f frequency 1                              | b100          | R/W | 0 to Free V/f frequency 2                                                                                        | 1 [Hz]         |
| 1368h          | Free V/f voltage 1                                | b101          | R/W | 0.0 to 800.0                                                                                                     | 0.1 [V]        |
| 1369h          | Free V/f frequency 2                              | b102          | R/W | 0 to Free V/f frequency 3                                                                                        | 1 [Hz]         |
| 136Ah          | Free V/f voltage 2                                | b103          | R/W | 0.0 to 800.0                                                                                                     | 0.1 [V]        |
| 136Bh          | Free V/f frequency 3                              | b104          | R/W | 0 to Free V/f frequency 4                                                                                        | 1 [Hz]         |
| 136Ch          | Free V/f voltage 3                                | b105          | R/W | 0.0 to 800.0                                                                                                     | 0.1 [V]        |
| 136Dh          | Free V/f frequency 4                              | b106          | R/W | 0 to Free V/f frequency 5                                                                                        | 1 [Hz]         |
| 136Eh          | Free V/f voltage 4                                | b107          | R/W | 0.0 to 800.0                                                                                                     | 0.1 [V]        |
| 136Fh          | Free V/f frequency 5                              | b108          | R/W | 0 to Free V/f frequency 6                                                                                        | 1 [Hz]         |
| 1370h          | Free V/f voltage 5                                | b109          | R/W | 0.0 to 800.0                                                                                                     | 0.1 [V]        |
| 1371h          | Free V/f frequency 6                              | b110          | R/W | 0 to Free V/f frequency 7                                                                                        | 1 [Hz]         |
| 1372h          | Free V/f voltage 6                                | b111          | R/W | 0.0 to 800.0                                                                                                     | 0.1 [V]        |
| 1373h          | Free V/f frequency 7                              | b112          | R/W | 0 to 400                                                                                                         | 1 [Hz]         |
| 1374h          | Free V/f voltage 7                                | b113          | R/W | 0.0 to 800.0                                                                                                     | 0.1 [V]        |
| 1375h to 137Ah | Not used                                          | —             | —   |                                                                                                                  | —              |
| 137Bh          | Brake control selection                           | b120          | R/W | 00: OFF (Disabled)<br>01: ON (Enabled)                                                                           | —              |
| 137Ch          | Brake wait time for release                       | b121          | R/W | 0.00 to 5.00                                                                                                     | 0.01 [s]       |
| 137Dh          | Brake wait time for acceleration                  | b122          | R/W | 0.00 to 5.00                                                                                                     | 0.01 [s]       |
| 137Eh          | Brake wait time for stopping                      | b123          | R/W | 0.00 to 5.00                                                                                                     | 0.01 [s]       |
| 137Fh          | Brake wait time for confirmation                  | b124          | R/W | 0.00 to 5.00                                                                                                     | 0.01 [s]       |
| 1380h          | Brake release frequency                           | b125          | R/W | 0.00 to 400.00                                                                                                   | 0.01 [Hz]      |
| 1381h          | Brake release current                             | b126          | R/W | 0.0 to 2.00 x Rated current (0.4 to 55 kW)<br>0.0 to 1.80 x Rated current (75 to 132 kW)                         | 0.1 [A]        |
| 1382h          | Brake input frequency                             | b127          | R/W | 0.00 to 400.00                                                                                                   | 0.01 [Hz]      |
| 1383h          | Not used                                          | —             | —   |                                                                                                                  | —              |
| 1384h          | Not used                                          | —             | —   |                                                                                                                  | —              |

| Register No.   | Function name                                                 | Function code | R/W | Monitor and setting parameters                                                                   | Resolution |
|----------------|---------------------------------------------------------------|---------------|-----|--------------------------------------------------------------------------------------------------|------------|
| 1385h          | Overvoltage protection function selection during deceleration | b130          | R/W | 00: OFF (Disabled)<br>01: V-const (DC voltage kept constant)<br>02: Accel (Acceleration enabled) | —          |
| 1386h          | Overvoltage protection level during deceleration              | b131          | R/W | 200-V class: 330 to 390 (V)<br>400-V class: 660 to 780 (V)                                       | 1 [V]      |
| 1387h          | Overvoltage protection parameter                              | b132          | R/W | 0.10 to 30.00                                                                                    | 0.01 [s]   |
| 1388h          | Overvoltage protection proportional gain setting              | b133          | R/W | 0.00 to 2.55                                                                                     | 0.01       |
| 1389h          | Overvoltage protection integral time setting                  | b134          | R/W | 0.000 to 65.535                                                                                  | 0.001 [s]  |
| 1390h to 1400h | Not used                                                      | —             | —   |                                                                                                  | —          |

| Register No. | Function name                    | Function code | R/W | Monitor and setting parameters                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Resolution |
|--------------|----------------------------------|---------------|-----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| 1401h        | Multi-function input 1 selection | C001          | R/W | 01: RV (reverse)<br>02: CF1 (multi-step speed setting binary 1)<br>03: CF2 (multi-step speed setting binary 2)<br>04: CF3 (multi-step speed setting binary 3)<br>05: CF4 (multi-step speed setting binary 4)<br>06: JG (jogging)<br>07: DB (external DC injection braking)<br>08: SET (2nd control)<br>09: 2CH (2-step acceleration/deceleration)<br>11: FRS (free-run stop)<br>12: EXT (external trip)<br>13: USP (USP function)<br>14: CS (commercial switch)<br>15: SFT (soft lock)<br>16: AT (analog input switching)<br>17: SET3 (3rd control)<br>18: RS (reset)<br>20: STA (3-wire start)<br>21: STP (3-wire stop)<br>22: F/R (3-wire forward/reverse)<br>23: PID (PID enabled/disabled)<br>24: PIDC (PID integral reset)<br>26: CAS (control gain switching)<br>27: UP (UP/DWN function accelerated)<br>28: DWN (UP/DWN function decelerated)<br>29: UDC (UP/DWN function data clear)<br>31: OPE (forced operator)<br>32: SF1 (multi-step speed setting bit 1)<br>33: SF2 (multi-step speed setting bit 2)<br>34: SF3 (multi-step speed setting bit 3)<br>35: SF4 (multi-step speed setting bit 4)<br>36: SF5 (multi-step speed setting bit 5)<br>37: SF6 (multi-step speed setting bit 6)<br>38: SF7 (multi-step speed setting bit 7)<br>39: OLR (overload limit switching)<br>40: TL (torque limit enabled)<br>41: TRQ1 (torque limit switching 1)<br>42: TRQ2 (torque limit switching 2)<br>43: PPI (P/PI switching)<br>44: BOK (Brake confirmation)<br>45: ORT (orientation)<br>46: LAC (LAD cancel)<br>47: PCLR (position deviation clear)<br>48: STAT (pulse train position command input permission) | —          |
| 1402h        | Multi-function input 2 selection | C002          | R/W |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | —          |
| 1403h        | Multi-function input 3 selection | C003          | R/W |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | —          |
| 1404h        | Multi-function input 4 selection | C004          | R/W |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | —          |
| 1405h        | Multi-function input 5 selection | C005          | R/W |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | —          |
| 1406h        | Multi-function input 6 selection | C006          | R/W | 50: ADD (frequency addition)<br>51: F-TM (forced terminal block)<br>52: ATR (torque command input permission)<br>53: KHC (integrated power clear)<br>54: SON (servo ON)<br>55: FOC (preliminary excitation)<br>56: MI1 (Drive Programming input 1)<br>57: MI2 (Drive Programming input 2)<br>58: MI3 (Drive Programming input 3)<br>59: MI4 (Drive Programming input 4)<br>60: MI5 (Drive Programming input 5)<br>61: MI6 (Drive Programming input 6)<br>62: MI7 (Drive Programming input 7)<br>63: MI8 (Drive Programming input 8)<br>65: AHD (analog command held)<br>66: CP1 (position command selection 1)<br>67: CP2 (position command selection 2)<br>68: CP3 (position command selection 3)<br>69: ORL (zero return limit signal)<br>70: ORG (zero return startup signal)<br>71: FOT (forward driving stop)<br>72: ROT (reverse driving stop)<br>73: SPD (speed/position switching)<br>74: PCNT (pulse counter)<br>75: PCC (pulse counter clear)<br>82: PRG (Drive program start)<br>no: NO (no allocation)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | —          |
| 1407h        | Multi-function input 7 selection | C007          | R/W |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | —          |
| 1408h        | Multi-function input 8 selection | C008          | R/W |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | —          |
| 1409h        | Not used                         | —             | —   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | —          |
| 140Ah        | Not used                         | —             | —   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | —          |



| Register No. | Function name                              | Function code | R/W | Monitor and setting parameters | Resolution |
|--------------|--------------------------------------------|---------------|-----|--------------------------------|------------|
| 140Bh        | Multi-function input 1 operation selection | C011          | R/W | 00: NO<br>01: NC               | —          |
| 140Ch        | Multi-function input 2 operation selection | C012          | R/W |                                | —          |
| 140Dh        | Multi-function input 3 operation selection | C013          | R/W |                                | —          |
| 140Eh        | Multi-function input 4 operation selection | C014          | R/W |                                | —          |
| 140Fh        | Multi-function input 5 operation selection | C015          | R/W |                                | —          |
| 1410h        | Multi-function input 6 operation selection | C016          | R/W |                                | —          |
| 1411h        | Multi-function input 7 operation selection | C017          | R/W |                                | —          |
| 1412h        | Multi-function input 8 operation selection | C018          | R/W |                                | —          |
| 1413h        | FW terminal operation selection            | C019          | R/W |                                | —          |
| 1414h        | Not used                                   | —             | —   |                                | —          |

| Register No. | Function name                               | Function code | R/W | Monitor and setting parameters                                                                                                                                                                                                                                                                                                                                                                       | Resolution |
|--------------|---------------------------------------------|---------------|-----|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| 1415h        | Multi-function output terminal 11 selection | C021          | R/W | 00: RUN (signal during RUN)<br>01: FA1 (constant speed arrival signal)<br>02: FA2 (over set frequency arrival signal)<br>03: OL (overload warning)<br>04: OD (excessive PID deviation)<br>05: AL (alarm output)<br>06: FA3 (set-frequency-only arrival signal)<br>07: OTQ (overtorque)<br>08: IP (signal during momentary power interruption)                                                        | —          |
| 1416h        | Multi-function output terminal 12 selection | C022          | R/W | 09: UV (signal during undervoltage)<br>10: TRQ (torque limit)<br>11: RNT (RUN time over)<br>12: ONT (Power ON time over)<br>13: THM (thermal warning)<br>19: BRK (brake release)<br>20: BER (brake error)<br>21: ZS (0 Hz signal)<br>22: DSE (excessive speed deviation)<br>23: POK (position ready)                                                                                                 | —          |
| 1417h        | Multi-function output terminal 13 selection | C023          | R/W | 24: FA4 (set frequency exceeded 2)<br>25: FA5 (set frequency only 2)<br>26: OL2 (overload warning 2)<br>27: ODc (analog O disconnection detection)<br>28: OIdc (analog OI disconnection detection)<br>29: O2Dc (analog O2 disconnection detection)<br>31: FBV (PID FB status output)<br>32: NDc (network error)                                                                                      | —          |
| 1418h        | Multi-function output terminal 14 selection | C024          | R/W | 33: LOG1 (logic operation output 1)<br>34: LOG2 (logic operation output 2)<br>35: LOG3 (logic operation output 3)<br>36: LOG4 (logic operation output 4)<br>37: LOG5 (logic operation output 5)<br>38: LOG6 (logic operation output 6)<br>39: WAC (capacitor life warning signal)<br>40: WAF (cooling fan life warning signal)<br>41: FR (starting contact signal)<br>42: OHF (fin overheat warning) | —          |
| 1419h        | Multi-function output terminal 15 selection | C025          | R/W | 43: LOC (light load detection signal)<br>44: MO1 (Drive Programming output 1)<br>45: MO2 (Drive Programming output 2)<br>46: MO3 (Drive Programming output 3)<br>47: MO4 (Drive Programming output 4)<br>48: MO5 (Drive Programming output 5)<br>49: MO6 (Drive Programming output 6)<br>50: IRDY (operation ready signal)<br>51: FWR (forward run signal)<br>52: RVR (reverse run signal)           | —          |
| 141Ah        | Relay output (AL2, AL1) function selection  | C026          | R/W | 53: MJA (fatal fault signal)<br>54: WCO (window comparator O)<br>55: WCOI (window comparator OI)<br>56: WCO2 (window comparator O2)<br>63: OPO (option board output)<br>no: Not used<br>(When alarm code output is selected in C062, AC0 to AC2, or AC0 to AC3 (ACn: alarm code output) are forced to be allocated to multi-function output terminals 11 to 13, or 11 to 14.)                        | —          |

| Register No. | Function name                           | Function code | R/W | Monitor and setting parameters                                                                                                                                                                                                                                                                                                                                                                                                                                             | Resolution |
|--------------|-----------------------------------------|---------------|-----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| 141Bh        | FM selection                            | C027          | R/W | 00: Output FQ (Output frequency)<br>01: Output I (Output current)<br>02: Output TRQ (Output torque)<br>03: Pulse FQ (Digital output frequency)<br>04: Output V (Output voltage)<br>05: Power<br>06: Thermal (Thermal load rate)<br>07: LAD-FQ (LAD frequency)<br>08: Pulse I (Digital current monitor)<br>09: Motor tmp (Motor temperature)<br>10: Heatsink tmp (Fin temperature)<br>12: YA0 (Drive Programming)<br>19: OP1 (Option board 1)<br>20: OP2 (Option board 2)   | —          |
| 141Ch        | AM selection                            | C028          | R/W | 00: Output FQ (Output frequency)<br>01: Output I (Output current)<br>02: Output TRQ (Output torque)<br>04: Output V (Output voltage)<br>05: Power<br>06: Thermal (Thermal load rate)<br>07: LAD-FQ (LAD frequency)<br>08: Pulse I (Digital current monitor)<br>09: Motor tmp (Motor temperature)<br>10: Heatsink tmp (Fin temperature)<br>11: Out TRQ sign (Output torque (signed))<br>13: YA1 (Drive Programming)<br>19: OP1 (Option board 1)<br>20: OP2 (Option board 2) | —          |
| 141Dh        | AMI selection                           | C029          | R/W | 00: Output FQ (Output frequency)<br>01: Output I (Output current)<br>02: Output TRQ (Output torque)<br>04: Output V (Output voltage)<br>05: Power<br>06: Thermal (Thermal load rate)<br>07: LAD-FQ (LAD frequency)<br>09: Motor tmp (Motor temperature)<br>10: Heatsink tmp (Fin temperature)<br>14: YA2 (Drive Programming)                                                                                                                                               | —          |
| 141Eh        | Digital current monitor reference value | C030          | R/W | 0.20 × Rated current to 2.00 × Rated current (Under 55 kW)<br>0.20 × Rated current to 1.50 × Rated current (Over 75 kW)<br>(Current value at the digital current monitor output 1440 Hz)                                                                                                                                                                                                                                                                                   | 0.1 [A]    |

| Register No. | Function name                                       | Function code | R/W | Monitor and setting parameters                                                                                                                     | Resolution |
|--------------|-----------------------------------------------------|---------------|-----|----------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| 141Fh        | Multi-function output terminal 11 contact selection | C031          | R/W | 00: NO<br>01: NC                                                                                                                                   | —          |
| 1420h        | Multi-function output terminal 12 contact selection | C032          | R/W |                                                                                                                                                    | —          |
| 1421h        | Multi-function output terminal 13 contact selection | C033          | R/W |                                                                                                                                                    | —          |
| 1422h        | Multi-function output terminal 14 contact selection | C034          | R/W |                                                                                                                                                    | —          |
| 1423h        | Multi-function output terminal 15 contact selection | C035          | R/W |                                                                                                                                                    | —          |
| 1424h        | Relay output (AL2, AL1) contact selection           | C036          | R/W | 00: NO contact at AL2, NC contact at AL1<br>01: NC contact at AL2, NO contact at AL1                                                               | —          |
| 1425h        | Not used                                            | —             | —   |                                                                                                                                                    | —          |
| 1426h        | Light load signal output mode                       | C038          | R/W | 00: ACC/DEC/CST (Enabled during acceleration/deceleration/constant speed)<br>01: Const (Enabled only during constant speed)                        | —          |
| 1427h        | Light load detection level                          | C039          | R/W | 0.0 to 2.00 x Rated current (0.4 to 55 kW)<br>0.0 to 1.80 x Rated current (75 to 132 kW)                                                           | 0.1 [A]    |
| 1428h        | Overload warning signal output mode                 | C040          | R/W | 00: ACC/DEC/CST (Enabled during acceleration/deceleration/constant speed)<br>01: Const (Enabled only during constant speed)                        | —          |
| 1429h        | Overload warning level                              | C041          | R/W | 0.0: Does not operate.<br>0.1 x Rated current to 2.00 x Rated current (0.4 to 55 kW)<br>0.1 x Rated current to 1.80 x Rated current (75 to 132 kW) | 0.1 [A]    |
| 142Ah        | Arrival frequency during acceleration               | C042 (HIGH)   | R/W | 0.00 to 400.00                                                                                                                                     | 0.01 [Hz]  |
| 142Bh        |                                                     | C042 (LOW)    | R/W |                                                                                                                                                    |            |
| 142Ch        | Arrival frequency during deceleration               | C043 (HIGH)   | R/W | 0.00 to 400.00                                                                                                                                     | 0.01 [Hz]  |
| 142Dh        |                                                     | C043 (LOW)    | R/W |                                                                                                                                                    |            |
| 142Eh        | PID deviation excessive level                       | C044          | R/W | 0.0 to 100.0                                                                                                                                       | 0.1 [%]    |
| 142Fh        | Arrival frequency during acceleration 2             | C045 (HIGH)   | R/W | 0.00 to 400.00                                                                                                                                     | 0.01 [Hz]  |
| 1430h        |                                                     | C045 (LOW)    | R/W |                                                                                                                                                    |            |

| Register No.   | Function name                                       | Function code | R/W | Monitor and setting parameters                                                      | Resolution |
|----------------|-----------------------------------------------------|---------------|-----|-------------------------------------------------------------------------------------|------------|
| 1431h          | Arrival frequency during deceleration 2             | C046 (HIGH)   | R/W | 0.00 to 400.00                                                                      | 0.01 [Hz]  |
| 1432h          |                                                     | C046 (LOW)    | R/W |                                                                                     |            |
| 1433h to 1437h | Not used                                            | —             | —   |                                                                                     | —          |
| 1438h          | PID FB upper limit                                  | C052          | R/W | 0.0 to 100.0                                                                        | 0.1 [%]    |
| 1439h          | PID FB lower limit                                  | C053          | R/W | 0.0 to 100.0                                                                        | 0.1 [%]    |
| 143Ah          | Not used                                            | —             | —   |                                                                                     | —          |
| 143Bh          | Overtorque level (Forward power running)            | C055          | R/W | 0 to 200 (0.4 to 55 kW)<br>0 to 180 (75 to 132 kW)                                  | 1 [%]      |
| 143Ch          | Overtorque level (Reverse regeneration)             | C056          | R/W | 0 to 200 (0.4 to 55 kW)<br>0 to 180 (75 to 132 kW)                                  | 1 [%]      |
| 143Dh          | Overtorque level (Reverse power running)            | C057          | R/W | 0 to 200 (0.4 to 55 kW)<br>0 to 180 (75 to 132 kW)                                  | 1 [%]      |
| 143Eh          | Overtorque level (Forward regeneration)             | C058          | R/W | 0 to 200 (0.4 to 55 kW)<br>0 to 180 (75 to 132 kW)                                  | 1 [%]      |
| 143Fh          | Not used                                            | —             | —   |                                                                                     | —          |
| 1440h          | Not used                                            | —             | —   |                                                                                     | —          |
| 1441h          | Thermal warning level                               | C061          | R/W | 0 to 100                                                                            | 1 [%]      |
| 1442h          | Alarm code selection                                | C062          | R/W | 00: OFF (Disabled)<br>01: 3-bit<br>02: 4-bit                                        | —          |
| 1443h          | 0-Hz detection level                                | C063          | R/W | 0.00 to 100.00                                                                      | 0.01 [Hz]  |
| 1444h          | Fin overheat warning level                          | C064          | R/W | 0 to 200                                                                            | 1 [°C]     |
| 1445h to 144Ah | Not used                                            | —             | —   |                                                                                     | —          |
| 144Bh          | Communication speed selection (Baud rate selection) | C071          | R/W | 02: Loop-back test<br>03: 2400 bps<br>04: 4800 bps<br>05: 9600 bps<br>06: 19200 bps | —          |
| 144Ch          | Communication station No. selection                 | C072          | R/W | 1 to 247                                                                            | —          |
| 144Dh          | Communication bit length selection                  | C073          | R/W | 7: 7-bit<br>8: 8-bit                                                                | —          |
| 144Eh          | Communication parity selection                      | C074          | R/W | 00: No parity<br>01: Even<br>02: Odd                                                | —          |
| 144Fh          | Communication stop bit selection                    | C075          | R/W | 1: 1-bit<br>2: 2-bit                                                                | —          |

## 4-4 Communication Function

4

Functions

| Register No.   | Function name                      | Function code | R/W | Monitor and setting parameters                                                                                                                                                        | Resolution |
|----------------|------------------------------------|---------------|-----|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| 1450h          | Communication error selection      | C076          | R/W | 00: Trip<br>01: Decel-Trip (Trip after deceleration stop)<br>02: Ignore<br>03: Free-RUN (Free-run stop)<br>04: Decel-Stop (Deceleration stop)                                         | —          |
| 1451h          | Communication error timeout        | C077          | R/W | 0.00 to 99.99                                                                                                                                                                         | 0.01 [s]   |
| 1452h          | Communication wait time            | C078          | R/W | 0 to 1000                                                                                                                                                                             | 1 [ms]     |
| 1453h          | Communication method selection     | C079          | R/W | 00: ASCII<br>01: ModBus-RTU                                                                                                                                                           | —          |
| 1454h          | Not used                           | —             | —   |                                                                                                                                                                                       | —          |
| 1455h          | O adjustment                       | C081          | R/W | 0 to 65535                                                                                                                                                                            | 1          |
| 1456h          | OI adjustment                      | C082          | R/W | 0 to 65535                                                                                                                                                                            | 1          |
| 1457h          | O2 adjustment                      | C083          | R/W | 0 to 65535                                                                                                                                                                            | 1          |
| 1458h          | Not used                           | —             | —   |                                                                                                                                                                                       | —          |
| 1459h          | Thermistor adjustment              | C085          | R/W | 0.0 to 1000.0                                                                                                                                                                         | 0.1        |
| 145Ah to 145Eh | Not used                           | —             | —   |                                                                                                                                                                                       | —          |
| 145Fh          | Debug mode selection               | C091          | R/W | 00<br>*Do not change                                                                                                                                                                  | —          |
| 1460h to 1468h | Not used                           | —             | —   |                                                                                                                                                                                       | —          |
| 1469h          | UP/DWN selection                   | C101          | R/W | 00: Not save (Do not store the frequency data)<br>01: Save (Store the frequency data)                                                                                                 | —          |
| 146Ah          | Reset selection                    | C102          | R/W | 00: ON-RESET (Trip reset at power-on)<br>01: OFF-RESET (Trip reset at power-off)<br>02: On in Trip (Enabled only during trip (Reset at power-on))<br>03: Trip RESET (Trip reset only) | —          |
| 146Bh          | Reset frequency matching selection | C103          | R/W | 00: 0-Hz start<br>01: f-match (Frequency matching start)<br>02: Actv. f-match (Active Frequency Matching restart)                                                                     | —          |
| 146Ch          | Not used                           | —             | —   |                                                                                                                                                                                       | —          |
| 146Dh          | FM gain setting                    | C105          | R/W | 50 to 200                                                                                                                                                                             | 1 [%]      |
| 146Eh          | AM gain setting                    | C106          | R/W | 50 to 200                                                                                                                                                                             | 1 [%]      |
| 146Fh          | AMI gain setting                   | C107          | R/W | 50 to 200                                                                                                                                                                             | 1 [%]      |
| 1470h          | Not used                           | —             | —   |                                                                                                                                                                                       | —          |
| 1471h          | AM bias setting                    | C109          | R/W | 0 to 100                                                                                                                                                                              | 1 [%]      |
| 1472h          | AMI bias setting                   | C110          | R/W | 0 to 100                                                                                                                                                                              | 1 [%]      |
| 1473h          | Overload warning level 2           | C111          | R/W | 0.0 to 2.00 x Rated current (0.4 to 55 kW)<br>0.0 to 1.80 x Rated current (75 to 132 kW)                                                                                              | 0.1 [A]    |

| Register No.   | Function name                            | Function code | R/W | Monitor and setting parameters             | Resolution |
|----------------|------------------------------------------|---------------|-----|--------------------------------------------|------------|
| 1474h to 147Ch | Not used                                 | —             | —   |                                            | —          |
| 147Dh          | O zero adjustment                        | C121          | R/W | 0 to 65535                                 | 1          |
| 147Eh          | OI zero adjustment                       | C122          | R/W | 0 to 65535                                 | 1          |
| 147Fh          | O2 zero adjustment                       | C123          | R/W | 0 to 65535                                 | 1          |
| 1480h to 1485h | Not used                                 | —             | —   |                                            | —          |
| 1486h          | Output 11 ON delay                       | C130          | R/W | 0.0 to 100.0                               | 0.1 [s]    |
| 1487h          | Output 11 OFF delay                      | C131          | R/W |                                            | 0.1 [s]    |
| 1488h          | Output 12 ON delay                       | C132          | R/W |                                            | 0.1 [s]    |
| 1489h          | Output 12 OFF delay                      | C133          | R/W |                                            | 0.1 [s]    |
| 148Ah          | Output 13 ON delay                       | C134          | R/W |                                            | 0.1 [s]    |
| 148Bh          | Output 13 OFF delay                      | C135          | R/W |                                            | 0.1 [s]    |
| 148Ch          | Output 14 ON delay                       | C136          | R/W |                                            | 0.1 [s]    |
| 148Dh          | Output 14 OFF delay                      | C137          | R/W |                                            | 0.1 [s]    |
| 148Eh          | Output 15 ON delay                       | C138          | R/W |                                            | 0.1 [s]    |
| 148Fh          | Output 15 OFF delay                      | C139          | R/W |                                            | 0.1 [s]    |
| 1490h          | Relay output ON delay                    | C140          | R/W |                                            | 0.1 [s]    |
| 1491h          | Relay output OFF delay                   | C141          | R/W |                                            | 0.1 [s]    |
| 1492h          | Logic output signal 1 selection 1        | C142          | R/W | Same as C021 to C026 (except LOG1 to LOG6) | —          |
| 1493h          | Logic output signal 1 selection 2        | C143          | R/W | Same as C021 to C026 (except LOG1 to LOG6) | —          |
| 1494h          | Logic output signal 1 operator selection | C144          | R/W | 00: AND<br>01: OR<br>02: XOR               | —          |
| 1495h          | Logic output signal 2 selection 1        | C145          | R/W | Same as C021 to C026 (except LOG1 to LOG6) | —          |
| 1496h          | Logic output signal 2 selection 2        | C146          | R/W | Same as C021 to C026 (except LOG1 to LOG6) | —          |
| 1497h          | Logic output signal 2 operator selection | C147          | R/W | 00: AND<br>01: OR<br>02: XOR               | —          |
| 1498h          | Logic output signal 3 selection 1        | C148          | R/W | Same as C021 to C026 (except LOG1 to LOG6) | —          |
| 1499h          | Logic output signal 3 selection 2        | C149          | R/W | Same as C021 to C026 (except LOG1 to LOG6) | —          |
| 149Ah          | Logic output signal 3 operator selection | C150          | R/W | 00: AND<br>01: OR<br>02: XOR               | —          |
| 149Bh          | Logic output signal 4 selection 1        | C151          | R/W | Same as C021 to C026 (except LOG1 to LOG6) | —          |
| 149Ch          | Logic output signal 4 selection 2        | C152          | R/W | Same as C021 to C026 (except LOG1 to LOG6) | —          |

## 4-4 Communication Function

4

Functions

| Register No.   | Function name                                | Function code | R/W | Monitor and setting parameters                                                                                      | Resolution |
|----------------|----------------------------------------------|---------------|-----|---------------------------------------------------------------------------------------------------------------------|------------|
| 149Dh          | Logic output signal 4 operator selection     | C153          | R/W | 00: AND<br>01: OR<br>02: XOR                                                                                        | —          |
| 149Eh          | Logic output signal 5 selection 1            | C154          | R/W | Same as C021 to C026 (except LOG1 to LOG6)                                                                          | —          |
| 149Fh          | Logic output signal 5 selection 2            | C155          | R/W | Same as C021 to C026 (except LOG1 to LOG6)                                                                          | —          |
| 14A0h          | Logic output signal 5 operator selection     | C156          | R/W | 00: AND<br>01: OR<br>02: XOR                                                                                        | —          |
| 14A1h          | Logic output signal 6 selection 1            | C157          | R/W | Same as C021 to C026 (except LOG1 to LOG6)                                                                          | —          |
| 14A2h          | Logic output signal 6 selection 2            | C158          | R/W | Same as C021 to C026 (except LOG1 to LOG6)                                                                          | —          |
| 14A3h          | Logic output signal 6 operator selection     | C159          | R/W | 00: AND<br>01: OR<br>02: XOR                                                                                        | —          |
| 14A4h          | Input terminal response time 1               | C160          | R/W | 0 to 200 (× 2 ms)                                                                                                   | 1          |
| 14A5h          | Input terminal response time 2               | C161          | R/W | 0 to 200 (× 2 ms)                                                                                                   | 1          |
| 14A6h          | Input terminal response time 3               | C162          | R/W | 0 to 200 (× 2 ms)                                                                                                   | 1          |
| 14A7h          | Input terminal response time 4               | C163          | R/W | 0 to 200 (× 2 ms)                                                                                                   | 1          |
| 14A8h          | Input terminal response time 5               | C164          | R/W | 0 to 200 (× 2 ms)                                                                                                   | 1          |
| 14A9h          | Input terminal response time 6               | C165          | R/W | 0 to 200 (× 2 ms)                                                                                                   | 1          |
| 14AAh          | Input terminal response time 7               | C166          | R/W | 0 to 200 (× 2 ms)                                                                                                   | 1          |
| 14ABh          | Input terminal response time 8               | C167          | R/W | 0 to 200 (× 2 ms)                                                                                                   | 1          |
| 14ACh          | FW terminal response time                    | C168          | R/W | 0 to 200 (× 2 ms)                                                                                                   | 1          |
| 14ADh          | Multi-step speed/position determination time | C169          | R/W | 0 to 200 (× 2 ms)                                                                                                   | 1          |
| 14AEh to 1500h | Not used                                     | —             | —   |                                                                                                                     | —          |
| 1501h          | Auto-tuning selection                        | H001          | R/W | 00: OFF (Disabled)<br>01: ON (STOP)<br>02: ON (Rotation)                                                            | —          |
| 1502h          | Motor parameter selection                    | H002          | R/W | 00: Standard motor parameter<br>01: Auto-tuning parameter<br>02: Auto-tuning parameter (online auto-tuning enabled) | —          |
| 1503h          | Motor capacity selection                     | H003          | R/W | 0.20 to 160.0                                                                                                       | 0.1 [kW]   |
| 1504h          | Motor pole number selection                  | H004          | R/W | 2/4/6/8/10                                                                                                          | Pole       |



| Register No.   | Function name                         | Function code | R/W | Monitor and setting parameters | Resolution                |
|----------------|---------------------------------------|---------------|-----|--------------------------------|---------------------------|
| 1505h          | Speed response                        | H005 (HIGH)   | R/W | 0.001 to 80.000                | 0.001                     |
| 1506h          |                                       | H005 (LOW)    | R/W |                                |                           |
| 1507h          | Stabilization parameter               | H006          | R/W | 0 to 255                       | 1                         |
| 1508h to 1514h | Not used                              | —             | —   |                                | —                         |
| 1515h          | Motor parameter R1                    | H020 (HIGH)   | R/W | 0.001 to 65.535                | 0.001 [ $\Omega$ ]        |
| 1516h          |                                       | H020 (LOW)    | R/W |                                |                           |
| 1517h          | Motor parameter R2                    | H021 (HIGH)   | R/W | 0.001 to 65.535                | 0.001 [ $\Omega$ ]        |
| 1518h          |                                       | H021 (LOW)    | R/W |                                |                           |
| 1519h          | Motor parameter L                     | H022 (HIGH)   | R/W | 0.01 to 655.35                 | 0.01 [mH]                 |
| 151Ah          |                                       | H022 (LOW)    | R/W |                                |                           |
| 151Bh          | Motor parameter IO                    | H023 (HIGH)   | R/W | 0.01 to 655.35                 | 0.01 [A]                  |
| 151Ch          |                                       | H023 (LOW)    | R/W |                                |                           |
| 151Dh          | Motor parameter J                     | H024 (HIGH)   | R/W | 0.001 to 9999.000              | 0.001 [kgm <sup>2</sup> ] |
| 151Eh          |                                       | H024 (LOW)    | R/W |                                |                           |
| 151Fh to 1523h | Not used                              | —             | —   |                                | —                         |
| 1524h          | Motor parameter R1 (auto-tuning data) | H030 (HIGH)   | R/W | 0.001 to 65.535                | 0.001 [ $\Omega$ ]        |
| 1525h          |                                       | H030 (LOW)    | R/W |                                |                           |
| 1526h          | Motor parameter R2 (auto-tuning data) | H031 (HIGH)   | R/W | 0.001 to 65.535                | 0.001 [ $\Omega$ ]        |
| 1527h          |                                       | H031 (LOW)    | R/W |                                |                           |
| 1528h          | Motor parameter L (auto-tuning data)  | H032 (HIGH)   | R/W | 0.01 to 655.35                 | 0.01 [mH]                 |
| 1529h          |                                       | H032 (LOW)    | R/W |                                |                           |
| 152Ah          | Motor parameter IO (auto-tuning data) | H033 (HIGH)   | R/W | 0.01 to 655.35                 | 0.01 [A]                  |
| 152Bh          |                                       | H033 (LOW)    | R/W |                                |                           |

## 4-4 Communication Function

| Register No.   | Function name                         | Function code | R/W | Monitor and setting parameters                                                                                                                                                        | Resolution                |
|----------------|---------------------------------------|---------------|-----|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|
| 152Ch          | Motor parameter J (auto-tuning data)  | H034 (HIGH)   | R/W | 0.001 to 9999.000                                                                                                                                                                     | 0.001 [kgm <sup>2</sup> ] |
| 152Dh          |                                       | H034 (LOW)    | R/W |                                                                                                                                                                                       |                           |
| 152Eh to 153Ch | Not used                              | —             | —   |                                                                                                                                                                                       | —                         |
| 153Dh          | PI proportional gain                  | H050          | R/W | 0.0 to 1000.0                                                                                                                                                                         | 0.1 [%]                   |
| 153Eh          | PI integral gain                      | H051          | R/W | 0.0 to 1000.0                                                                                                                                                                         | 0.1 [%]                   |
| 153Fh          | P proportional gain                   | H052          | R/W | 0.01 to 10.00                                                                                                                                                                         | 0.01                      |
| 1540h to 1546h | Not used                              | —             | —   |                                                                                                                                                                                       | —                         |
| 1547h          | Limit at 0 Hz                         | H060          | R/W | 0.0 to 100.0                                                                                                                                                                          | 0.1 [%]                   |
| 1548h          | Boost amount at SLV startup, 0 Hz     | H061          | R/W | 0 to 50                                                                                                                                                                               | 1 [%]                     |
| 1549h to 1550h | Not used                              | —             | —   |                                                                                                                                                                                       | —                         |
| 1551h          | For PI proportional gain switching    | H070          | R/W | 0.0 to 1000.0                                                                                                                                                                         | 0.1 [%]                   |
| 1552h          | For PI integral gain switching        | H071          | R/W | 0.0 to 1000.0                                                                                                                                                                         | 0.1 [%]                   |
| 1553h          | For P proportional gain switching     | H072          | R/W | 0.00 to 10.00                                                                                                                                                                         | 0.01                      |
| 1554h          | Gain switching time                   | H073          | R/W | 0 to 9999                                                                                                                                                                             | 1 [ms]                    |
| 1555h to 1600h | Not used                              | —             | —   |                                                                                                                                                                                       | —                         |
| 1601h          | Operation selection at option 1 error | P001          | R/W | 00: Trip<br>01: RUN (Continues operation)                                                                                                                                             | —                         |
| 1602h          | Operation selection at option 2 error | P002          | R/W | 00: Trip<br>01: RUN (Continues operation)                                                                                                                                             | —                         |
| 1603h to 160Ah | Not used                              | —             | —   |                                                                                                                                                                                       | —                         |
| 160Bh          | Encoder pulses                        | P011          | R/W | 128 to 65535                                                                                                                                                                          | 1                         |
| 160Ch          | V2 control mode selection             | P012          | R/W | 00: ASR (speed control mode)<br>01: APR (pulse train position control mode)<br>02: APR2 (absolute position control mode)<br>03: HAPR (High resolution absolute position control mode) | —                         |
| 160Dh          | Pulse train mode selection            | P013          | R/W | 00: Mode 1<br>01: Mode 2<br>02: Mode 3                                                                                                                                                | —                         |
| 160Eh          | Orientation stop position             | P014          | R/W | 0 to 4095                                                                                                                                                                             | 1                         |

| Register No. | Function name                                              | Function code | R/W | Monitor and setting parameters                                                                                                   | Resolution |
|--------------|------------------------------------------------------------|---------------|-----|----------------------------------------------------------------------------------------------------------------------------------|------------|
| 160Fh        | Orientation speed setting                                  | P015          | R/W | Starting frequency to Max. frequency (upper limit: 120.0)                                                                        | 0.01 [Hz]  |
| 1610h        | Orientation direction setting                              | P016          | R/W | 00: FWD (Forward side)<br>01: REV (Reverse side)                                                                                 | —          |
| 1611h        | Position ready range setting                               | P017          | R/W | 0 to 10000                                                                                                                       | 1          |
| 1612h        | Position ready delay time setting                          | P018          | R/W | 0.00 to 9.99                                                                                                                     | 0.01 [s]   |
| 1613h        | Electronic gear setting position selection                 | P019          | R/W | 00: FB (Position feedback side)<br>01: REF (Position command side)                                                               | —          |
| 1614h        | Electronic gear ratio numerator                            | P020          | R/W | 1 to 9999                                                                                                                        | —          |
| 1615h        | Electronic gear ratio denominator                          | P021          | R/W | 1 to 9999                                                                                                                        | —          |
| 1616h        | Position control feedforward gain                          | P022          | R/W | 0.00 to 655.35                                                                                                                   | 0.01       |
| 1617h        | Position loop gain                                         | P023          | R/W | 0.00 to 100.00                                                                                                                   | 0.01       |
| 1618h        | Position bias amount                                       | P024          | R/W | -2048 to 2048                                                                                                                    | —          |
| 1619h        | Secondary resistance compensation enable/disable selection | P025          | R/W | 00: OFF (Disabled)<br>01: ON (Enabled)                                                                                           | —          |
| 161Ah        | Overspeed error detection level                            | P026          | R/W | 0.0 to 150.0                                                                                                                     | 0.1 [%]    |
| 161Bh        | Speed deviation error detection level                      | P027          | R/W | 0.00 to 120.00                                                                                                                   | 0.01 [Hz]  |
| 161Ch        | Motor gear ratio numerator                                 | P028          | R/W | 1 to 9999                                                                                                                        | 1          |
| 161Dh        | Motor gear ratio denominator                               | P029          | R/W | 1 to 9999                                                                                                                        | 1          |
| 161Eh        | Not used                                                   | —             | —   |                                                                                                                                  | —          |
| 161Fh        | Acceleration/deceleration time input type                  | P031          | R/W | 00: OPE (Digital Operator)<br>01: Option 1<br>02: Option 2<br>03: EzSQ (Drive Programming)                                       | —          |
| 1620h        | Orientation stop position input type                       | P032          | R/W | 00: OPE (Digital Operator)<br>01: Option 1<br>02: Option 2                                                                       | —          |
| 1621h        | Torque reference input selection                           | P033          | R/W | 00: O (Terminal O)<br>01: OI (Terminal OI)<br>02: O2 (Terminal O2)<br>03: OPE (Digital Operator)<br>06: Option 1<br>07: Option 2 | —          |
| 1622h        | Torque reference setting                                   | P034          | R/W | 0 to 200 (0.4 to 55 kW)<br>0 to 180 (75 to 132 kW)                                                                               | 1 [%]      |
| 1623h        | Polarity selection at torque reference via O2              | P035          | R/W | 00: Sign (Signed)<br>01: Direction (Depends on the RUN direction)                                                                | —          |

| Register No.   | Function name                                 | Function code | R/W | Monitor and setting parameters                                                                                                                                                                                                                                                  | Resolution |
|----------------|-----------------------------------------------|---------------|-----|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| 1624h          | Torque bias mode                              | P036          | R/W | 00: OFF (None)<br>01: OPE (Digital Operator)<br>02: O2 (Terminal O2)<br>05: Option 1<br>06: Option 2                                                                                                                                                                            | —          |
| 1625h          | Torque bias value                             | P037          | R/W | -200 to 200 (0.4 to 55 kW)<br>-180 to 180 (75 to 132 kW)                                                                                                                                                                                                                        | 1 [%]      |
| 1626h          | Torque bias polarity selection                | P038          | R/W | 00: Sign (Signed)<br>01: Direction (Depends on the RUN direction)                                                                                                                                                                                                               | —          |
| 1627h          | Speed limit value in torque control (forward) | P039 (HIGH)   | R/W | 0.00 to Maximum frequency                                                                                                                                                                                                                                                       | 0.01 [Hz]  |
| 1628h          |                                               | P039 (LOW)    | R/W |                                                                                                                                                                                                                                                                                 |            |
| 1629h          | Speed limit value in torque control (reverse) | P040 (HIGH)   | R/W | 0.00 to 1st Max. frequency                                                                                                                                                                                                                                                      | 0.01 [Hz]  |
| 162Ah          |                                               | P040 (LOW)    | R/W |                                                                                                                                                                                                                                                                                 |            |
| 162Bh          | Not used                                      | —             | —   |                                                                                                                                                                                                                                                                                 | —          |
| 162Ch          | Not used                                      | —             | —   |                                                                                                                                                                                                                                                                                 | —          |
| 162Dh          | Not used                                      | —             | —   |                                                                                                                                                                                                                                                                                 | —          |
| 162Eh          | DeviceNet comm Watch dog timer                | P044          | R/W | 0.00 to 99.99                                                                                                                                                                                                                                                                   | [s]        |
| 162Fh          | Operation setting at communications error     | P045          | R/W | 00: Trip<br>01: Decel-Trip (Trip after deceleration stop)<br>02: Ignore<br>03: Free RUN<br>04: Decel-Stop (Deceleration stop)                                                                                                                                                   | —          |
| 1630h          | Instance Number                               | P046          | R/W | 0: Basic speed I/O<br>1: Extended speed I/O<br>2: Extended speed and Torque control<br>3: Special I/O<br>4: Extended control I/O<br>5: Extended control I/O and multifunction I/O monitor<br>6: Flexible format<br>7: Extended speed and Acceleration control<br>8-20: Not used | —          |
| 1632h          | Operation setting at idle mode detection      | P048          | R/W | 00: Trip<br>01: Decel-Trip (Trip after deceleration stop)<br>02: Ignore<br>03: Free RUN<br>04: Decel-Stop (Deceleration stop)                                                                                                                                                   | —          |
| 1633h          | Polarity setting for rotation speed           | P049          | R/W | 0/2/4/6/8/10/12/14/16/18/20/22/24/26/28/30/32/34/36/38                                                                                                                                                                                                                          | —          |
| 1634h to 1638h | Not used                                      | —             | —   |                                                                                                                                                                                                                                                                                 | —          |
| 1639h          | Pulse train frequency scale                   | P055          | R/W | 1.0 to 50.0<br>* Input frequency at maximum frequency                                                                                                                                                                                                                           | 0.1 [kHz]  |

| Register No. | Function name                              | Function code | R/W | Monitor and setting parameters                                                                                        | Resolution |
|--------------|--------------------------------------------|---------------|-----|-----------------------------------------------------------------------------------------------------------------------|------------|
| 163Ah        | Pulse train frequency filter time constant | P056          | R/W | 0.01 to 2.00                                                                                                          | 0.01 [s]   |
| 163Bh        | Pulse train frequency bias amount          | P057          | R/W | -100 to 100                                                                                                           | 1 [%]      |
| 163Ch        | Pulse train frequency limit                | P058          | R/W | 0 to 100                                                                                                              | 1 [%]      |
| 163Dh        | Not used                                   | —             | —   |                                                                                                                       | —          |
| 163Eh        | Multi-step position command 0              | P060 (HIGH)   | R/W | Position range specification (reverse side) to Position range specification (forward side)<br>-268435455 to 268435455 | 1          |
| 163Fh        |                                            | P060 (LOW)    | R/W |                                                                                                                       |            |
| 1640h        | Multi-step position command 1              | P061 (HIGH)   | R/W | Position range specification (reverse side) to Position range specification (forward side)<br>-268435455 to 268435455 | 1          |
| 1641h        |                                            | P061 (LOW)    | R/W |                                                                                                                       |            |
| 1642h        | Multi-step position command 2              | P062 (HIGH)   | R/W | Position range specification (reverse side) to Position range specification (forward side)<br>-268435455 to 268435455 | 1          |
| 1643h        |                                            | P062 (LOW)    | R/W |                                                                                                                       |            |
| 1644h        | Multi-step position command 3              | P063 (HIGH)   | R/W | Position range specification (reverse side) to Position range specification (forward side)<br>-268435455 to 268435455 | 1          |
| 1645h        |                                            | P063 (LOW)    | R/W |                                                                                                                       |            |
| 1646h        | Multi-step position command 4              | P064 (HIGH)   | R/W | Position range specification (reverse side) to Position range specification (forward side)<br>-268435455 to 268435455 | 1          |
| 1647h        |                                            | P064 (LOW)    | R/W |                                                                                                                       |            |
| 1648h        | Multi-step position command 5              | P065 (HIGH)   | R/W | Position range specification (reverse side) to Position range specification (forward side)<br>-268435455 to 268435455 | 1          |
| 1649h        |                                            | P065 (LOW)    | R/W |                                                                                                                       |            |
| 164Ah        | Multi-step position command 6              | P066 (HIGH)   | R/W | Position range specification (reverse side) to Position range specification (forward side)<br>-268435455 to 268435455 | 1          |
| 164Bh        |                                            | P066 (LOW)    | R/W |                                                                                                                       |            |
| 164Ch        | Multi-step position command 7              | P067 (HIGH)   | R/W | Position range specification (reverse side) to Position range specification (forward side)<br>-268435455 to 268435455 | 1          |
| 164Dh        |                                            | P067 (LOW)    | R/W |                                                                                                                       |            |
| 164Eh        | Zero return mode                           | P068          | R/W | 00: Low speed<br>01: High speed 1<br>02: High speed 2                                                                 | —          |
| 164Fh        | Zero return direction selection            | P069          | R/W | 00: FWD (Forward side)<br>01: REV (Reverse side)                                                                      | —          |
| 1650h        | Low-speed zero return frequency            | P070          | R/W | 0.00 to 10.00                                                                                                         | 0.01 [Hz]  |
| 1651h        | High-speed zero return frequency           | P071          | R/W | 0.00 to Maximum frequency                                                                                             | 0.01 [Hz]  |

| Register No.   | Function name                          | Function code | R/W | Monitor and setting parameters                                                                                                                                                                                                                                                                                                                                                                               | Resolution |
|----------------|----------------------------------------|---------------|-----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| 1652h          | Position range specification (forward) | P072 (HIGH)   | R/W | 0 to 268435455 (at P012 = 02)/<br>0 to 1073741823 (at P012 = 03)                                                                                                                                                                                                                                                                                                                                             | 1          |
| 1653h          |                                        | P072 (LOW)    | R/W |                                                                                                                                                                                                                                                                                                                                                                                                              |            |
| 1654h          | Position range specification (reverse) | P073 (HIGH)   | R/W | -268435455 to 0 (at P012 = 02)/<br>-1073741823 to 0 (at P012 = 03)                                                                                                                                                                                                                                                                                                                                           | 1          |
| 1655h          |                                        | P073 (LOW)    | R/W |                                                                                                                                                                                                                                                                                                                                                                                                              |            |
| 1656h          | Teaching selection                     | P074          | R/W | 00: X00 (Multi-step position command 0 (P060))<br>01: X01 (Multi-step position command 0 (P061))<br>02: X02 (Multi-step position command 0 (P062))<br>03: X03 (Multi-step position command 0 (P063))<br>04: X04 (Multi-step position command 0 (P064))<br>05: X05 (Multi-step position command 0 (P065))<br>06: X06 (Multi-step position command 0 (P066))<br>07: X07 (Multi-step position command 0 (P067)) | —          |
| 1656h to 1665h | Not used                               | —             | —   |                                                                                                                                                                                                                                                                                                                                                                                                              | —          |
| 1666h to 1685h | Drive Program parameter U(00) to U(31) | P100 to P131  | R/W | 0 to 65535                                                                                                                                                                                                                                                                                                                                                                                                   | 1          |
| 1686h to 16A1h | Not used                               | —             | —   |                                                                                                                                                                                                                                                                                                                                                                                                              | —          |
| 16A2h to 16ABh | Option I/F cmd W register 1 to 10      | P160 to P169  | R/W | 0000 to FFFF                                                                                                                                                                                                                                                                                                                                                                                                 | —          |
| 16ACh to 16B5h | Option I/F cmd R register 1 to 10      | P170 to P179  | R/W | 0000 to FFFF                                                                                                                                                                                                                                                                                                                                                                                                 | —          |
| 16B6h          | Profibus node address                  | P180          | R/W | 0 to 125                                                                                                                                                                                                                                                                                                                                                                                                     | —          |
| 16B7h          | Profibus clear mode                    | P181          | R/W | 00: Clear<br>01: Last value                                                                                                                                                                                                                                                                                                                                                                                  | —          |
| 16B8h          | Profibus Map selection                 | P182          | R/W | 00: PPO<br>01: Conventional<br>02: Flexible mode                                                                                                                                                                                                                                                                                                                                                             | —          |
| 16BBh          | CANOpen Node address                   | P185          | R/W | 0 to 127                                                                                                                                                                                                                                                                                                                                                                                                     | —          |

| Register No. | Function name               | Function code | R/W | Monitor and setting parameters                                                                                              | Resolution |
|--------------|-----------------------------|---------------|-----|-----------------------------------------------------------------------------------------------------------------------------|------------|
| 16BCh        | CANOpen communication speed | P186          | R/W | 00: Auto<br>01: 10Kbps<br>02: 20Kbps<br>03: 50Kbps<br>04: 125Kbps<br>05: 250Kbps<br>06: 500Kbps<br>07: 800Kbps<br>08: 1Mbps | —          |
| 16C0h        | CompoNet node address       | P190          | R/W | 0 to 63                                                                                                                     | —          |
| 16C2h        | DeviceNet node address      | P192          | R/W | 0 to 63                                                                                                                     | —          |
| 16C5h        | ML2 frame length            | P195          | R/W | 00: 32 bytes<br>01: 17 bytes                                                                                                | —          |
| 16C6h        | ML2 node address            | P196          | R/W | 21 to 3E                                                                                                                    | —          |

\* Data on H003 (Motor capacity selection) is the following code data.

| Code data           | 00  | 01  | 02  | 03  | 04   | 05 | 06  | 07  | 08 | 09  | 10 |
|---------------------|-----|-----|-----|-----|------|----|-----|-----|----|-----|----|
| Motor capacity (kW) | 0.2 | —   | 0.4 | —   | 0.75 | —  | 1.5 | 2.2 | —  | 3.7 | —  |
| Code data           | 11  | 12  | 13  | 14  | 15   | 16 | 17  | 18  | 19 | 20  | 21 |
| Motor capacity (kW) | 5.5 | 7.5 | 11  | 15  | 18.5 | 22 | 30  | 37  | 45 | 55  | 75 |
| Code data           | 22  | 23  | 24  | 25  | 26   |    |     |     |    |     |    |
| Motor capacity (kW) | 90  | 110 | 132 | 150 | 160  |    |     |     |    |     |    |

<Holding Register Number List (2nd Setting)>

| Register No.   | Function name           | Function code | R/W | Monitor and setting parameters | Resolution |
|----------------|-------------------------|---------------|-----|--------------------------------|------------|
| 2103h          | 2nd acceleration time 1 | F202 (HIGH)   | R/W | 0.01 to 3600.00                | 0.01 [s]   |
| 2104h          |                         | F202 (LOW)    | R/W |                                |            |
| 2105h          | 2nd deceleration time 1 | F203 (HIGH)   | R/W | 0.01 to 3600.00                | 0.01 [s]   |
| 2106h          |                         | F203 (LOW)    | R/W |                                |            |
| 2107h to 2202h | Not used                | —             | —   |                                | —          |

<Holding Register Number List (Function Mode 2nd Setting)>

| Register No.   | Function name          | Function code | R/W | Monitor and setting parameters | Resolution |
|----------------|------------------------|---------------|-----|--------------------------------|------------|
| 2203h          | 2nd set base frequency | A203          | R/W | 30 to 2nd Max. frequency       | 1 [Hz]     |
| 2204h          | 2nd maximum frequency  | A204          | R/W | 30 to 400                      | 1 [Hz]     |
| 2205h to 2215h | Not used               | —             | —   |                                | —          |

| Register No.   | Function name                                        | Function code | R/W | Monitor and setting parameters                                                                                                                                                                                                                      | Resolution |
|----------------|------------------------------------------------------|---------------|-----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| 2216h          | 2nd multi-step speed reference 0                     | A220 (HIGH)   | R/W | 0.00 to 2nd Max. frequency                                                                                                                                                                                                                          | 0.01 [Hz]  |
| 2217h          |                                                      | A220 (LOW)    | R/W |                                                                                                                                                                                                                                                     |            |
| 2218h to 223Ah | Not used                                             | —             | —   |                                                                                                                                                                                                                                                     | —          |
| 223Bh          | 2nd torque boost selection                           | A241          | R/W | 00: Manual torque boost<br>01: Automatic torque boost                                                                                                                                                                                               | —          |
| 223Ch          | 2nd manual torque boost voltage                      | A242          | R/W | 0.0 to 20.0                                                                                                                                                                                                                                         | 0.1 [%]    |
| 223Dh          | 2nd manual torque boost frequency                    | A243          | R/W | 0.0 to 50.0                                                                                                                                                                                                                                         | 0.1 [%]    |
| 223Eh          | 2nd V/f characteristics selection                    | A244          | R/W | 00: VC (Constant torque characteristics)<br>01: VP (Special reduced torque characteristics)<br>02: Free V/f (characteristics)<br>03: SLV (Sensorless vector control)<br>04: OSLV (0-Hz sensorless vector control)<br>05: V2 (Sensor vector control) | —          |
| 223Fh          | Not used                                             | —             | —   |                                                                                                                                                                                                                                                     | —          |
| 2240h          | 2nd automatic torque boost voltage compensation gain | A246          | R/W | 0 to 255                                                                                                                                                                                                                                            | 1          |
| 2241h          | *2nd automatic torque boost slip compensation gain   | A247          | R/W | 0 to 255                                                                                                                                                                                                                                            | 1          |
| 2242h to 224Eh | Not used                                             | —             | —   |                                                                                                                                                                                                                                                     | —          |
| 224Fh          | 2nd frequency upper limit                            | A261 (HIGH)   | R/W | 0.00/2nd frequency lower limit to 2nd Max. frequency                                                                                                                                                                                                | 0.01 [Hz]  |
| 2250h          |                                                      | A261 (LOW)    | R/W |                                                                                                                                                                                                                                                     |            |
| 2251h          | 2nd frequency lower limit                            | A262 (HIGH)   | R/W | 0.00/Starting frequency to 2nd frequency upper limit                                                                                                                                                                                                | 0.01 [Hz]  |
| 2252h          |                                                      | A262 (LOW)    | R/W |                                                                                                                                                                                                                                                     |            |
| 2253h to 226Eh | Not used                                             | —             | —   |                                                                                                                                                                                                                                                     | —          |
| 226Fh          | 2nd acceleration time 2                              | A292 (HIGH)   | R/W | 0.01 to 3600.00                                                                                                                                                                                                                                     | 0.01 [s]   |
| 2270h          |                                                      | A292 (LOW)    | R/W |                                                                                                                                                                                                                                                     |            |
| 2271h          | 2nd deceleration time 2                              | A293 (HIGH)   | R/W | 0.01 to 3600.00                                                                                                                                                                                                                                     | 0.01 [s]   |
| 2272h          |                                                      | A293 (LOW)    | R/W |                                                                                                                                                                                                                                                     |            |



| Register No.         | Function name                                       | Function code  | R/W | Monitor and setting parameters                                                                                                                                   | Resolution         |
|----------------------|-----------------------------------------------------|----------------|-----|------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|
| 2273h                | 2nd 2-step acceleration/<br>deceleration selection  | A294           | R/W | 00: 2CH-Terminal (Switched via<br>multifunction input 09)<br>01: Preset FQ (Switched by setting)<br>02: FWD-REV (Enabled only when<br>switching forward/reverse) | —                  |
| 2274h                | 2nd 2-step acceleration<br>frequency                | A295<br>(HIGH) | R/W | 0.00 to 400.00                                                                                                                                                   | 0.01 [Hz]          |
| 2275h                |                                                     | A295<br>(LOW)  | R/W |                                                                                                                                                                  |                    |
| 2276h                | 2nd 2-step deceleration<br>frequency                | A296<br>(HIGH) | R/W | 0.00 to 400.00                                                                                                                                                   | 0.01 [Hz]          |
| 2277h                |                                                     | A296<br>(LOW)  | R/W |                                                                                                                                                                  |                    |
| 2278h<br>to<br>230Bh | Not used                                            | —              | —   |                                                                                                                                                                  | —                  |
| 230Ch                | 2nd electronic thermal<br>level                     | b212           | R/W | 0.20 x Rated current to 1.00 x Rated<br>current                                                                                                                  | 0.1 [A]            |
| 230Dh                | 2nd electronic thermal<br>characteristics selection | b213           | R/W | 00: Reduced TRQ (Reduced torque<br>characteristics)<br>01: Const TRQ (Constant torque<br>characteristics)<br>02: Free set (Free setting)                         | —                  |
| 230Eh<br>to<br>2501h | Not used                                            | —              | —   |                                                                                                                                                                  | —                  |
| 2502h                | 2nd motor parameter<br>selection                    | H202           | R/W | 00: Standard motor parameter<br>01: Auto-tuning parameter<br>02: Auto-tuning parameter<br>(online auto-tuning enabled)                                           | —                  |
| 2503h                | 2nd motor capacity<br>selection                     | H203           | R/W | 0.20 to 160.0                                                                                                                                                    | 0.01 [kW]          |
| 2504h                | 2nd motor pole number<br>selection                  | H204           | R/W | 2/4/6/8/10                                                                                                                                                       | Pole               |
| 2505h                | 2nd speed response                                  | H205<br>(HIGH) | R/W | 0.001 to 80.000                                                                                                                                                  | 0.001              |
| 2506h                |                                                     | H205<br>(LOW)  | R/W |                                                                                                                                                                  |                    |
| 2507h                | 2nd stabilization<br>parameter                      | H206           | R/W | 0 to 255                                                                                                                                                         | 1                  |
| 2508h<br>to<br>2514h | Not used                                            | —              | —   |                                                                                                                                                                  | —                  |
| 2515h                | 2nd motor parameter R1                              | H220<br>(HIGH) | R/W | 0.001 to 65.535                                                                                                                                                  | 0.001 [ $\Omega$ ] |
| 2516h                |                                                     | H220<br>(LOW)  | R/W |                                                                                                                                                                  |                    |
| 2517h                | 2nd motor parameter R2                              | H221<br>(HIGH) | R/W | 0.001 to 65.535                                                                                                                                                  | 0.001 [ $\Omega$ ] |
| 2518h                |                                                     | H221<br>(LOW)  | R/W |                                                                                                                                                                  |                    |

## 4-4 Communication Function

4

Functions

| Register No.   | Function name                             | Function code | R/W | Monitor and setting parameters | Resolution                |
|----------------|-------------------------------------------|---------------|-----|--------------------------------|---------------------------|
| 2519h          | 2nd motor parameter L                     | H222 (HIGH)   | R/W | 0.01 to 655.35                 | 0.01 [mH]                 |
| 251Ah          |                                           | H222 (LOW)    | R/W |                                |                           |
| 251Bh          | 2nd motor parameter IO                    | H223 (HIGH)   | R/W | 0.01 to 655.35                 | 0.01 [A]                  |
| 251Ch          |                                           | H223 (LOW)    | R/W |                                |                           |
| 251Dh          | 2nd motor parameter J                     | H224 (HIGH)   | R/W | 0.001 to 9999.000              | 0.001 [kgm <sup>2</sup> ] |
| 251Eh          |                                           | H224 (LOW)    | R/W |                                |                           |
| 251Fh to 2523h | Not used                                  | —             | —   |                                | —                         |
| 2524h          | 2nd motor parameter R1 (auto-tuning data) | H230 (HIGH)   | R/W | 0.001 to 65.535                | 0.001 [Ω]                 |
| 2525h          |                                           | H230 (LOW)    | R/W |                                |                           |
| 2526h          | 2nd motor parameter R2 (auto-tuning data) | H231 (HIGH)   | R/W | 0.001 to 65.535                | 0.001 [Ω]                 |
| 2527h          |                                           | H231 (LOW)    | R/W |                                |                           |
| 2528h          | 2nd motor parameter L (auto-tuning data)  | H232 (HIGH)   | R/W | 0.01 to 655.35                 | 0.01 [mH]                 |
| 2529h          |                                           | H232 (LOW)    | R/W |                                |                           |
| 252Ah          | 2nd motor parameter IO (auto-tuning data) | H233 (HIGH)   | R/W | 0.01 to 655.35                 | 0.01 [A]                  |
| 252Bh          |                                           | H233 (LOW)    | R/W |                                |                           |
| 252Ch          | 2nd motor parameter J (auto-tuning data)  | H234 (HIGH)   | R/W | 0.001 to 9999.000              | 0.001 [kgm <sup>2</sup> ] |
| 252Dh          |                                           | H234 (LOW)    | R/W |                                |                           |
| 252Eh to 253Ch | Not used                                  | —             | —   |                                | —                         |
| 253Dh          | 2nd PI proportional gain                  | H250          | R/W | 0.0 to 1000.0                  | 0.1 [%]                   |
| 253Eh          | 2nd PI integral gain                      | H251          | R/W | 0.0 to 1000.0                  | 0.1 [%]                   |
| 253Fh          | 2nd P proportional gain                   | H252          | R/W | 0.01 to 10.00                  | 0.01                      |
| 2540h to 2546h | Not used                                  | —             | —   |                                | —                         |
| 2547h          | 2nd limit at 0 Hz                         | H260          | R/W | 0.0 to 100.0                   | 0.1 [%]                   |
| 2548h          | 2nd boost amount at SLV startup, 0 Hz     | H261          | R/W | 0 to 50                        | 1 [%]                     |

| Register No.   | Function name | Function code | R/W | Monitor and setting parameters | Resolution |
|----------------|---------------|---------------|-----|--------------------------------|------------|
| 2549h to 3102h | Not used      | —             | —   |                                | —          |

\* Data on H203 (2nd motor capacity selection) is the following code data.

| Code data           | 00  | 01  | 02  | 03  | 04   | 05 | 06  | 07  | 08 | 09  | 10 |
|---------------------|-----|-----|-----|-----|------|----|-----|-----|----|-----|----|
| Motor capacity (kW) | 0.2 | —   | 0.4 | —   | 0.75 | —  | 1.5 | 2.2 | —  | 3.7 | —  |
| Code data           | 11  | 12  | 13  | 14  | 15   | 16 | 17  | 18  | 19 | 20  | 21 |
| Motor capacity (kW) | 5.5 | 7.5 | 11  | 15  | 18.5 | 22 | 30  | 37  | 45 | 55  | 75 |
| Code data           | 22  | 23  | 24  | 25  | 26   |    |     |     |    |     |    |
| Motor capacity (kW) | 90  | 110 | 132 | 150 | 160  |    |     |     |    |     |    |

<Holding Register Number List (3rd Setting)>

| Register No.   | Function name           | Function code | R/W | Monitor and setting parameters | Resolution |
|----------------|-------------------------|---------------|-----|--------------------------------|------------|
| 3103h          | 3rd acceleration time 1 | F302 (HIGH)   | R/W | 0.01 to 3600.00                | 0.01 [s]   |
| 3104h          |                         | F302 (LOW)    | R/W |                                |            |
| 3105h          | 3rd deceleration time 1 | F303 (HIGH)   | R/W | 0.01 to 3600.00                | 0.01 [s]   |
| 3106h          |                         | F303 (LOW)    | R/W |                                |            |
| 3107h to 3202h | Not used                | —             | —   |                                | —          |

<Holding Register Number List (Function Mode 3rd Setting)>

| Register No.   | Function name                     | Function code | R/W | Monitor and setting parameters                                                              | Resolution |
|----------------|-----------------------------------|---------------|-----|---------------------------------------------------------------------------------------------|------------|
| 3203h          | 3rd set base frequency            | A303          | R/W | 30 to 3rd Max. frequency                                                                    | 1 [Hz]     |
| 3204h          | 3rd maximum frequency             | A304          | R/W | 30 to 400                                                                                   | 1 [Hz]     |
| 3205h to 3215h | Not used                          | —             | —   |                                                                                             | —          |
| 3216h          | 3rd multi-step speed reference 0  | A320 (HIGH)   | R/W | 0.00 to 3rd Max. frequency                                                                  | 0.01 [Hz]  |
| 3217h          |                                   | A320 (LOW)    | R/W |                                                                                             |            |
| 3218h to 323Bh | Not used                          | —             | —   |                                                                                             | —          |
| 323Ch          | 3rd manual torque boost voltage   | A342          | R/W | 0.0 to 20.0                                                                                 | 0.1 [%]    |
| 323Dh          | 3rd manual torque boost frequency | A343          | R/W | 0.0 to 50.0                                                                                 | 0.1 [%]    |
| 323Eh          | 3rd V/f characteristics selection | A344          | R/W | 00: VC (Constant torque characteristics)<br>01: VP (Special reduced torque characteristics) | —          |

## 4-4 Communication Function

| Register No.   | Function name                                    | Function code | R/W | Monitor and setting parameters                                                                                                     | Resolution |
|----------------|--------------------------------------------------|---------------|-----|------------------------------------------------------------------------------------------------------------------------------------|------------|
| 323Fh to 326Ch | Not used                                         | —             | —   |                                                                                                                                    | —          |
| 326Dh          | 3rd acceleration time 2                          | A392 (HIGH)   | R/W | 0.01 to 3600.00                                                                                                                    | 0.01 [s]   |
| 326Eh          |                                                  | A392 (LOW)    | R/W |                                                                                                                                    |            |
| 326Fh          | 3rd deceleration time 2                          | A393 (HIGH)   | R/W | 0.01 to 3600.00                                                                                                                    | 0.01 [s]   |
| 3270h          |                                                  | A393 (LOW)    | R/W |                                                                                                                                    |            |
| 3271h to 330B  | Not used                                         | —             | —   |                                                                                                                                    | —          |
| 330Ch          | 3rd electronic thermal level                     | b312          | R/W | 0.20 x Rated current to 1.00 x Rated current                                                                                       | 0.1 [A]    |
| 330Dh          | 3rd electronic thermal characteristics selection | b313          | R/W | 00: Reduced TRQ (Reduced torque characteristics)<br>01: Const TRQ (Constant torque characteristics)<br>02: Free set (Free setting) | —          |
| 330Eh to 3506h | Not used                                         | —             | —   |                                                                                                                                    | —          |
| 3507h          | 3rd stabilization parameter                      | H306          | R/W | 0 to 255                                                                                                                           | 1          |
| From 3508h     | Not used                                         | —             | —   |                                                                                                                                    | —          |

4

Functions

# Chapter 5

## Maintenance Operations

|     |                                              |      |
|-----|----------------------------------------------|------|
| 5-1 | Protective Functions and Troubleshooting ... | 5-1  |
| 5-2 | Warning Function.....                        | 5-10 |

# 5-1 Protective Functions and Troubleshooting

## Error Code List

| Name                           | Description                                                                                                                                                                                                                                                                                                                                                                                                                                | Error Code     | Points to check and remedy                                                                                                                                                                                                                                                                                                                                                                                                                                               | Reference page |
|--------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|
| Overcurrent trip               | If the motor is restrained or rapidly accelerated or decelerated, a large current flows through the Inverter, which results in a malfunction. The current exceeding the specified level shuts off the output and an error appears. This protection function detects an overcurrent through the AC CT (current detector). The protection circuit is activated at approximately 220% of the Inverter rated output current and a trip occurs. | Constant speed | E01.0<br>Is there any rapid load fluctuation? (Eliminate load fluctuation.)<br>Is there any output short-circuit? (Check the output wires.)<br>Is there any ground fault? (Check the output wires and motor.)                                                                                                                                                                                                                                                            | —              |
|                                |                                                                                                                                                                                                                                                                                                                                                                                                                                            | Deceleration   | E02.0<br>Is there any rapid deceleration? (Increase the deceleration time.)                                                                                                                                                                                                                                                                                                                                                                                              | 4-8<br>4-37    |
|                                |                                                                                                                                                                                                                                                                                                                                                                                                                                            | Acceleration   | E03.0<br>Is there any rapid acceleration? (Increase the acceleration time.)<br>Has the motor shaft been locked? (Check the motor and wires.)<br>Is the torque boost too high? (Lower the torque boost.)                                                                                                                                                                                                                                                                  | 4-8<br>4-37    |
|                                |                                                                                                                                                                                                                                                                                                                                                                                                                                            | Others         | E04.0<br>Is the DC injection braking too high? (Lower the injection braking.)<br>Is there any error on CT? (Replace or repair the CT.)                                                                                                                                                                                                                                                                                                                                   | 4-24           |
| Overload trip<br>*1            | Monitors the Inverter output current and shuts off the output, displaying an error if the built-in electronic thermal function detects overload against the motor. Trips depending on the electronic thermal function settings.                                                                                                                                                                                                            | E05.0          | Is the load too large? (Reduce the loading factor.)<br>Is the thermal level correct? (Adjust the thermal level to an appropriate level.)<br>Note: The electronic thermal function is set to work easily at 5 Hz or lower. If a large load inertial moment is applied, the overload protect function works when the motor starts accelerating, and the load prevents it from accelerating. In this case, increase the torque boost or take other measures for adjustment. | 4-46           |
| Braking resistor overload trip | Shuts off the output and displays an error if the usage rate of regenerative braking circuit exceeds the b090 set value.                                                                                                                                                                                                                                                                                                                   | E06.0          | Is there any rapid deceleration? (Increase the deceleration time.)<br>Is the operation cycle frequent? (Decrease the number of operation cycles.)<br>Is the usage rate setting of the regenerative braking function low? (Set to an appropriate level.)<br>Note: Pay attention to the allowable power of the resistor.                                                                                                                                                   | 4-8<br>4-74    |

| Name                  | Description                                                                                                                                                                                                                                                                                                                                                                                                                                  | Error Code | Points to check and remedy                                                                                                                                                                                                                                            | Reference page |
|-----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|
| Overvoltage trip      | Extremely high DC voltage between P/+ and N/- may result in failure. This function therefore shuts off the output and displays an error if the DC voltage between P/+ and N/- exceeds the specified level because of regenerative energy from the motor or increase of the incoming voltage during operation.<br>Trips when the DC voltage between P/+ and N/- reaches approximately 400 V DC for 200-V class, and 800 V DC for 400-V class. | E07.0      | Is there any rapid deceleration?<br>(Increase the deceleration time.)<br>Is there any ground fault?<br>(Check the output wires and motor.)<br>Has the motor been rotated/driven from the load side?<br>(Reduce regenerative energy.)                                  | —              |
| EEPROM error<br>*2 *3 | Shuts off the output and displays an error if an error occurs in the built-in EEPROM because of external noise or abnormal temperature rise.<br>Note: This may be a CPU error depending on the case.                                                                                                                                                                                                                                         | E08.0      | Is there any large electrical noise source around?<br>(Countermeasures against electrical noise)<br>Has the cooling efficiency been reduced?<br>(Check that there is no clogging in the cooling fan and fin, if so clean it.)<br>(Replace the cooling fan if faulty.) | —              |

\*1. The reset command is not accepted until approximately 10 seconds after the trip occurs (protection function works).

\*2. The reset command is not accepted if the EEPROM error E08.0 occurs. Turn off the power once. If you find E08 when turning on the power again, it is possible that the internal memory element of the drive has been damaged or the parameters have not been memorized correctly. Perform the user initialization to set the parameters again.

\*3. The reset command through the RS terminal or STOP/RESET key is not accepted. Turn off the power.

| Name              | Description                                                                                                                                                                                                                                                                                                                             | Error Code | Check point and remedy                                                                                                                                                                                                                             | Reference page |
|-------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|
| Undervoltage trip | Shuts off the output if the incoming supply voltage drops below the specified level. This is because the control circuit stops working properly when the incoming supply voltage to the Inverter drops.<br>Trips when the DC voltage between P/+ and N/- drops to approximately 175 V DC for 200-V class, and 345 V DC for 400-V class. | E09.0      | Has the power supply voltage decreased?<br>(Check the incoming power supply.)<br>Is the power supply capacity sufficient?<br>(Check the power supply.)<br>Has the drives internal charge circuit thyristor been damaged?<br>(Check the thyristor.) | 4-28           |
| CT error          | Shuts off the output if an error occurs in the CT (current detector) built into the Inverter. Trips if the CT output is approximately 0.6 V or more when the power is turned on.                                                                                                                                                        | E10.0      | The Inverter has a fault. (Repair/Replace)                                                                                                                                                                                                         | —              |
| CPU error<br>*1   | Shuts off the output and displays an error if the internal CPU has worked erroneously or abnormally.<br>Note: If an abnormal value is read from EEPROM, it may become a CPU error depending on the case.                                                                                                                                | E11.0      | Is there any large electrical noise source around?<br>(Countermeasures against noise)<br>The Inverter has a fault. (Repair/Replace)                                                                                                                | —              |

\*1. The reset command through the RS terminal or STOP/RESET key is not accepted. Turn off the power.

\*2. The reset operation via the Digital Operator is not accepted. Be sure to reset via the RS terminal.

| Name                                                                   | Description                                                                                                                                                                                                                                                                 | Error Code | Check point and remedy                                                                                                                                                                                                                                         | Reference page |
|------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|
| External trip                                                          | If an error occurs in the external equipment or devices, the Inverter receives an input signal, then the drives output is shut off.<br>(Available with the external trip function selected)                                                                                 | E12.0      | Has any error occurred in the external devices when the external trip function is selected?<br>(Correct the external device error.)                                                                                                                            | 4-84           |
| USP trip                                                               | Appears when the power is turned on with the RUN signal input into the Inverter.<br>(Available with the USP function selected)                                                                                                                                              | E13.0      | When the USP function was selected, did you turn on the power with the RUN signal input into the Inverter? (Cancel the RUN command and turn on the power.)                                                                                                     | 4-84           |
| Ground fault trip<br>*1                                                | Protects the Inverter if a ground fault between the Inverter output unit and the motor is detected when turning on the power.<br>(This function does not work when there is residual voltage in the motor.)                                                                 | E14.0      | Is there any ground fault? (Check the output wires and motor.)<br>Is there any error in the Inverter itself? (Disconnect the output wires to check.)<br>Is there any error in the main circuit? (Check the main circuit. Refer to Chapter 6.) (Repair/Replace) | —              |
| Incoming overvoltage trip                                              | Appears if the incoming voltage continues to be higher than the specification value for 100 seconds while the Inverter is stopped.<br>Trips when the main circuit DC voltage reaches approximately 390 V DC for 200-V class, and 780 V DC for 400-V class.                  | E15.0      | Is the incoming supply voltage too high while the Inverter is stopped?<br>(Lower the incoming voltage, correct the power supply fluctuation. Fit an AC reactor to power supply input if needed.)                                                               | —              |
| Momentary power interruption trip                                      | Shuts off the output when a momentary power interruption occurs for 15 ms or more.<br>If the shutoff time is long, it is normally recognized as a power shutoff. Note that, when restart is selected, the Inverter restarts at power-on as long as the RUN command remains. | E16.0      | Has the incoming power supply voltage dropped?<br>(Power recovery)<br>Is there a contact failure for MCCB and/or Mg?<br>(Replace MCCB, Mg.)                                                                                                                    | 4-60           |
| Temperature error when the rotation speed of the cooling fan decreases | Appears if a decrease of the cooling fan rotation speed has been detected when a temperature error occurs.                                                                                                                                                                  | E20.0      | Has the cooling efficiency been reduced?<br>(Replace the cooling fan.)<br>Is there any clogging in the heatsink fin?<br>(Clean the fin.)                                                                                                                       | —              |
| Temperature error                                                      | Shuts off the output if the temperature has risen in the main circuit because of the high ambient temperature.                                                                                                                                                              | E21.0      | Have you installed the Inverter vertically?<br>(Installation check)<br>Is the ambient temperature high?<br>(Decrease the ambient temperature.)                                                                                                                 | —              |
| Gate array communications error                                        | Trips when a fault is detected in communication behavior between the built-in CPU and the gate array.                                                                                                                                                                       | E23.0      | Is there any large electrical noise source around?<br>(Countermeasures against electrical noise)<br>Has any internal cable been disconnected?<br>(Check the connector.)                                                                                        | —              |

\*1. The reset command through the RS terminal or STOP/RESET key is not accepted. Turn off the power.

\*2. The reset operation via the Digital Operator is not accepted. Be sure to reset via the RS terminal.



| Name                             | Description                                                                                                                                                                                                                                             | Error Code | Check point and remedy                                                                                                                                                                                                                                           | Reference page |
|----------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|
| Input open phase trip            | Prevents Inverter damage due to input phase loss when the input phase loss protection selection is enabled (b006=01), and trips. Trips when the phase loss time is approximately 1 s or more.                                                           | E24.0      | Is there any input power supply phase loss?<br>(Check the input wiring.)<br>Is there a contact failure for MCCB and/or Mg?<br>(Replace MCCB, Mg.)                                                                                                                | —              |
| Main circuit error *1            | Trips when the gate array cannot confirm IGBT ON/OFF because of a main element failure, a load short circuit, or an erroneous operation resulting from radiated electrical noise.                                                                       | E25.0      | Is there any large electrical noise source around?<br>(Countermeasures against electrical noise)<br>Has the main element/IGBT been damaged?<br>Is there any output short-circuit?<br>(Check the IGBT.)<br>The Inverter has a failure. (Repair/ Replace)          | —              |
| IGBT error                       | Shuts off the Inverter output to protect the main element when a momentary overcurrent, temperature error in the main element, or drop of the main element driving power supply occurs.<br>(Retry operation cannot be performed for this trip.)         | E30.0      | Is there any output short-circuit? (Check the output wires.)<br>Is there any ground fault?<br>(Check the output wires and motor.)<br>Has the main element been damaged?<br>(Check the IGBT.)<br>Is there any clogging in the fin?<br>(Clean the fin.)            | —              |
| Thermistor error                 | Shuts off the Inverter output when detecting the thermistor resistance value inside the motor has changed which is connected to the TH terminal, resulting motor temperature rise.                                                                      | E35.0      | Is the motor temperature too high?<br>(Check the motor temperature.)<br>Is there any damage to the thermistor inside the motor?<br>(Check the thermistor.)<br>Is there any electrical noise being introduced in the thermistor signal?<br>(Separate the wiring.) | 2-9<br>4-75    |
| Brake error                      | When 01 is selected in b120 (brake control selection), this error appears if the brake ON/OFF cannot be confirmed within the b124 set time (brake confirmation wait time) after the Inverter outputs the brake release signal.                          | E36.0      | Is the brake ON/OFF function working?<br>(Brake check)<br>Is the set time for b124 too short?<br>(Increase b124.)<br>Has the brake confirmation signal been input?<br>(Wiring check)                                                                             | 4-76           |
| Emergency shutoff *2             | Shuts off the hardware output and displays an error when the EMR terminal (S3) is turned on with SW1 on the logic board ON.                                                                                                                             | E37.0      | Did any error occur in the external devices when the emergency shutoff function was selected?<br>(Correct the external device error.)                                                                                                                            | 2-9            |
| Overload trip in low speed range | If an overload is detected in the lowest speed range of 0.2 Hz max., an electronic thermal trip inside the Inverter works to shut off the Inverter output. (2nd electronic thermal)<br>(However, a higher frequency could remain in the error history.) | E38.0      | Is the load too large? (Reduce the loading factor.)                                                                                                                                                                                                              | —              |
| ModBus communications error      | Appears when the timeout occurs because of disconnection during Modbus-RTU communication.<br>(Trip by the C076 setting)                                                                                                                                 | E41.0      | Is the communication speed correct?<br>Is the wiring distance appropriate?<br>(Connection check)                                                                                                                                                                 | 4-147          |

\*1. The reset command through the RS terminal or STOP/RESET key is not accepted. Turn off the power.

\*2. The reset operation via the Digital Operator is not accepted. Be sure to reset via the RS terminal.

| Name                   | Description                                                                                                                                           | Error Code       | Check point and remedy                                                                                                                                                                                                             | Reference page |
|------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|
| Option 1 error         | Detects an error on the board mounted on option port 1.                                                                                               | E60.0 to E69.0   | Has the option board been securely mounted?<br>(Check that the mounting is correct.)                                                                                                                                               | —              |
| Option 2 error         | Detects an error on the board mounted on option port 2.                                                                                               | E70.0 to E79.0   | Has the option board been securely mounted?<br>(Check that the mounting is correct.)                                                                                                                                               | —              |
| Undervoltage standby   | Shows the waiting status after the incoming Inverter voltage decreases and shuts off.<br>This error also appears during momentary power interruption. | UV Wait          | Has the incoming power supply voltage dropped? (Power recovery)<br>Is there a contact failure for MCCB and/or Mg?<br>(Replace MCCB, Mg.)<br>Is the voltage between P/+ and N/- normal?<br>(Check the voltage between P/+ and N/-.) | —              |
| Communications error   | Appears if an error occurs between the Digital Operator and the Inverter.                                                                             | COM ERROR        | Has the remote cable plug been inserted properly?<br>(Check the remote cable inserted correctly.)<br>Has the Digital Operator been inserted properly?<br>(Check the Digital Operator contact.)                                     | —              |
| Retry standby          | Appears in the restart standby status when the momentary power interruption/trip retry functions are enabled.                                         | Restart Wait     | In case of zero-start.                                                                                                                                                                                                             | —              |
|                        |                                                                                                                                                       | F-adj Wait       | In case of frequency matching.                                                                                                                                                                                                     |                |
| Power shutoff          | Appears when the power is shut off.                                                                                                                   | Power OFF        | —                                                                                                                                                                                                                                  | —              |
| RUN command is limited | Appears if the limited RUN command is received while the rotation direction is limited to one direction with b035.                                    | RUN CMD. Disable | —                                                                                                                                                                                                                                  | —              |

\*1. The reset command through the RS terminal or STOP/RESET key is not accepted. Turn off the power.

\*2. The reset operation via the Digital Operator is not accepted. Be sure to reset via the RS terminal.

## LCD Digital Operator Error Message

| Display              | Cause                                                                                               | Check item                                                                                                                        | Action                                                                                                                                           | Resetting method       |
|----------------------|-----------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|
| COM ERROR            | -No signal is received from the inverter within 4 sec.                                              | -Reset the inverter.<br>-Check inverter type.<br>-Check the connector for looseness/disconnection.<br>-Check the cable for break. | -Avoid issuing the RESET signal continuously for more than 5 sec.<br>-Change the correct inverter type.<br>-Replace the cable and the connector. | Press STOP/RESET key   |
| INV in RUN mode      | -The WRITE key is pressed while the inverter is running.<br>-Soft-lock is turned ON.                | -Check if the WRITE key is pressed while the inverter is running.<br>-Check if the WRITE key is pressed while soft-lock is ON.    | -The WRITE key should be pressed only while the inverter stops.<br>-Release the Soft-Lock (of the inverter).                                     |                        |
| INV in TRIP mode     | -WRITE key is pressed while inverter trips.                                                         | -Check if the inverter trips.                                                                                                     | -Reset the inverter from trip status.                                                                                                            |                        |
| INV Type Un-match    | -An attempt was made writing parameters between different inverter type.                            | -                                                                                                                                 | -Writing is possible only between the same type inverters,                                                                                       |                        |
| Read lock enabled    | -In case of display "READ LOCK".                                                                    | -                                                                                                                                 | -Release the Read Lock.                                                                                                                          |                        |
| Data Check Sum Error | -EEPROM of LCD digital operator is overloaded. It reaches the EEPROM's Write Limitation.            | -                                                                                                                                 | -If the same error appears after the power is supplied several times, the operator is defective.                                                 | Supply the power again |
| INV Check Sum Error  | -The parameters in LCD digital operator and the parameters written into the inverter are unmatched. | -                                                                                                                                 | -If the same error appears several times, the inverter is defective. <b>(Note)</b>                                                               |                        |

**Note:** It will happen sometimes when you try to write data into an inverter with different voltage class and capacity. (Please refer to each inverter instruction manual).

## Option Board Protection Function List

E6\*.□(OP1-\*) appears when the option board is mounted on option port 1 (Digital Operator connector side) , and E7\*.□(OP2-\*) appears when it is mounted on option port 2 (control circuit terminal block side).

### •Protection function list when the PG board (3G3AX-PG01) is mounted

| Name                        | Description                                                                                                                                                                                                       | Error Code |       |
|-----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|-------|
| Encoder disconnection       | Shuts off the output and displays an error when the encoder wiring disconnection or connection failure is detected, the encoder is damaged, or an encoder except for line driver output is used.                  | E60.0      | E70.0 |
| Excess speed                | Shuts off the output and displays an error when the motor rotation exceeds the maximum frequency (A004) × the overspeed error detection level (P026).                                                             | E61.0      | E71.0 |
| Positioning error           | Shuts off the output and displays an error when the current position deviation against the position reference value exceeds 1,000,000 pulses during position control.                                             | E62.0      | E72.0 |
| Position control range trip | Shuts off the output and displays an error when the current position exceeds the setting values of the position limit range specification for Forward (P072) and Reverse (P073) during absolute position control. | E63.0      | E73.0 |
| 3G3AX-PG01 connection error | Shuts off the output and displays an error if a connection (mounting) failure of the PG board is detected.                                                                                                        | E69.0      | E79.0 |

Note: Check the DIP switch settings on the PG board for any abnormal operation.

### Function List of the DIP Switches on the PG Board (3G3AX-PG01)

| DIP switch | Switch No. | Description |                                                                              |
|------------|------------|-------------|------------------------------------------------------------------------------|
| SWENC      | 1          | ON          | Disconnection detection enabled when the encoder A/B-phase is not connected  |
|            |            | OFF         | Disconnection detection disabled when the encoder A/B-phase is not connected |
|            | 2          | ON          | Disconnection detection enabled when the encoder Z-phase is not connected    |
|            |            | OFF         | Disconnection detection disabled when the encoder Z-phase is not connected   |
| SWR        | 1          | ON          | With the termination resistor between SAP and SAN (150 Ω)                    |
|            |            | OFF         | Without the termination resistor between SAP and SAN                         |
|            | 2          | ON          | With the termination resistor between SBP and SBN (150 Ω)                    |
|            |            | OFF         | Without the termination resistor between SBP and SBN                         |

### •Protection function display when the digital command board (3G3AX-DI01) is mounted

| Name             | Description                                                                                                                     | Error Code |       |
|------------------|---------------------------------------------------------------------------------------------------------------------------------|------------|-------|
| 3G3AX-DI01 error | Shuts off the output and displays an error if a timeout occurs in communication between the Inverter and digital command board. | E60.0      | E70.0 |

Note: Input mode is determined by the combination of DIP and rotary switches. Check the settings of the DIP and rotary switches on the digital command board for any abnormal operation.

Function List of the DIP and Rotary Switches on the digital command board (3G3AX-DI01)

| DIP switch<br>(TYPE)                                                 |                                           | Rotary<br>switch<br>(CODE) | Resolution setting                  |        |      |      |                                           |         |       |                            |                          |   |  |
|----------------------------------------------------------------------|-------------------------------------------|----------------------------|-------------------------------------|--------|------|------|-------------------------------------------|---------|-------|----------------------------|--------------------------|---|--|
|                                                                      |                                           |                            | Set frequency                       |        |      |      | Acceleration/Deceleration<br>time setting |         |       | Torque<br>limit<br>setting | Posi-<br>tion<br>setting |   |  |
| Switch No.                                                           |                                           | Setting<br>code            | 0.01 Hz                             | 0.1 Hz | 1 Hz | Rate | 0.01 sec                                  | 0.1 sec | 1 sec | 1%                         | 1 pulse                  |   |  |
| 1                                                                    | 2                                         |                            |                                     |        |      |      |                                           |         |       |                            |                          |   |  |
| ON:<br>BCD<br>input<br>(BCD)<br><br>OFF:<br>Binary<br>input<br>(BIN) | OFF:<br>Batch<br>input<br>mode<br>(PAC)   | 0                          | ○                                   |        |      |      |                                           |         |       |                            |                          |   |  |
|                                                                      |                                           | 1                          |                                     | ○      |      |      |                                           |         |       |                            |                          |   |  |
|                                                                      |                                           | 2                          |                                     |        | ○    |      |                                           |         |       |                            |                          |   |  |
|                                                                      |                                           | 3                          |                                     |        |      | ○    |                                           |         |       |                            |                          |   |  |
|                                                                      |                                           | 4                          |                                     |        |      |      |                                           |         |       | ○                          |                          |   |  |
|                                                                      |                                           | 5                          | For factory adjustment (Do not set) |        |      |      |                                           |         |       |                            |                          |   |  |
|                                                                      |                                           | 6                          |                                     |        |      |      |                                           |         |       |                            | ○                        |   |  |
|                                                                      |                                           | 7 to F                     | For factory adjustment (Do not set) |        |      |      |                                           |         |       |                            |                          |   |  |
|                                                                      | ON:<br>Dividing<br>input<br>mode<br>(DIV) | 0                          | ○                                   |        |      |      |                                           | ○       |       |                            | ○                        | ○ |  |
|                                                                      |                                           | 1                          |                                     |        |      |      |                                           |         | ○     |                            |                          |   |  |
|                                                                      |                                           | 2                          |                                     |        |      |      |                                           |         |       | ○                          |                          |   |  |
|                                                                      |                                           | 3                          |                                     | ○      |      |      |                                           | ○       |       |                            |                          |   |  |
|                                                                      |                                           | 4                          |                                     |        |      |      |                                           | ○       |       |                            |                          |   |  |
|                                                                      |                                           | 5                          |                                     |        |      |      |                                           |         |       | ○                          |                          |   |  |
|                                                                      |                                           | 6                          |                                     |        | ○    |      |                                           | ○       |       |                            |                          |   |  |
|                                                                      |                                           | 7                          |                                     |        |      |      |                                           | ○       |       |                            |                          |   |  |
|                                                                      |                                           | 8                          |                                     |        |      |      |                                           |         |       | ○                          |                          |   |  |
|                                                                      |                                           | 9                          |                                     |        |      | ○    |                                           |         | ○     |                            |                          |   |  |
|                                                                      |                                           | A                          |                                     |        |      |      |                                           | ○       |       |                            |                          |   |  |
|                                                                      |                                           | B                          |                                     |        |      |      |                                           |         |       | ○                          |                          |   |  |
|                                                                      |                                           | C to F                     | For factory adjustment (Do not set) |        |      |      |                                           |         |       |                            |                          |   |  |

## How to Read the Input Mode List

Example 1. Switch setting when setting the frequency with a resolution of 1 Hz, via binary input (BIN) in the batch input mode (PAC)

| TYPE     |          | CODE |
|----------|----------|------|
| 1        | 2        | 2    |
| OFF: BIN | OFF: PAC |      |

Example 2. Switch setting when setting the frequency with a resolution of 0.1 Hz, via BCD input, and setting the acceleration/deceleration time with a resolution of 0.1 sec, via BCD input in the dividing input mode (DIV)

| TYPE    |         | CODE |
|---------|---------|------|
| 1       | 2       | 4    |
| ON: BCD | ON: DIV |      |

For the communication option boards, refer to the specific user manual of each option.

## Trip Monitor Display

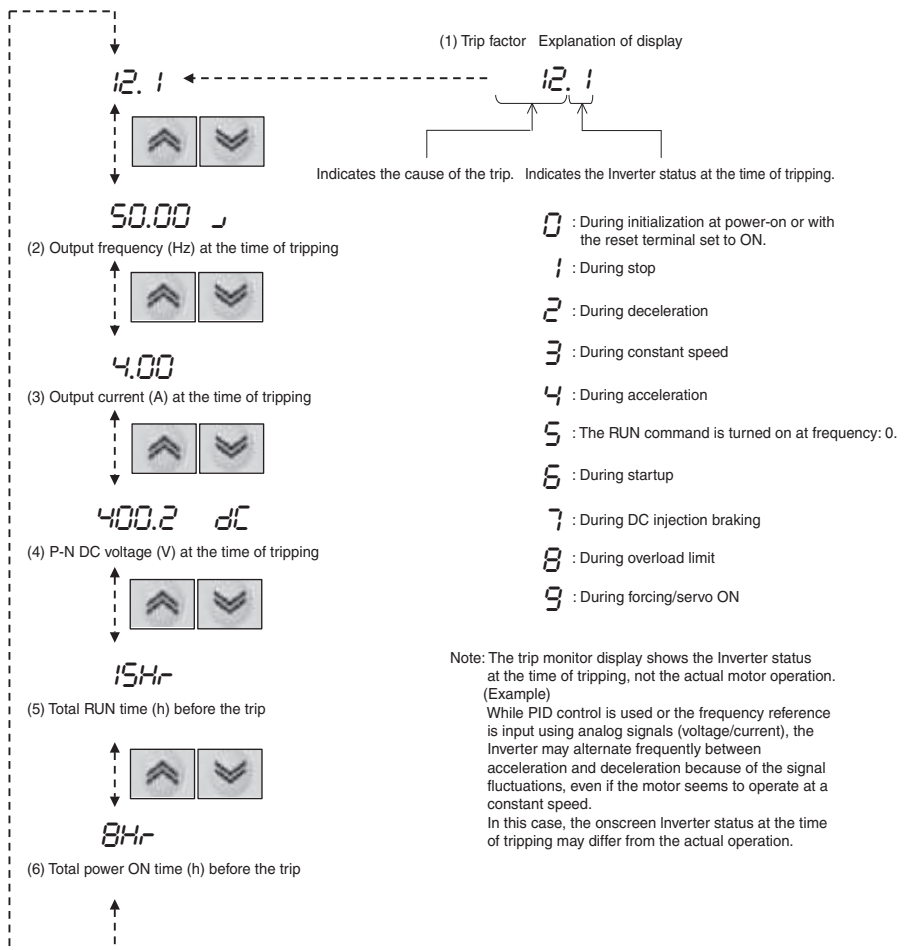
| TRIP      | M1-STOP | ALL  |
|-----------|---------|------|
| E12.1     |         |      |
| Ext. Trip |         |      |
| 111006    | 11:05   | Stop |



| TRIP           | M1-STOP | ALL  |
|----------------|---------|------|
| ERR1 P1        |         |      |
| Ext. Trip      |         |      |
| 111006         | 11:05   | Stop |
| Output FQ      | 50.00Hz |      |
| Output current | 4.00A   |      |



| TRIP       | M1-STOP  | ALL |
|------------|----------|-----|
| ERR1 P2    |          |     |
| Ext. Trip  |          |     |
| DC Voltage | 400.2Vdc |     |
| RUN time   | 15hr     |     |
| ON time    | 8hr      |     |



## 5-2 Warning Function

•The following table shows the details of warning display and parameter correction.

| Target code                                                                         | Condition | Base code                                                                                       |
|-------------------------------------------------------------------------------------|-----------|-------------------------------------------------------------------------------------------------|
| Frequency upper limit A061/A261                                                     | >         | Maximum frequency<br>A004/A204/A304                                                             |
| Frequency lower limit A062/A262                                                     | >         |                                                                                                 |
| Base frequency A003/A203/A303 <sup>*1</sup>                                         | >         |                                                                                                 |
| Output frequency F001, Multi-step speed reference 0<br>A020/A220/A320 <sup>*2</sup> | >         |                                                                                                 |
| Multi-step speeds 1 to 15 A021 to A035                                              | >         |                                                                                                 |
| Orientation speed setting P015                                                      | >         |                                                                                                 |
| Frequency lower limit A062/A262                                                     | >         | Frequency upper limit<br>A061/A261                                                              |
| Output frequency F001, Multi-step speed reference 0 A020/A220 <sup>*2</sup>         | >         |                                                                                                 |
| Multi-step speeds 1 to 15 A021 to A035                                              | >         |                                                                                                 |
| Frequency upper limit A061/A261                                                     | <         | Orientation speed<br>P015                                                                       |
|                                                                                     | <         | Frequency lower limit<br>A062/A262                                                              |
| Output frequency F001, Multi-step speed reference 0<br>A020/A220/A320 <sup>*2</sup> | <         | Starting frequency<br>b082                                                                      |
| Frequency upper limit A061/A261                                                     | <         |                                                                                                 |
| Frequency lower limit A062/A262                                                     | <         |                                                                                                 |
| Output frequency F001, Multi-step speed reference 0<br>A020/A220/A320 <sup>*2</sup> | <         |                                                                                                 |
| Multi-step speeds 1 to 15 A021 to A035                                              | <         |                                                                                                 |
| Jogging frequency A038                                                              | <         | Jump frequency 1/2/3<br>± Jump width<br>A063 ± A064<br>A065 ± A066<br>A067 ± A068 <sup>*3</sup> |
| Output frequency F001, Multi-step speed reference 0<br>A020/A220/A320 <sup>*2</sup> | < >       |                                                                                                 |
| Multi-step speeds 1 to 15 A021 to A035                                              | < >       |                                                                                                 |
| Frequency upper limit A061/A261                                                     | >         | Free V/f frequency 7 b112                                                                       |
| Frequency lower limit A062/A262                                                     | >         |                                                                                                 |
| Output frequency F001, Multi-step speed reference 0 A020/A220 <sup>*2</sup>         | >         |                                                                                                 |
| Multi-step speed reference 1 to 15 A021 to A035                                     | >         |                                                                                                 |
| Free V/f frequencies 1 to 6<br>b100, b102, b104, b106, b108, b110                   | >         |                                                                                                 |
| Free V/f frequencies 2 to 6<br>b102, b104, b106, b108, b110                         | <         | Free V/f frequency 1 b100                                                                       |
| Free V/f frequency 1 b100                                                           | >         | Free V/f frequency 2 b102                                                                       |
| Free V/f frequencies 3 to 6 b104, b106, b108, b110                                  | <         | Free V/f frequency 3 b104                                                                       |
| Free V/f frequencies 1, 2 b100, b102                                                | >         |                                                                                                 |
| Free V/f frequencies 4 to 6 b106, b108, b110                                        | <         |                                                                                                 |

## 5-2 Warning Function

| Target code                                                 | Condition | Base code                                    |
|-------------------------------------------------------------|-----------|----------------------------------------------|
| Free V/f frequencies 1 to 3 b100, b102, b104                | >         | Free V/f frequency 4 b106                    |
| Free V/f frequencies 5, 6 b108, b110                        | <         |                                              |
| Free V/f frequencies 1 to 4 b100, b102, b104, b106          | >         | Free V/f frequency 5 b108                    |
| Free V/f frequency 6 b110                                   | <         |                                              |
| Free V/f frequencies 1 to 5<br>b100, b102, b104, b106, b108 | >         | Free V/f frequency 6 b110                    |
| Free electric thermal frequencies 2, 3 b017, b019           | <         | Free electric thermal<br>frequency 1<br>b015 |
| Free electric thermal frequency 1 b015                      | >         | Free electric thermal<br>frequency 2         |
| Free electric thermal frequency 3 b019                      | <         | b017                                         |
| Free electric thermal frequencies 1 2 b015, b017            | >         | Free electric thermal<br>frequency 3<br>b019 |

- \*1. In this case, the base frequency is rewritten when corresponding parameters. Change the data to a correct value is a warning occurs. Otherwise, the motor may burn out depending on the value.
- \*2. Checks even if the frequency reference selection (A001) is set other than to the Digital Operator (02).
- \*3. The jump frequency is rewritten into the value of the subtraction of the jump width (lower limit) from the jump frequency.
- Warning appears when a target code set data meets the condition shown above in relation to the base code data.
- Parameters are rewritten into the data of the base code. (rewritten at start-up)



# Chapter 6

## Inspection and Maintenance

|     |                                  |     |
|-----|----------------------------------|-----|
| 6-1 | Inspection and Maintenance ..... | 6-1 |
|-----|----------------------------------|-----|

## 6-1 Inspection and Maintenance

### DANGER

|                                                                                   |                                                                                                                                                                                                                                          |
|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | Do not change wiring and slide switches (SW1), put on or take off Digital Operator and optional devices, replace cooling fans while the input power is being supplied. Doing so may result in a serious injury due to an electric shock. |
|  | Do not remove the terminal block cover during the power supply and 10 minutes after the power shutoff. Doing so may result in a serious injury due to an electric shock.                                                                 |

### CAUTION

|                                                                                    |                                                                                                                                                                                         |
|------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|   | Do not touch the Inverter fins, braking resistors and the motor, which become too hot during the power supply and for some time after the power shutoff. Doing so may result in a burn. |
|  | Do not dismantle, repair or modify this product. Doing so may result in an injury.                                                                                                      |

### Safety Information

#### ■ Maintenance and Inspection

- Be sure to confirm safety before conducting maintenance, inspection or parts replacement.

### Precautions for Use

#### ■ Operation Stop Command

- Provide a separate emergency stop switch because the STOP key on the Digital Operator is valid only when function settings are performed.
- When checking a signal during the power supply and the voltage is erroneously applied to the control input terminals, the motor may start abruptly. Be sure to confirm safety before checking a signal.

#### ■ Product Disposal

- Comply with the local ordinance and regulations when disposing of the product.

## Daily Inspection

- Basically, check the following during operation.
  - The motor operates according to the settings.
  - There are no errors in the installation environment.
  - There are no errors in the cooling system.
  - There are no abnormal vibrations or sounds.
  - There are no abnormal overheat or discoloration.
  - There are no abnormal odors.
- Check the input voltage of the Inverter during operation using a tester or other equipment.
  - There is no frequent power supply voltage fluctuation.
  - The voltage level between the wires is balanced.

## Cleaning

- Always keep the Inverter clean for operation.
- Lightly remove any dirt with a soft cloth moistened with a neutral detergent.

### Note:

Do not use such solutions as acetone, benzene, toluene, or alcohol for cleaning. Doing so may cause the Inverter surface to dissolve or its coating to come off.

Do not use any detergent or alcohol to clean the Digital Operator display.

## Periodic Inspection

- Check the parts that cannot be checked without stopping operation, as well as those that require periodic inspection.
- Contact OMRON Corporation for periodic inspections.
  - Check that there are no errors in the cooling system.
    - ..... Clean the air filter.
  - Check that all parts that need tightening are secure.
    - ..... Screws and bolts may become loose because of vibration or temperature change.
  - Check that there is no corrosion or damage to the conductors and/or insulators.
  - Measurement of insulation resistance.
  - Check and replace the cooling fan, smoothing capacitor, and relay.

### ■ Daily Inspection and Periodic Inspection

| Inspection part | Inspection item      | Inspection point                                                 | Inspection period |          |         | Inspection method                                                                                                                                                                                                                                                                                                                                                                                    | Criteria                                                                                   | Meter                                     |
|-----------------|----------------------|------------------------------------------------------------------|-------------------|----------|---------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------|-------------------------------------------|
|                 |                      |                                                                  | Daily             | Periodic |         |                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                            |                                           |
|                 |                      |                                                                  |                   | 1 year   | 2 years |                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                            |                                           |
| General         | Ambient environment  | Check ambient temperature, as well as humidity and dust levels.  | ○                 |          |         | Refer to "2-1 Installation".                                                                                                                                                                                                                                                                                                                                                                         | Ambient temperature 10°C to 50°C, no freezing. Ambient humidity 90% max., no condensation. | Thermometer<br>-er<br>Hygrometer Recorder |
|                 | Entire device        | Check that there are no abnormal vibrations or sounds.           | ○                 |          |         | Visual or acoustic inspection                                                                                                                                                                                                                                                                                                                                                                        | No faults                                                                                  |                                           |
|                 | Power supply voltage | Check that the main circuit voltage is normal.                   | ○                 |          |         | Measure the voltage between Inverter main circuit terminals R/L1, S/L2, and T/L3.                                                                                                                                                                                                                                                                                                                    | Must be within allowable fluctuation of AC voltage.                                        | Tester, digital multimeter                |
| Main circuit    | General              | Megger check (between main circuit terminal and ground terminal) |                   | ○        |         | Disconnect the I/O wirings of the Inverter main circuit terminal block, detach the control terminal block board, and remove the short-circuit bar used for switching the Inverter built-in filter function. Then, use a megger to measure the resistance between the ground terminal and the short-circuited parts of terminals R/L1, S/L2, T/L3, U/T1, V/T2, W/T3, P/+, PD/+1, N/-, RB, Ro, and To. | 5 MΩ min.                                                                                  | 500 V DC megger                           |

\*1. The life of the smoothing capacitor depends on ambient temperature.

Refer to "Appendix-2 Product Life Curve" for the replacement reference.

\*2. The life of the cooling fan varies depending on the environmental conditions, such as ambient temperature and/or dust. Check the operation through daily inspections.

\*3. The replacement reference (year/cycle) or "Appendix-2 Product Life Curve" is based on the expected design life, which is not guaranteed.

| Inspection part | Inspection item                                          | Inspection point                                                           | Inspection period |          |         | Inspection method                                                                                                                                                                                                            | Criteria                                                                                                                 | Meter          |  |
|-----------------|----------------------------------------------------------|----------------------------------------------------------------------------|-------------------|----------|---------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|----------------|--|
|                 |                                                          |                                                                            | Daily             | Periodic |         |                                                                                                                                                                                                                              |                                                                                                                          |                |  |
|                 |                                                          |                                                                            |                   | 1 year   | 2 years |                                                                                                                                                                                                                              |                                                                                                                          |                |  |
| Main circuit    | General                                                  | Check that any parts which may need tightening are secure.                 |                   | ○        |         | Tighten securely.                                                                                                                                                                                                            | No faults                                                                                                                |                |  |
|                 |                                                          | Check that no part has indications of overheating.                         |                   | ○        |         | Visual inspection                                                                                                                                                                                                            | No faults                                                                                                                |                |  |
|                 | Connection conductor and wire                            | Check that there is no distortion with the conductor.                      |                   | ○        |         | Visual inspection                                                                                                                                                                                                            | No faults                                                                                                                |                |  |
|                 |                                                          | Check that there is no damage to the wire Insulation.                      |                   | ○        |         |                                                                                                                                                                                                                              |                                                                                                                          |                |  |
|                 | Terminal block                                           | Check that there is no damage.                                             |                   | ○        |         | Visual inspection                                                                                                                                                                                                            | No faults                                                                                                                |                |  |
|                 | Inverter unit<br>Converter unit (including the resistor) | Check the resistance between the terminals.                                |                   |          | ○       | Disconnect the wiring of the Inverter main circuit terminal block and measure the resistance levels between terminals R/L1, S/L2, T/L3 and P/+, N/-, and between U/T1, V/T2, W/T3 and P/+, N/- in the range of tester × 1 Ω. | Refer to "Checking the Inverter and Converter". Inverter unit replacement reference Start/Stop: Cycle 10 <sup>6</sup> *3 | Analog tester  |  |
|                 | Smoothing capacitor                                      | Check that there is no liquid leakage.                                     | ○                 |          |         | Visual inspection                                                                                                                                                                                                            | No faults<br>Reference of the replacement period: 10 years *2 *3                                                         | Capacity meter |  |
|                 |                                                          | Check that the safety valve has not come out and that there are no bulges. | ○                 |          |         |                                                                                                                                                                                                                              |                                                                                                                          |                |  |
|                 | Relay                                                    | Check that there is no abnormal sound during operation.                    |                   |          | ○       |                                                                                                                                                                                                                              | Acoustic inspection                                                                                                      | No faults      |  |
|                 |                                                          | Check that there is no rough surface on the contact.                       |                   |          | ○       |                                                                                                                                                                                                                              | Visual inspection                                                                                                        | No faults      |  |

\*1. The life of the smoothing capacitor depends on ambient temperature.

Refer to "Appendix-2 Product Life Curve" for the replacement reference.

\*2. The life of the cooling fan varies depending on the environmental conditions, such as ambient temperature and/or dust. Check the operation through daily inspections.

\*3. The replacement reference (year/cycle) or "Appendix-2 Product Life Curve" is based on the expected design life, which is not guaranteed.

| Inspection part                       | Inspection item | Inspection point                                                                                         | Inspection period |          |         | Inspection method                                                                        | Criteria                                                                              | Meter                                     |
|---------------------------------------|-----------------|----------------------------------------------------------------------------------------------------------|-------------------|----------|---------|------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|-------------------------------------------|
|                                       |                 |                                                                                                          | Daily             | Periodic |         |                                                                                          |                                                                                       |                                           |
|                                       |                 |                                                                                                          |                   | 1 year   | 2 years |                                                                                          |                                                                                       |                                           |
| Control circuit<br>Protection circuit | Operation check | Check the balance of output voltage levels between phases in single Inverter run.                        |                   | ○        |         | Measure the voltage between Inverter main circuit terminals U/T1, V/T2, and W/T3.        | Phase-to-phase voltage balance<br>200-V class: 4 V max.<br>400-V class: 8 V max.      | Digital multimeter<br>Rectifier Voltmeter |
|                                       |                 | Check that there are no errors in protection and display circuits through sequence protection operation. |                   | ○        |         | Short-circuit or open the Inverter protection circuit output under simulated conditions. | Error is found in the sequence.                                                       |                                           |
| Cooling system                        | Cooling fan     | Check that there are no abnormal vibration or sounds.                                                    | ○                 |          |         | Rotate manually when the power is off.                                                   | Rotates smoothly.<br>No faults<br>Reference of the replacement period: 10 years *2 *3 |                                           |
|                                       |                 | Check that the connection parts are secure.                                                              |                   | ○        |         | Visual inspection                                                                        |                                                                                       |                                           |
|                                       | Fin             | Check that there is no clogging.                                                                         |                   | ○        |         | Visual inspection                                                                        | No clogging.                                                                          |                                           |
| Display                               | Display         | Check that the LED indicators are lit properly.                                                          | ○                 |          |         | Visual inspection                                                                        | Check that the LED indicators are lit properly.                                       | Voltmeter, ammeter                        |
|                                       |                 | Cleaning                                                                                                 |                   | ○        |         | Clean with a soft cloth.                                                                 |                                                                                       |                                           |
|                                       | Meter           | Check that the indicated value is normal.                                                                | ○                 |          |         | Check the indicated values on the panel meters.                                          | The specified or control values must be satisfied.                                    |                                           |

\*1. The life of the smoothing capacitor depends on ambient temperature.

Refer to "Appendix-2 Product Life Curve" for the replacement reference.

\*2. The life of the cooling fan varies depending on the environmental conditions, such as ambient temperature and/or dust. Check the operation through daily inspections.

\*3. The replacement reference (year/cycle) or "Appendix-2 Product Life Curve" is based on the expected design life, which is not guaranteed.

| Inspection part | Inspection item       | Inspection point                                                          | Inspection period |          |         | Inspection method                                                                                                                                                                                    | Criteria  | Meter           |
|-----------------|-----------------------|---------------------------------------------------------------------------|-------------------|----------|---------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|-----------------|
|                 |                       |                                                                           | Daily             | Periodic |         |                                                                                                                                                                                                      |           |                 |
|                 |                       |                                                                           |                   | 1 year   | 2 years |                                                                                                                                                                                                      |           |                 |
| Motor           | General               | Check that there are no abnormal vibrations or sounds.                    | ○                 |          |         | Acoustic, feeling, and/or visual inspection                                                                                                                                                          | No faults |                 |
|                 |                       | Check that there are no abnormal odors.                                   | ○                 |          |         | Check that there is no abnormal odor caused by damage or overheating.                                                                                                                                | No faults |                 |
|                 | Insulation resistance | Megger check (Between the collective motor terminals and ground terminal) |                   |          | ○       | Disconnect Inverter main circuit terminals U/T1, V/T2, and W/T3, and short-circuit the 3-phase motor wires. Then, use a megger to measure the resistance between the motor wire and ground terminal. | 5 MΩ min. | 500 V DC megger |

\*1. The life of the smoothing capacitor depends on ambient temperature.

Refer to "Appendix-2 Product Life Curve" for the replacement reference.

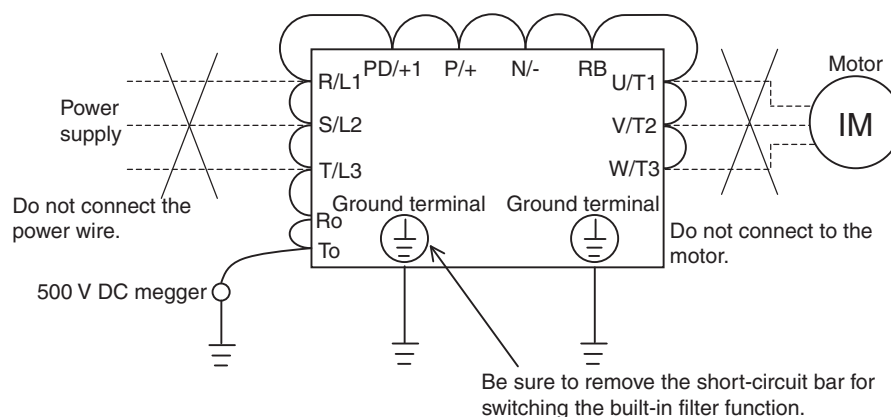
\*2. The life of the cooling fan varies depending on the environmental conditions, such as ambient temperature and/or dust. Check the operation through daily inspections.

\*3. The replacement reference (year/cycle) or "Appendix-2 Product Life Curve" is based on the expected design life, which is not guaranteed.

## Megger test

- For a megger test of the external circuit, be sure to disconnect all the terminals of the Inverter so as not to apply the test voltage to the Inverter.
- Use a high resistance tester for a power distribution test of the control circuit. Do not use a megger or buzzer.
- Conduct an Inverter megger test only to the main circuit, not to the control circuit.
- Use a 500 V DC megger for a megger test.
- For a megger test of the Inverter main circuit, remove the short-circuit bar used for switching the Inverter built-in filter function and then short-circuit terminals R/L1, S/L2, T/L3, U/T1, V/T2, W/T3, PD/+1, P/+, N/-, RB, Ro, and To with the wires, as shown below.  
After the megger test, remove the short-circuit wires from terminals R/L1, S/L2, T/L3, U/T1, V/T2, W/T3, P/+, PD/+1, N/-, RB, Ro, and To, and reconnect the short-circuit bar for switching the Inverter built-in filter function.

Note that the RB terminal is provided only for the Inverters with 22 kW or lower capacity.



## Withstand Voltage Test

Do not conduct a withstand voltage test on any part of the Inverter.

Doing the test is dangerous and may cause damage or deterioration to the parts inside the Inverter.

## Checking the Inverter and Converter

- The quality of the Inverter and converter can be checked using a tester.

(Preparation)

Disconnect the externally connected power supply wires (R/L1, S/L2, T/L3), the motor connection wires (U/T1, V/T2, W/T3), and the regenerative braking resistance (P/+, RB).

Prepare a tester. (Usable range is 1  $\Omega$  measurement resistance.)

(Checking method)

- The quality can be judged by measuring the conduction state of Inverter main circuit terminal blocks R/L1, S/L2, T/L3, U/T1, V/T2, W/T3, RB, P/+, and N/- while alternating the tester polarity.

Note 1: Before checking, measure the voltage between P/+ and N/- at DC voltage range in advance, and confirm that the smoothing capacitor is sufficiently discharged.



Note 2: A nearly infinite value is shown in a no-conduction state.

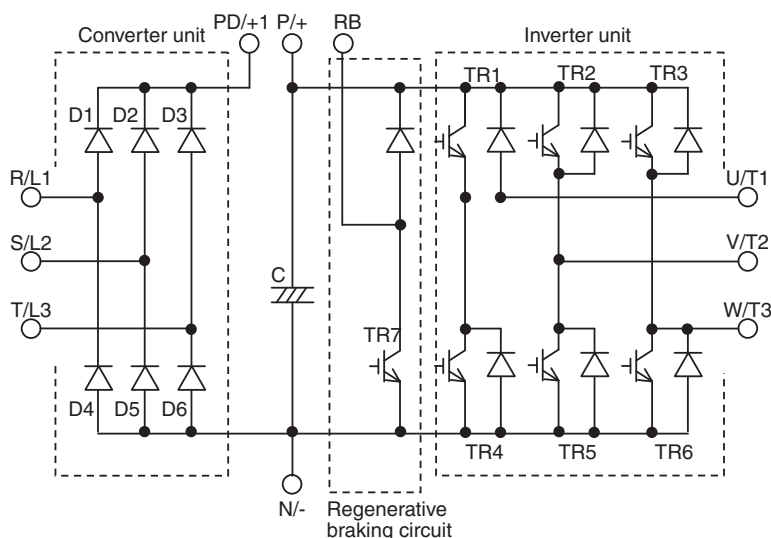
However, the value may not be infinite if the momentary conduction occurs through the influence of the smoothing capacitor

The value shown ranges from a few to a few dozen  $\Omega$  in a conduction state.

The Inverter or converter is in good shape if the values from various parameters are nearly equal, though they are not consistent depending on the types of elements or testers.

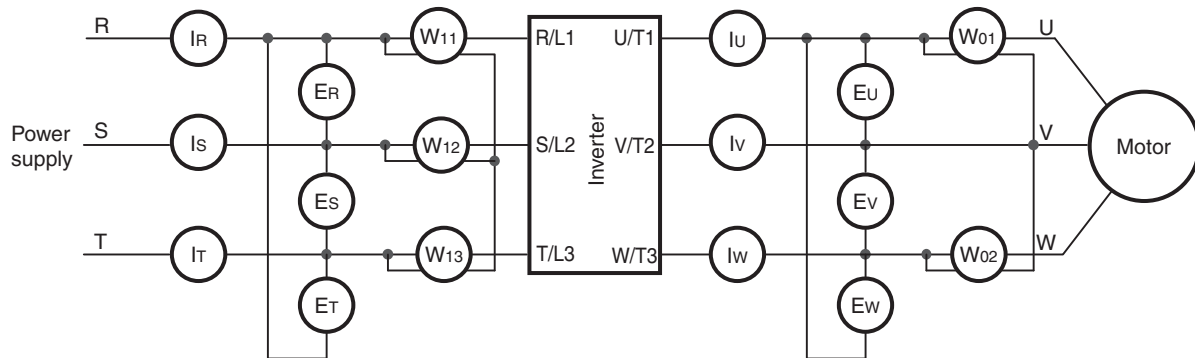
Note 3: The regenerative braking circuit is provided for Inverters with a capacity of 22 kW or lower.

|                              |     | Tester polarity |           | Measurement value |
|------------------------------|-----|-----------------|-----------|-------------------|
|                              |     | + (red)         | - (black) |                   |
| Converter unit               | D1  | R/L1            | PD/+1     | No conduction     |
|                              |     | PD/+1           | R/L1      | Conduction        |
|                              | D2  | S/L2            | PD/+1     | No conduction     |
|                              |     | PD/+1           | S/L2      | Conduction        |
|                              | D3  | T/L3            | PD/+1     | No conduction     |
|                              |     | PD/+1           | T/L3      | Conduction        |
|                              | D4  | R/L1            | N/-       | Conduction        |
|                              |     | N/-             | R/L1      | No conduction     |
|                              | D5  | S/L2            | N/-       | Conduction        |
|                              |     | N/-             | S/L2      | No conduction     |
|                              | D6  | T/L3            | N/-       | Conduction        |
|                              |     | N/-             | T/L3      | No conduction     |
| Inverter unit                | TR1 | U/T1            | P/+       | No conduction     |
|                              |     | P/+             | U/T1      | Conduction        |
|                              | TR2 | V/T2            | P/+       | No conduction     |
|                              |     | P/+             | V/T2      | Conduction        |
|                              | TR3 | W/T3            | P/+       | No conduction     |
|                              |     | P/+             | W/T3      | Conduction        |
|                              | TR4 | U/T1            | N/-       | Conduction        |
|                              |     | N/-             | U/T1      | No conduction     |
|                              | TR5 | V/T2            | N/-       | Conduction        |
|                              |     | N/-             | V/T2      | No conduction     |
|                              | TR6 | W/T3            | N/-       | Conduction        |
|                              |     | N/-             | W/T3      | No conduction     |
| Regenerative braking circuit | TR7 | RB              | P/+       | No conduction     |
|                              |     | P/+             | RB        | Conduction        |
|                              |     | RB              | N/-       | No conduction     |
|                              |     | N/-             | RB        | No conduction     |



## ■ Measurement Methods of I/O Voltage, Current, and Electric Power

Below is a general measurement device for input/output voltages, current, and electric power.

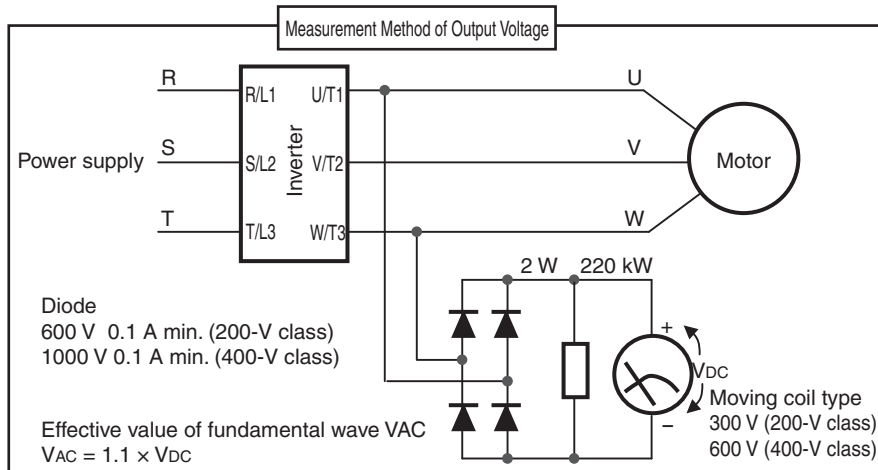


| Measurement item                 | Measurement point                                                                                                                                                                                                          | Measurement device                                 | Note                                | Measurement value reference                                                |
|----------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------|-------------------------------------|----------------------------------------------------------------------------|
| Power supply voltage<br>$E_{IN}$ | Between R-S, S-T, and T-R<br>( $E_R$ ), ( $E_S$ ), ( $E_T$ )                                                                                                                                                               | Moving-iron voltmeter<br>or<br>Rectifier voltmeter | All effective values                | 200-V class: 200 to 240 V, 50/60 Hz<br>400-V class: 380 to 480 V, 50/60 Hz |
| Power supply current<br>$I_{IN}$ | Current R, S, T<br>( $I_R$ ), ( $I_S$ ), ( $I_T$ )                                                                                                                                                                         | Moving iron ammeter                                | All effective values                | When the input current is not balanced<br>$I_{IN} = (I_R + I_S + I_T)/3$   |
| Input electric power<br>$W_{IN}$ | Between R-S, S-T, and T-R<br>( $W_{I1}$ ) + ( $W_{I2}$ ) + ( $W_{I3}$ )                                                                                                                                                    | Electrodynamic wattmeter                           | All effective values                | Three-wattmeter method                                                     |
| Input power factor $P_{fIN}$     | Calculated from the measured values of power supply voltage $E_{IN}$ , power supply current $I_{IN}$ , and input electric power $W_{IN}$ .<br>$P_{fIN} = \frac{W_{IN}}{\sqrt{3} \cdot E_{IN} \cdot I_{IN}} \times 100(\%)$ |                                                    |                                     |                                                                            |
| Output voltage<br>$E_{OUT}$      | Between U-V, V-W, W-U<br>( $E_U$ ), ( $E_V$ ), ( $E_W$ )                                                                                                                                                                   | See the figure below or Rectifier voltmeter        | Effective value of fundamental wave |                                                                            |
| Output current<br>$I_{OUT}$      | Current U, V, W<br>( $I_U$ ), ( $I_V$ ), ( $I_W$ )                                                                                                                                                                         | Moving iron ammeter                                | All effective values                |                                                                            |
| Output power<br>$W_{OUT}$        | Between U-V, V-W<br>( $W_{O1}$ ) + ( $W_{O2}$ )                                                                                                                                                                            | Electrodynamic wattmeter                           | All effective values                | Two-wattmeter method (or three-wattmeter method)                           |
| Output power factor $P_{fOUT}$   | Calculated from the measured values of output voltage $E_{OUT}$ , output current $I_{OUT}$ , and output power $W_{OUT}$ .<br>$P_{fOUT} = \frac{W_{OUT}}{\sqrt{3} \cdot E_{OUT} \cdot I_{OUT}} \times 100(\%)$              |                                                    |                                     |                                                                            |

Note 1: For output voltage, use a measurement device that displays effective values of fundamental wave. For current and electric power, use a measurement device that displays all effective values.

Note 2: The Inverter output waveform, under PWM control, has a margin of error, especially at a low frequency.

Note 3: General-purpose testers are not applicable because of noise in many cases.





# Chapter 7

## Specifications

|     |                                  |      |
|-----|----------------------------------|------|
| 7-1 | Standard Specification List..... | 7-1  |
| 7-2 | Dimensional Drawing.....         | 7-7  |
| 7-3 | Options.....                     | 7-15 |

# 7-1 Standard Specification List

## ■Three-phase 200-V Class

| Class                       |                                   |       | 3-phase 200 V                                                             |       |       |       |       |       |       |       |       |       |
|-----------------------------|-----------------------------------|-------|---------------------------------------------------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Model name (3G3RX-)         |                                   |       | A2004                                                                     | A2007 | A2015 | A2022 | A2037 | A2055 | A2075 | A2110 | A2150 | A2185 |
| Max. applicable motor 4P    | kW                                | at CT | 0.4                                                                       | 0.75  | 1.5   | 2.2   | 3.7   | 5.5   | 7.5   | 11    | 15    | 18.5  |
|                             |                                   | at VT | 0.75                                                                      | 1.5   | 2.2   | 3.7   | 5.5   | 7.5   | 11    | 15    | 18.5  | 22    |
| Rated output capacity (kVA) | 200 V                             | at CT | 1.0                                                                       | 1.7   | 2.5   | 3.6   | 5.7   | 8.3   | 11.0  | 15.9  | 22.1  | 26.3  |
|                             |                                   | at VT | 1.3                                                                       | 2.1   | 3.2   | 4.1   | 6.7   | 10.4  | 15.2  | 20.0  | 26.3  | 29.4  |
|                             | 240 V                             | at CT | 1.2                                                                       | 2.0   | 3.1   | 4.3   | 6.8   | 9.9   | 13.3  | 19.1  | 26.6  | 31.5  |
|                             |                                   | at VT | 1.5                                                                       | 2.6   | 3.9   | 5.0   | 8.1   | 12.4  | 18.2  | 24.1  | 31.5  | 35.3  |
| Rated input voltage         |                                   |       | 3-phase (3-wire) 200 V -15% to 240 V +10%, 50/60 Hz ±5%                   |       |       |       |       |       |       |       |       |       |
| Rated output voltage        |                                   |       | 3-phase: 200 to 240 V (Cannot exceed that of incoming voltage.)           |       |       |       |       |       |       |       |       |       |
| Rated output current (A)    | at CT                             | 3.0   | 5.0                                                                       | 7.5   | 10.5  | 16.5  | 24    | 32    | 46    | 64    | 76    |       |
|                             | at VT                             | 3.7   | 6.3                                                                       | 9.4   | 12    | 19.6  | 30    | 44    | 58    | 73    | 85    |       |
| Radio noise filter          |                                   |       | Built-in                                                                  |       |       |       |       |       |       |       |       |       |
| Weight (kg)                 |                                   |       | 3.5                                                                       | 3.5   | 3.5   | 3.5   | 3.5   | 6     | 6     | 6     | 14    | 14    |
| Braking                     | Regenerative braking              |       | Built-in braking resistor circuit (discharge resistor separately mounted) |       |       |       |       |       |       |       |       |       |
|                             | Minimum connection resistance (Ω) |       | 50                                                                        | 50    | 35    | 35    | 35    | 16    | 10    | 10    | 7.5   | 7.5   |

| Class                       |                                   |       | 3-phase 200 V                                                   |                                              |       |       |       |
|-----------------------------|-----------------------------------|-------|-----------------------------------------------------------------|----------------------------------------------|-------|-------|-------|
| Model name (3G3RX-)         |                                   |       | A2220                                                           | A2300                                        | A2370 | A2450 | A2550 |
| Max. applicable motor 4P    | kW                                | at CT | 22                                                              | 30                                           | 37    | 45    | 55    |
|                             |                                   | at VT | 30                                                              | 37                                           | 45    | 55    | 75    |
| Rated output capacity (kVA) | 200 V                             | at CT | 32.9                                                            | 41.9                                         | 50.2  | 63.0  | 76.2  |
|                             |                                   | at VT | 39.1                                                            | 49.5                                         | 59.2  | 72.7  | 93.5  |
|                             | 240 V                             | at CT | 39.4                                                            | 50.2                                         | 60.2  | 75.6  | 91.4  |
|                             |                                   | at VT | 46.9                                                            | 59.4                                         | 71.0  | 87.2  | 112.2 |
| Rated input voltage         |                                   |       | 3-phase (3-wire) 200 V -15% to 240 V +10%, 50/60 Hz ±5%         |                                              |       |       |       |
| Rated output voltage        |                                   |       | 3-phase: 200 to 240 V (Cannot exceed that of incoming voltage.) |                                              |       |       |       |
| Rated output current (A)    |                                   | at CT | 95                                                              | 121                                          | 145   | 182   | 220   |
|                             |                                   | at VT | 113                                                             | 140                                          | 169   | 210   | 270   |
| Radio noise filter          |                                   |       | Built-in                                                        |                                              |       |       |       |
| Weight (kg)                 |                                   |       | 14                                                              | 22                                           | 30    | 30    | 43    |
| Braking                     | Regenerative braking              |       | Built-in braking resistor circuit                               | Regenerative braking unit separately mounted |       |       |       |
|                             | Minimum connection resistance (Ω) |       | 5                                                               | —                                            |       |       |       |

### ■Three-phase 400-V Class

| Class                       |                                   |       | 3-phase 400 V                                                   |       |       |       |       |       |       |       |       |       |
|-----------------------------|-----------------------------------|-------|-----------------------------------------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Model name (3G3RX-)         |                                   |       | A4004                                                           | A4007 | A4015 | A4022 | A4040 | A4055 | A4075 | A4110 | A4150 | A4185 |
| Max. applicable motor 4P    | kW                                | at CT | 0.4                                                             | 0.75  | 1.5   | 2.2   | 4.0   | 5.5   | 7.5   | 11    | 15    | 18.5  |
|                             |                                   | at VT | 0.75                                                            | 1.5   | 2.2   | 4.0   | 5.5   | 7.5   | 11    | 15    | 18.5  | 22    |
| Rated output capacity (kVA) | 400 V                             | at CT | 1.0                                                             | 1.7   | 2.5   | 3.6   | 6.2   | 9.7   | 13.1  | 17.3  | 22.1  | 26.3  |
|                             |                                   | at VT | 1.3                                                             | 2.1   | 3.3   | 4.6   | 7.7   | 11.0  | 15.2  | 20.9  | 25.6  | 30.4  |
|                             | 480 V                             | at CT | 1.2                                                             | 2.0   | 3.1   | 4.3   | 7.4   | 11.6  | 15.8  | 20.7  | 26.6  | 31.5  |
|                             |                                   | at VT | 1.5                                                             | 2.5   | 4.0   | 5.5   | 9.2   | 13.3  | 18.2  | 24.1  | 30.7  | 36.5  |
| Rated input voltage         |                                   |       | 3-phase (3-wire) 380 V -15% to 480 V +10%, 50/60 Hz ±5%         |       |       |       |       |       |       |       |       |       |
| Rated output voltage        |                                   |       | 3-phase: 380 to 480 V (Cannot exceed that of incoming voltage.) |       |       |       |       |       |       |       |       |       |
| Rated output current (A)    | at CT                             | 1.5   | 2.5                                                             | 3.8   | 5.3   | 9.0   | 14    | 19    | 25    | 32    | 38    |       |
|                             | at VT                             | 1.9   | 3.1                                                             | 4.8   | 6.7   | 11.1  | 16    | 22    | 29    | 37    | 43    |       |
| Radio noise filter          |                                   |       | Built-in                                                        |       |       |       |       |       |       |       |       |       |
| Weight (kg)                 |                                   |       | 3.5                                                             | 3.5   | 3.5   | 3.5   | 3.5   | 6     | 6     | 6     | 14    | 14    |
| Braking                     | Regenerative braking              |       | Built-in braking resistor circuit (discharge resistor)          |       |       |       |       |       |       |       |       |       |
|                             | Minimum connection resistance (Ω) |       | 100                                                             | 100   | 100   | 100   | 70    | 70    | 35    | 35    | 24    | 24    |

| Class                       |                                   |       | 3-phase 400 V                                                   |                                              |       |       |       |       |       |       |       |
|-----------------------------|-----------------------------------|-------|-----------------------------------------------------------------|----------------------------------------------|-------|-------|-------|-------|-------|-------|-------|
| Model name (3G3RX-)         |                                   |       | A4220                                                           | A4300                                        | A4370 | A4450 | A4550 | B4750 | B4900 | B411K | B413K |
| Max. applicable motor 4P    | kW                                | at CT | 22                                                              | 30                                           | 37    | 45    | 55    | 75    | 90    | 110   | 132   |
|                             |                                   | at VT | 30                                                              | 37                                           | 45    | 55    | 75    | 90    | 110   | 132   | 160   |
| Rated output capacity (kVA) | 400 V                             | at CT | 33.2                                                            | 40.1                                         | 51.9  | 63.0  | 77.6  | 103.2 | 121.9 | 150.3 | 180.1 |
|                             |                                   | at VT | 39.4                                                            | 48.4                                         | 58.8  | 72.7  | 93.5  | 110.8 | 135   | 159.3 | 200.9 |
|                             | 480 V                             | at CT | 39.9                                                            | 48.2                                         | 62.3  | 75.6  | 93.1  | 128.3 | 146.3 | 180.4 | 216.1 |
|                             |                                   | at VT | 47.3                                                            | 58.1                                         | 70.6  | 87.2  | 112.2 | 133   | 162.1 | 191.2 | 241.1 |
| Rated input voltage         |                                   |       | 3-phase (3-wire) 380 V -15% to 480 V +10%, 50/60 Hz ±5%         |                                              |       |       |       |       |       |       |       |
| Rated output voltage        |                                   |       | 3-phase: 380 to 480 V (Cannot exceed that of incoming voltage.) |                                              |       |       |       |       |       |       |       |
| Rated output current (A)    |                                   | at CT | 48                                                              | 58                                           | 75    | 91    | 112   | 149   | 176   | 217   | 260   |
|                             |                                   | at VT | 57                                                              | 70                                           | 85    | 105   | 135   | 160   | 195   | 230   | 290   |
| Radio noise filter          |                                   |       | Built-in                                                        |                                              |       |       |       |       |       |       |       |
| Weight (kg)                 |                                   |       | 14                                                              | 22                                           | 30    | 30    | 30    | 60    | 60    | 80    | 80    |
| Braking                     | Regenerative braking              |       | Built-in braking resistor circuit                               | Regenerative braking unit separately mounted |       |       |       |       |       |       |       |
|                             | Minimum connection resistance (Ω) |       | 20                                                              | —                                            |       |       |       |       |       |       |       |



## Common Specifications

| Item                              |                                   | Specifications                                                                                                                                                                                                                               |
|-----------------------------------|-----------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Enclosure rating                  |                                   | IP20 up to 55 kW, IP00 from 75 to 132 kW                                                                                                                                                                                                     |
| Cooling method                    |                                   | Forced air cooling                                                                                                                                                                                                                           |
| Control method                    |                                   | Phase-to-phase sinusoidal modulation PWM                                                                                                                                                                                                     |
| Output frequency range            |                                   | 0.1 to 400 Hz                                                                                                                                                                                                                                |
| Frequency precision               |                                   | Digital command: $\pm 0.01\%$ of the max. frequency<br>Analog command: $\pm 0.2\%$ of the max. frequency ( $25^{\circ}\text{C} \pm 10^{\circ}\text{C}$ )                                                                                     |
| Frequency resolution              |                                   | Digital setting: 0.01 Hz<br>Analog setting: Max. frequency/4000<br>(Terminal O: 12 bits/0 to +10 V), (Terminal O2: 12 bits/-10 to +10 V),<br>(Terminal OI: 12 bits/0 to +20 mA)                                                              |
| Voltage/Frequency characteristics |                                   | V/f optionally changeable at base frequencies of 30 to 400 Hz, V/f braking constant torque, reduction torque, sensor-less vector control, sensor-less vector control at 0 Hz                                                                 |
| Speed fluctuation                 |                                   | $\pm 0.5\%$ (under sensor-less vector control or sensor-less vector control at 0 Hz)                                                                                                                                                         |
| Overload current rating           |                                   | 150%/60s, 200%/3s for CT and 120%/60s for VT                                                                                                                                                                                                 |
| Acceleration/Deceleration time    |                                   | 0.01 to 3600.0 s (line/curve selection)                                                                                                                                                                                                      |
| Starting torque                   |                                   | 200%/0.3 Hz<br>(under sensor-less vector control or sensor-less vector control at 0 Hz)                                                                                                                                                      |
|                                   |                                   | 150%/Torque at 0 Hz (under sensor-less vector control at 0 Hz, when a motor size one rank lower than specified is connected)                                                                                                                 |
| DC injection braking              |                                   | Operates when the starting frequency is lower than that in deceleration via the STOP command, when the frequency reference is lower than the operation frequency, or via an external input (braking power, time, and frequency are variable) |
| Input                             | Frequency settings                | Standard Digital Operator<br>Setting via   keys                        |
|                                   |                                   | External signal<br>0 to +10 V DC, -10 to +10 V DC (Input impedance: 10 k $\Omega$ )<br>4 to 20 mA (Input impedance: 100 $\Omega$ )                                                                                                           |
|                                   |                                   | External port<br>Setting through RS485 communication                                                                                                                                                                                         |
|                                   | Forward or reverse operation/Stop | Standard Digital Operator<br>RUN/STOP (Forward/reverse switched via the parameter settings)                                                                                                                                                  |
|                                   |                                   | External signal<br>Forward/Stop (Reverse/Stop available at the time of multi-functional input terminal allocation)<br>3-wire input available (at the time of control circuit terminal block allocation)                                      |
|                                   |                                   | External port<br>Setting through RS485 communication                                                                                                                                                                                         |

| Item            |                                        | Specifications                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|-----------------|----------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Input           | Multi-function input                   | <p>8 terminals, NO/NC switchable, sink/source logic switchable</p> <p>[Terminal function] 8 functions can be selected from among 61.</p> <p>Reverse (RV), Multi-step speed setting binary 1 (CF1), Multi-step speed setting binary 2 (CF2), Multi-step speed setting binary 3 (CF3), Multi-step speed setting binary 4 (CF4), Jogging (JG), DC injection braking (DB), 2nd control (SET), 2-step acceleration/deceleration (2CH), Free-run stop (FRS), External trip (EXT), USP function (USP), Commercial switching (CS), Soft lock (SFT), Analog input switching (AT), 3rd control (SET3), Reset (RS), 3-wire start (STA), 3-wire stop (STP), 3-wire forward/reverse (F/R), PID enabled/disabled (PID), PID integral reset (PIDC), Control gain switching (CAS), UP/DWN function accelerated (UP), UP/DWN function decelerated (DWN), UP/DWN function data clear (UDC), Forced operator (OPE), Multi-step speed setting bit 1 (SF1), Multi-step speed setting bit 2 (SF2), Multi-step speed setting bit 3 (SF3), Multi-step speed setting bit 4 (SF4), Multi-step speed setting bit 5 (SF5), Multi-step speed setting bit 6 (SF6), Multi-step speed setting bit 7 (SF7), Overload limit switching (OLR), Torque limit enabled (TL), Torque limit switching 1 (TRQ1), Torque limit switching 2 (TRQ2), P/PI switching (PPI), Brake confirmation (BOK), Orientation (ORT), LAD cancel (LAC), Position deviation clear (PCLR), Pulse train position command input permission (STAT), Frequency addition function (ADD), Forced terminal block (F-TM), Torque reference input permission (ATR), Integrated power clear (KHC), Servo ON (SON), Preliminary excitation (FOC), Analog command on hold (AHD), Position command selection 1 (CP1), Position command selection 2 (CP2), Position command selection 3 (CP3), Zero return limit signal (ORL), Zero return startup signal (ORG), Forward driving stop (FOT), Reverse driving stop (ROT), Speed/Position switching (SPD), Pulse counter (PCNT), Pulse counter clear (PCC), No allocation (no)</p> |
|                 | Thermistor input terminal              | 1 terminal (Positive/Negative temperature coefficient of resistance element switchable)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Output          | Multi-function output                  | <p>5 open collector output terminals: NO/NC switchable, sink/source logic switchable</p> <p>1 relay (SPDT contact) output terminal: NO/NC switchable</p> <p>[Terminal function] 6 functions can be selected from among 45.</p> <p>Signal during RUN (RUN), Constant speed arrival signal (FA1), Over set frequency arrival signal (FA2), Overload warning (OL), Excessive PID deviation (OD), Alarm signal (AL), Set-frequency-only arrival signal (FA3), Overtorque (OTQ), Signal during momentary power interruption (IP), Signal during undervoltage (UV), Torque limit (TRQ), RUN time exceeded (RNT), Power ON time exceeded (ONT), Thermal warning (THM), Brake release (BRK), Brake error (BER), 0-Hz signal (ZS), Excessive speed deviation (DSE), Position ready (POK), Set frequency exceeded 2 (FA4), Set frequency only 2 (FA5), Overload warning 2 (OL2), Analog FV disconnection detection (FVDc), Analog FI disconnection detection (FIDc), Analog FE disconnection detection (FEDc), PID FB status output (FBV), Network error (NDc), Logic operation output 1 (LOG1), Logic operation output 2 (LOG2), Logic operation output 3 (LOG3), Logic operation output 4 (LOG4), Logic operation output 5 (LOG5), Logic operation output 6 (LOG6), Capacitor life warning (WAC), Cooling fan life warning (WAF), Starting contact signal (FR), Fan overheat warning (OHF), Light load detection signal (LOC), Operation ready (IRDY), Forward run (FWR), Reverse run (RVR), Fatal fault (MJA), Window comparator FV (WCFV), Window comparator FI (WCFI), Window comparator FE (WCFE), Alarm codes 0 to 3 (AC0 to AC3)</p>                                                                                                                                                                                                                                                                                                                                                                                                                    |
|                 | Multi-function monitor output terminal | Analog voltage output, Analog current output, Pulse train output (A-F, D-F {multiplied by "n", pulse output only}, A, T, V, P, etc.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Display monitor |                                        | Output frequency, Output current, Output torque, Frequency conversion value, Trip record, I/O terminal status, Electric power, etc.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Other functions |                                        | V/f free setting (7), Upper/lower frequency limit, Frequency jump, Curve acceleration/deceleration, Manual torque boost level/break, Energy-saving operation, Analog meter adjustment, Starting frequency, Carrier frequency adjustment, Electronic thermal function, (free setting available), External start/end (frequency/rate), Analog input selection, Trip retry, Restart during momentary power interruption, Various signal outputs, Reduced voltage startup, Overload limit, Initialization value setting, Automatic deceleration at power-off, AVR function, Automatic acceleration/deceleration, Auto tuning (Online/Offline), High-torque multi-motor operation control (sensor-less vector control of two monitors with one Inverter)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |

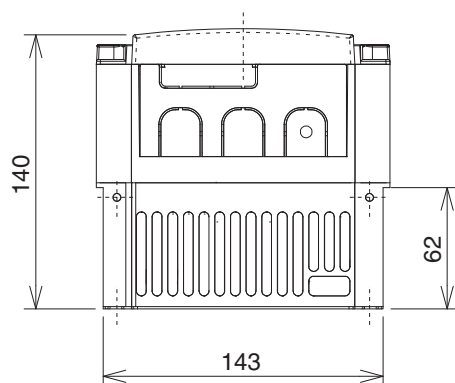
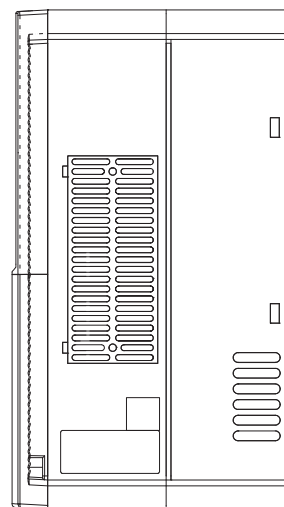
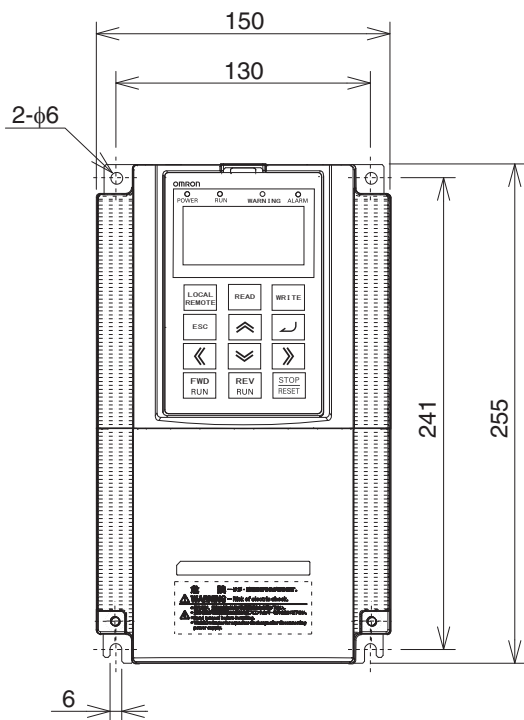
| Item                                 |                                       | Specifications                                                                                                                                                                                                                                                                                                                                                                                                       |
|--------------------------------------|---------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Carrier frequency modification range |                                       | 0.5 to 15 kHz for CT, 0.5 to 12 kHz for VT                                                                                                                                                                                                                                                                                                                                                                           |
| Protective functions                 |                                       | Overcurrent protection, Overvoltage protection, Undervoltage protection, Electronic thermal protection, Temperature error protection, Momentary power interruption/Power interruption protection, Input phase loss protection, Braking resistor overload protection, Ground-fault current detection at power-on, USP error, External trip, Emergency shutoff trip, CT error, Communication error, Option error, etc. |
| Operating environment                | Ambient/Storage temperature/ Humidity | -10°C to 50°C/-20°C to 65°C/20% to 90% RH (with no condensation)                                                                                                                                                                                                                                                                                                                                                     |
|                                      | Vibration *                           | 3G3RX-A□004 to A□220<br>5.9 m/s <sup>2</sup> (0.6G), 10 to 55 Hz<br>3G3RX-A□300 to A□550, B4750 to B413K<br>2.94 m/s <sup>2</sup> (0.3G), 10 to 55 Hz                                                                                                                                                                                                                                                                |
|                                      | Location                              | At a maximum altitude of 1,000 m; indoors (without corrosive gases or dust)                                                                                                                                                                                                                                                                                                                                          |
| Options                              | Feedback option                       | Sensor vector control                                                                                                                                                                                                                                                                                                                                                                                                |
|                                      | Digital input option                  | 4-digit BCD, 16-bit binary                                                                                                                                                                                                                                                                                                                                                                                           |
| Other options                        |                                       | Braking resistor, AC reactor, DC reactor, Digital Operator cables, Noise filter, Braking unit, etc.                                                                                                                                                                                                                                                                                                                  |

\* Complies with the test method specified in JIS C0040 (1999).

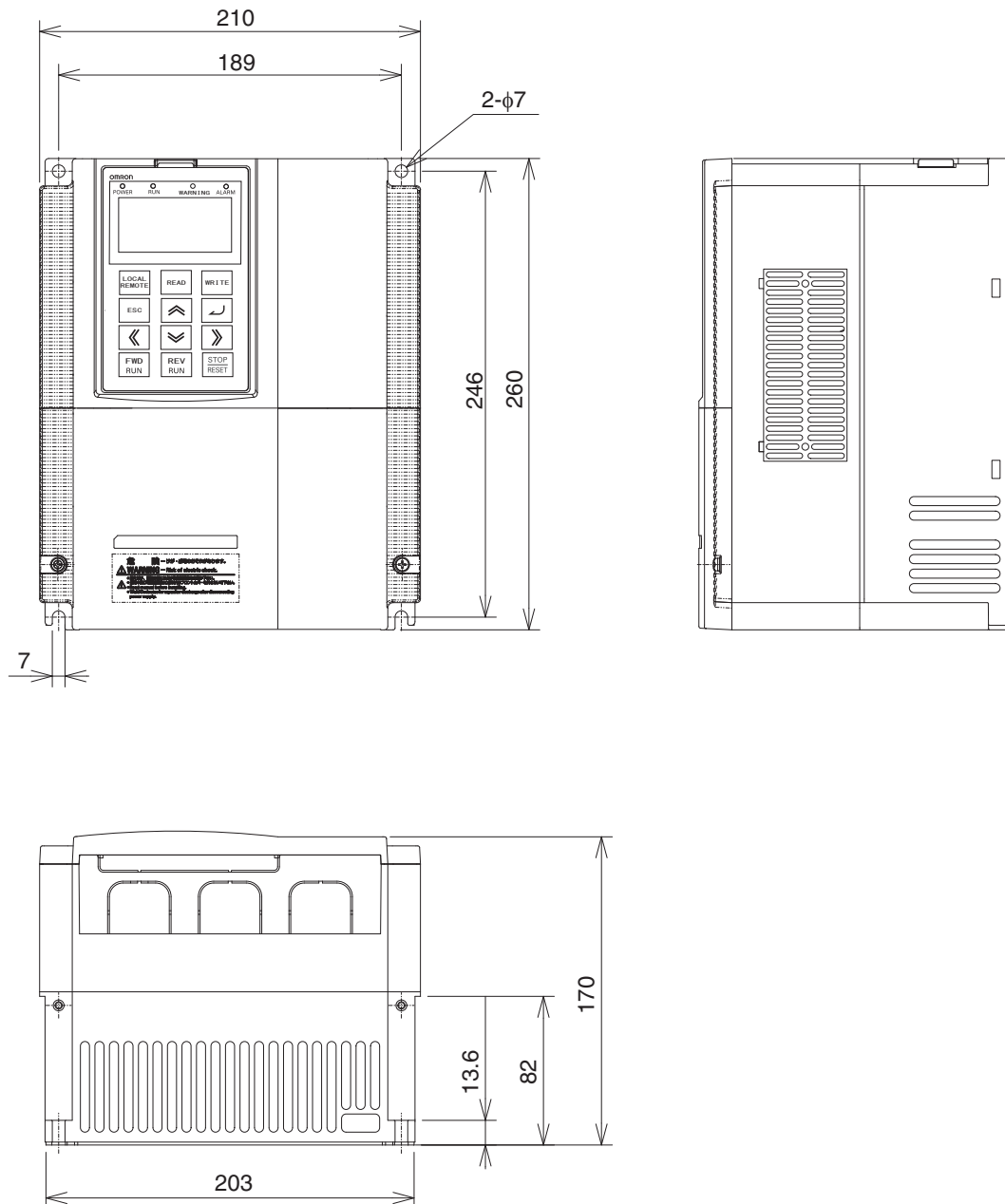
Note: Insulation distance complies with UL/CE standards.

## 7-2 Dimensional Drawing

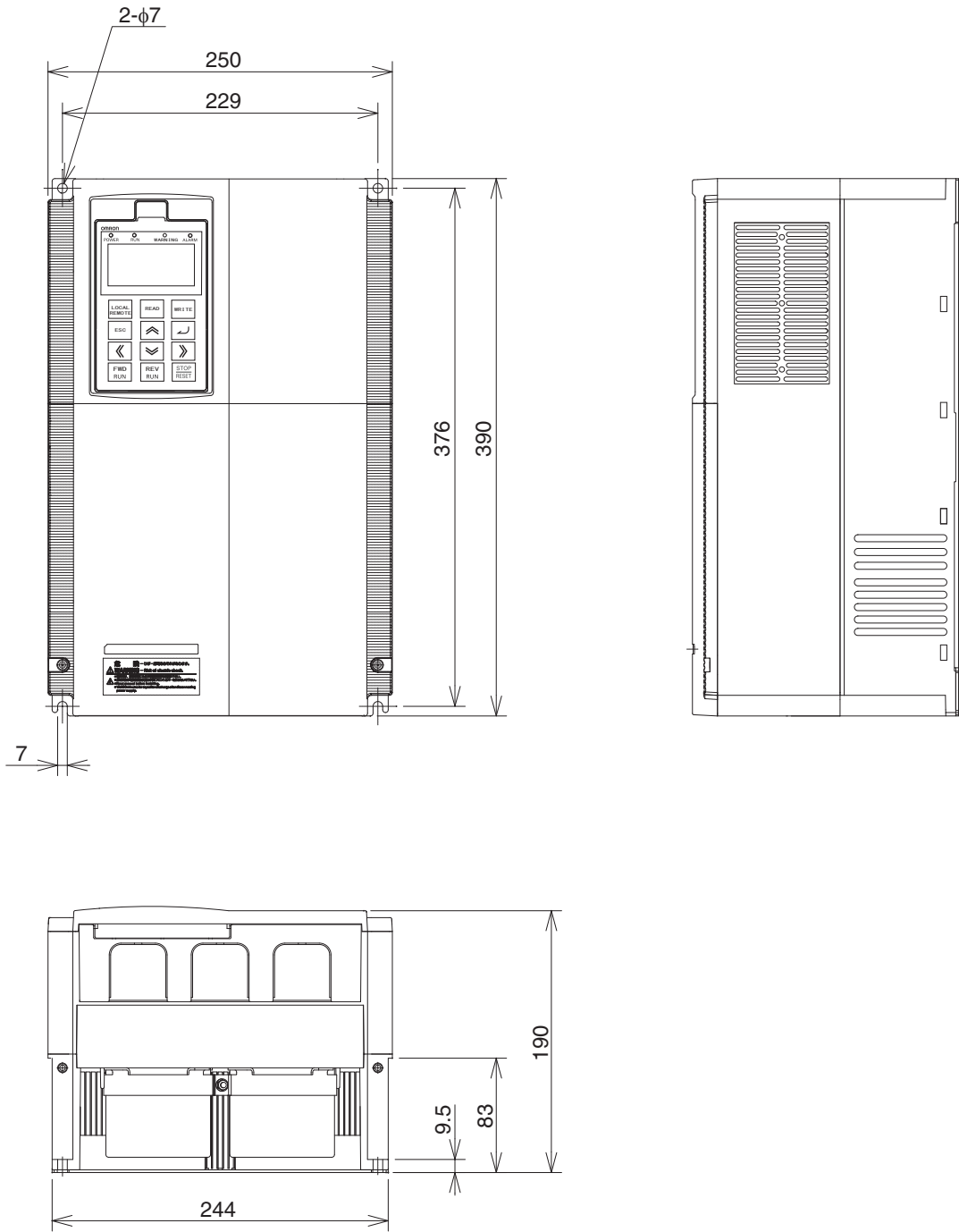
■ 3G3RX-A2004/A2007/A2015/A2022/A2037  
A4004/A4007/A4015/A4022/A4040



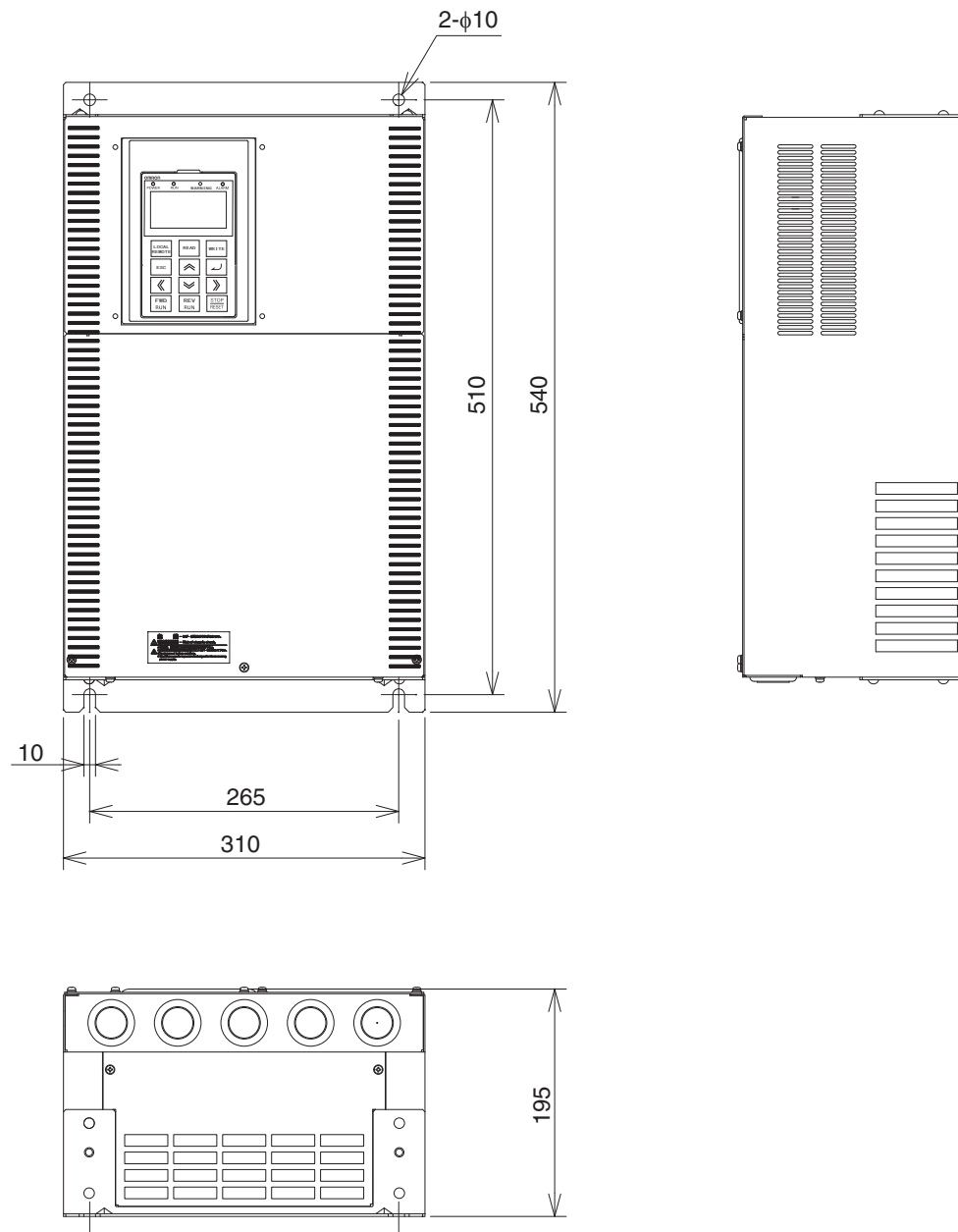
■ 3G3RX-A2055/A2075/A2110  
A4055/A4075/A4110



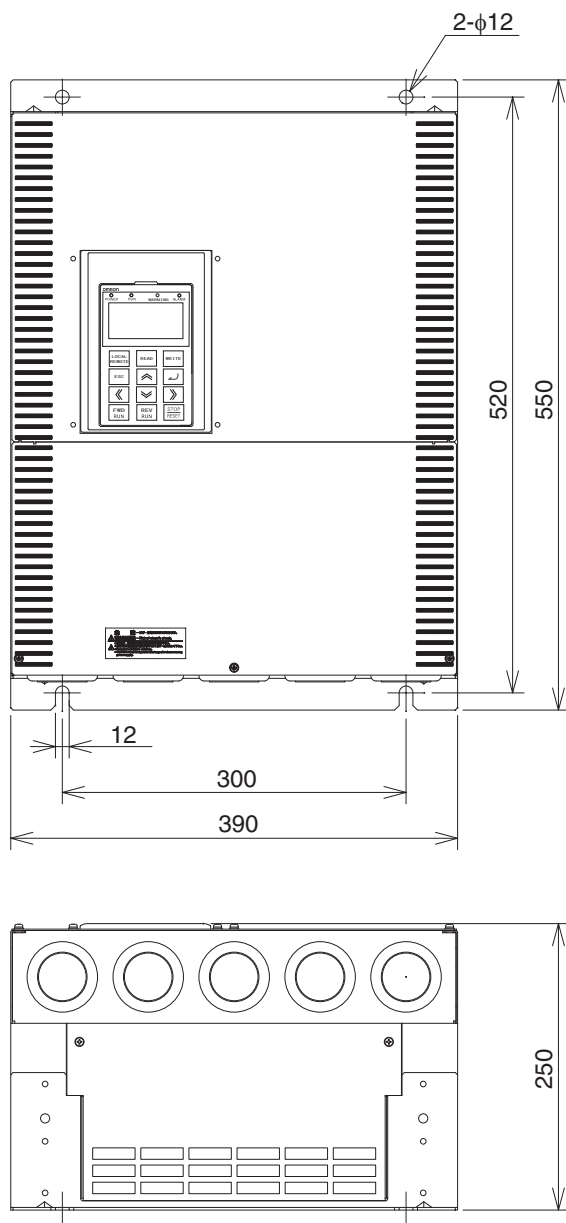
■ 3G3RX-A2150/A2185/A2220  
A4150/A4185/A4220



# **3G3RX-A2300/A4300**

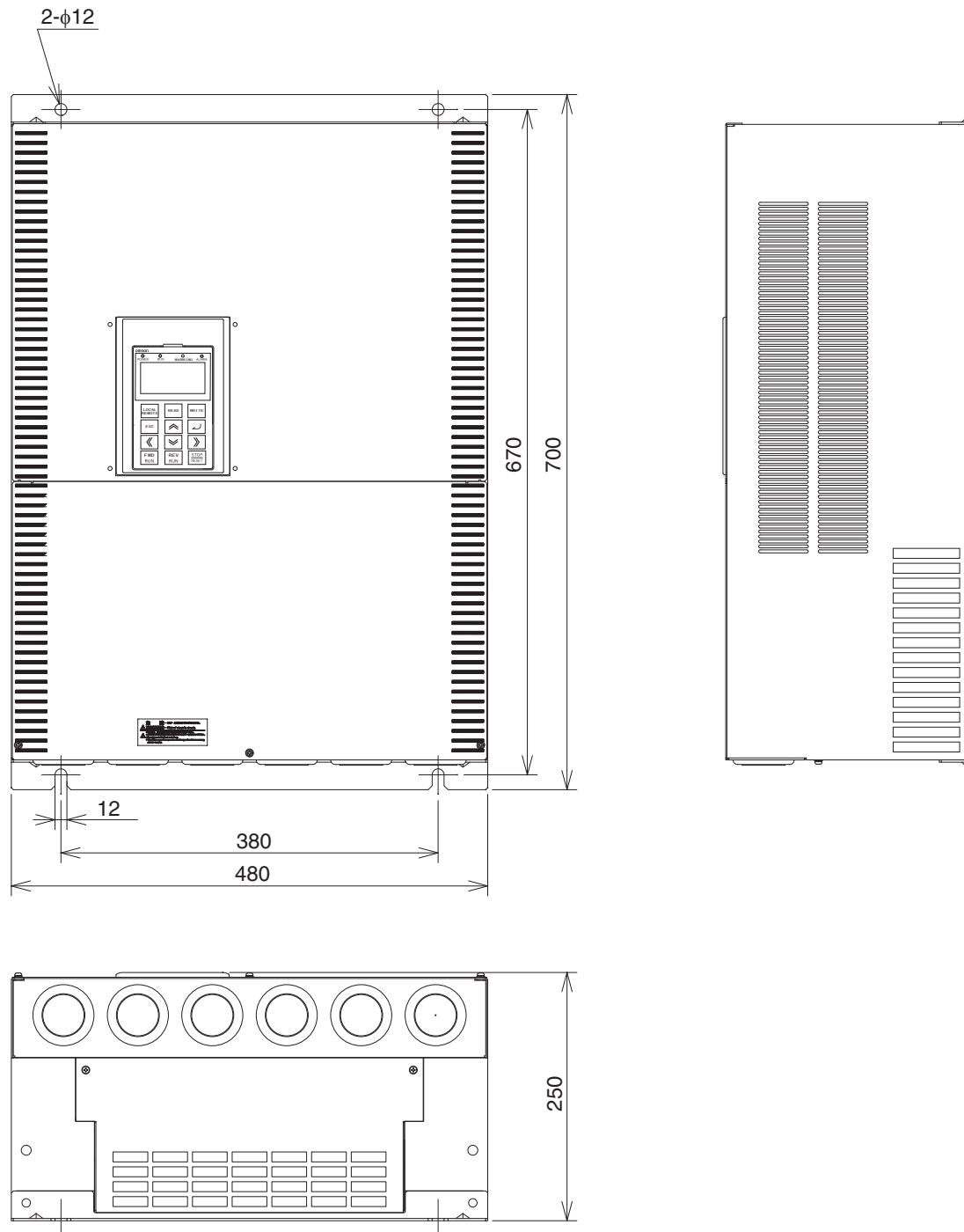


■ 3G3RX-A2370/A2450  
A4370/A4450/A4550

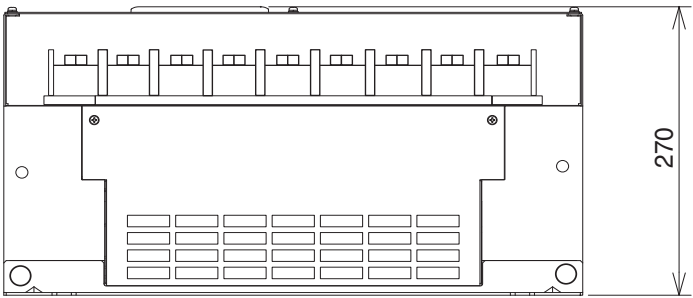
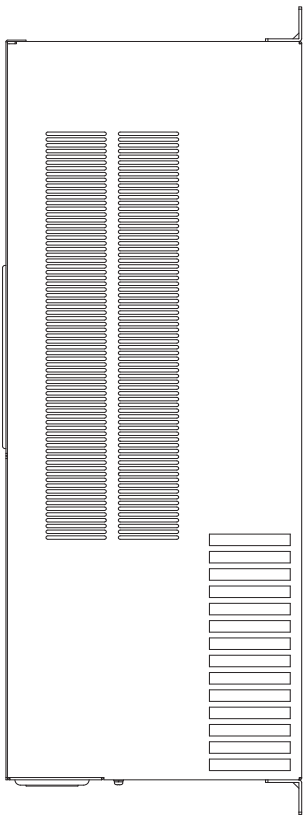
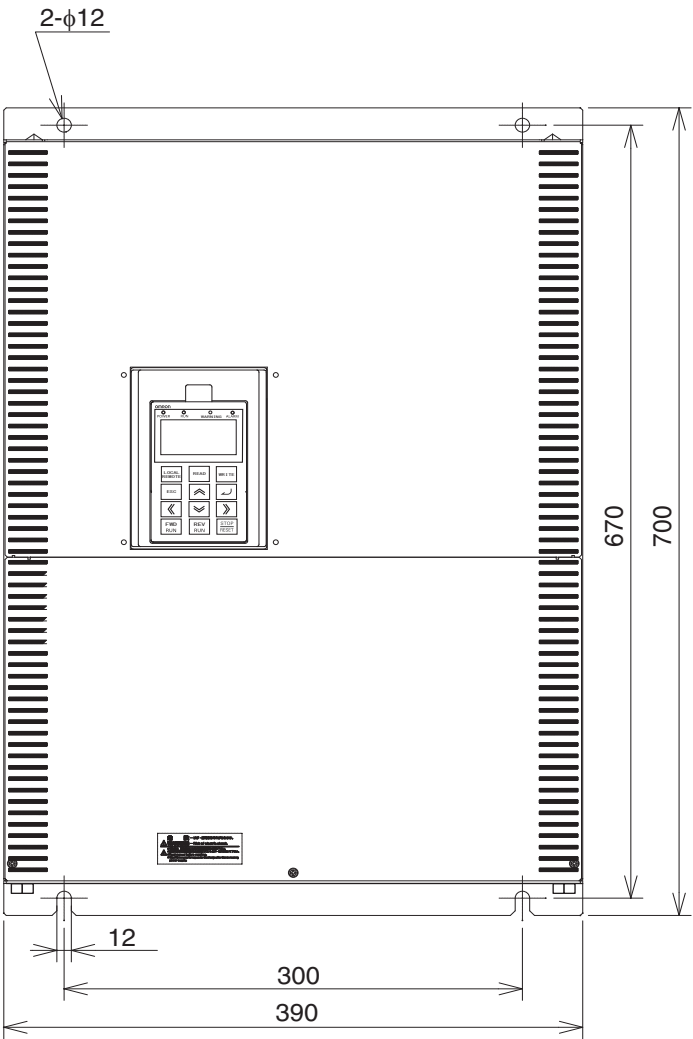




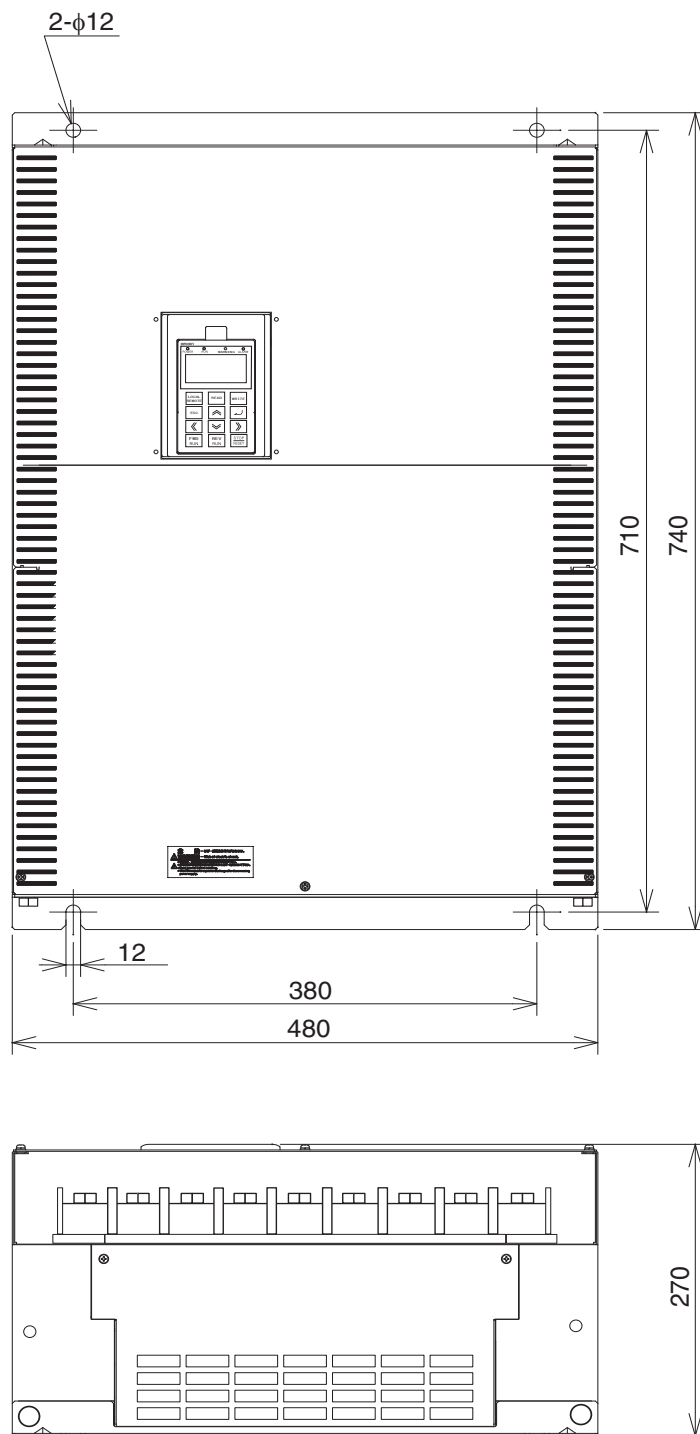
## ■ 3G3RX-A2550



■ 3G3RX-B4750/B4900



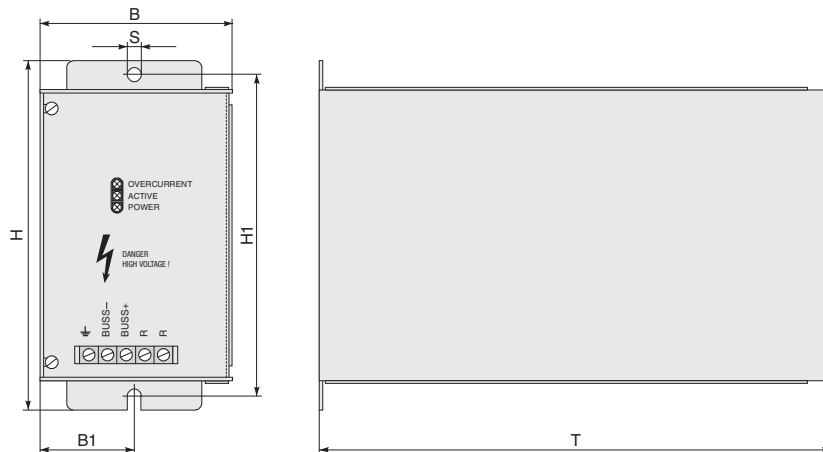
## ■ 3G3RX-B411K/B413K



## 7-3 Options

### Braking Unit (AX-BCR□□□□□□□-TE)

#### ■ Dimensional Drawing



| Reference        | Dimensions |      |     |     |     |   |
|------------------|------------|------|-----|-----|-----|---|
|                  | B          | B1   | H   | H1  | T   | S |
| AX-BCR4015045-TE | 82.5       | 40.5 | 150 | 138 | 220 | 6 |
| AX-BCR4017068-TE |            |      |     |     |     |   |
| AX-BCR2035090-TE | 130        | 64.5 | 205 | 193 | 208 | 6 |
| AX-BCR2070130-TE |            |      |     |     |     |   |
| AX-BCR4035090-TE |            |      |     |     |     |   |
| AX-BCR4070130-TE |            |      |     |     |     |   |
| AX-BCR4090240-TE | 131        | 64.5 | 298 | 280 | 300 | 9 |

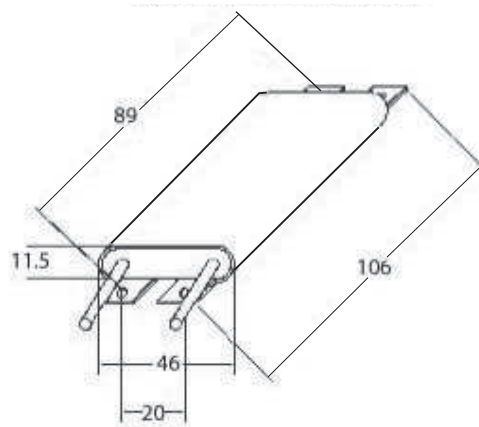
#### ■ Specifications

| Voltage | Reference        | Specifications |                   |               |                   |                                     |                       |
|---------|------------------|----------------|-------------------|---------------|-------------------|-------------------------------------|-----------------------|
|         |                  | Permanent      |                   | Peak (5s max) |                   | Minimum connectable resistor (Ohms) | Superfast fuse F2 (A) |
|         |                  | Current (A)    | Brake power (KVA) | Current (A)   | Brake power (KVA) |                                     |                       |
| 200V    | AX-BCR2035090-TE | 35             | 13                | 90            | 32                | 4                                   | 100                   |
|         | AX-BCR2070130-TE | 70             | 25                | 130           | 47                | 2.8                                 | 125                   |
| 400V    | AX-BCR4015045-TE | 15             | 11                | 45            | 33                | 16                                  | 50                    |
|         | AX-BCR4017068-TE | 17             | 13                | 68            | 51                | 11                                  | 63                    |
|         | AX-BCR4035090-TE | 35             | 26                | 90            | 67                | 8.5                                 | 100                   |
|         | AX-BCR4070130-TE | 70             | 52                | 130           | 97                | 5.5                                 | 125                   |
|         | AX-BCR4090240-TE | 90             | 67                | 240           | 180               | 3.2                                 | 250                   |

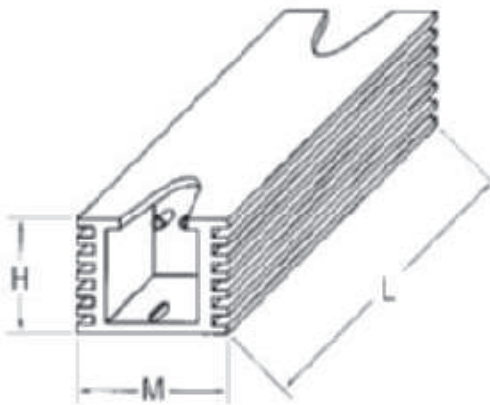
## Braking Resistor (AX-REM□□K□□□□-IE)

### ■ Dimensional Drawing

AX-REM00K1200/400-IE



AX-REM00K2/4/5/6□□□-IE

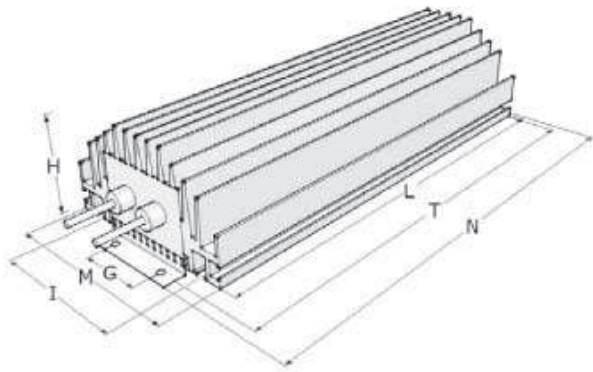


7

Specifications

| Type             | Specifications          |           | Dimensions |    |    |     |   | Weight |
|------------------|-------------------------|-----------|------------|----|----|-----|---|--------|
|                  | Resistance ( $\Omega$ ) | Power (W) | L          | H  | M  | I   | T | KG     |
| AX-REM00K2070-IE | 70                      | 200       | 105        | 27 | 36 | 94  | - | 0.2    |
| AX-REM00K2120-IE | 120                     | 200       |            |    |    |     |   |        |
| AX-REM00K2200-IE | 200                     | 200       |            |    |    |     |   |        |
| AX-REM00K4075-IE | 75                      | 400       | 200        | 27 | 36 | 189 | - | 0.425  |
| AX-REM00K4035-IE | 35                      | 400       |            |    |    |     |   |        |
| AX-REM00K4030-IE | 30                      | 400       |            |    |    |     |   |        |
| AX-REM00K5120-IE | 120                     | 500       | 260        | 27 | 36 | 249 | - | 0.58   |
| AX-REM00K6100-IE | 100                     | 600       | 320        | 27 | 36 | 309 | - | 0.73   |
| AX-REM00K6035-IE | 35                      | 600       |            |    |    |     |   |        |

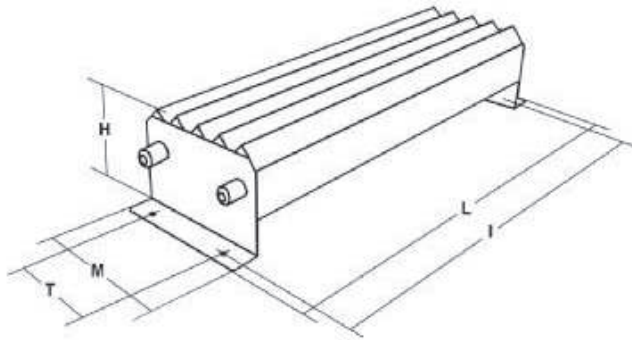
AX-REM00K9□□□-IE



| Type             | Specifications          |           | Dimensions |    |     |    |     |    |     | Weight |
|------------------|-------------------------|-----------|------------|----|-----|----|-----|----|-----|--------|
|                  | Resistance ( $\Omega$ ) | Power (W) | L          | H  | M   | I  | T   | G  | N   | KG     |
| AX-REM00K9070-IE | 70                      | 900       | 200        | 61 | 100 | 74 | 211 | 40 | 230 | 1.41   |
| AX-REM00K9020-IE | 20                      | 900       |            |    |     |    |     |    |     |        |
| AX-REM00K9017-IE | 17                      | 900       |            |    |     |    |     |    |     |        |

7

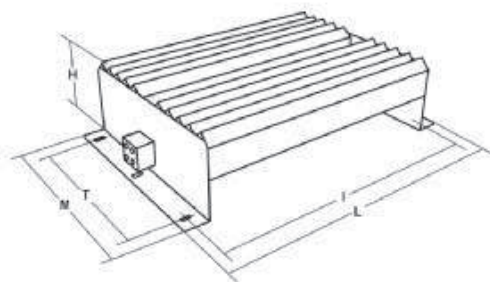
AX-REM01K9□□□-IE



| Type             | Specifications          |           | Dimensions |    |     |     |    | Weight |
|------------------|-------------------------|-----------|------------|----|-----|-----|----|--------|
|                  | Resistance ( $\Omega$ ) | Power (W) | L          | H  | M   | I   | T  | KG     |
| AX-REM01K9070-IE | 70                      | 1900      | 365        | 73 | 105 | 350 | 70 | 4      |
| AX-REM01K9017-IE | 17                      | 1900      |            |    |     |     |    |        |

Specifications

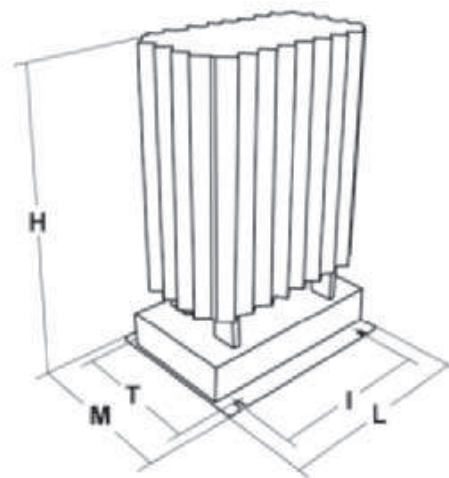
## AX-REM02/03K□□□□-IE



| Type             | Specifications          |           | Dimensions |     |     |     |     | Weight |
|------------------|-------------------------|-----------|------------|-----|-----|-----|-----|--------|
|                  | Resistance ( $\Omega$ ) | Power (W) | L          | H   | M   | I   | T   | KG     |
| AX-REM02K1070-IE | 70                      | 2100      | 310        | 100 | 240 | 295 | 210 | 7      |
| AX-REM02K1017-IE | 17                      | 2100      |            |     |     |     |     |        |
| AX-REM03K5035-IE | 35                      | 3500      | 365        | 100 | 240 | 350 | 210 | 8      |
| AX-REM03K5010-IE | 10                      | 3500      |            |     |     |     |     |        |

7

## AX-REM19/38K□□□□-IE



| Type             | Specifications          |           | Dimensions |     |     |     |    | Weight |
|------------------|-------------------------|-----------|------------|-----|-----|-----|----|--------|
|                  | Resistance ( $\Omega$ ) | Power (W) | L          | H   | M   | I   | T  | KG     |
| AX-REM19K0030-IE | 30                      | 19000     | 206        | 350 | 140 | 190 | 50 | 8.1    |
| AX-REM19K0020-IE | 20                      | 19000     |            |     |     |     |    |        |
| AX-REM19K0008-IE | 8                       | 19000     |            |     |     |     |    |        |
| AX-REM19K0006-IE | 6                       | 19000     |            |     |     |     |    |        |
| AX-REM38K0012-IE | 12                      | 38000     | 306        | 350 | 140 | 290 | 50 | 14.5   |

Specifications

## ■ Simplified Selection Table for Braking Unit and Braking Resistor

| Inverter                       |       |       |                      | Braking resistor unit |                                           |               |                  |                                                                            |               |                  |               |
|--------------------------------|-------|-------|----------------------|-----------------------|-------------------------------------------|---------------|------------------|----------------------------------------------------------------------------|---------------|------------------|---------------|
| Max. motor kW                  |       | RX□   | Braking Unit AX-BCR□ | min. resistance Ω     | Inverter mounted type (3 %ED, 10 sec max) |               | Braking torque % | External resistor 10%ED 10 sec max for built-in 5 sec max for Braking Unit |               | Braking torque % |               |
|                                |       | 3-pha |                      |                       | Type AX-                                  | Resist Ω      |                  | Type AX-                                                                   | Resist Ω      |                  |               |
| 200 V<br>(single-/three-phase) | 0.55  | 2004  | Built-in             | 50                    | REM00K1200-IE                             | 200           | 180              | REM00K1200-IE                                                              | 200           | 180              |               |
|                                | 1.1   | 2007  |                      |                       |                                           |               | 100              | REM00K2070-IE                                                              | 70            | 200              |               |
|                                | 1.5   | 2015  |                      | 35                    | REM00K2070-IE                             | 70            | 140              | REM00K4075-IE                                                              | 75            | 130              |               |
|                                | 2.2   | 2022  |                      |                       |                                           |               | 90               | REM00K4035-IE                                                              | 35            | 180              |               |
|                                | 4.0   | 2037  |                      |                       |                                           |               | 50               | REM00K6035-IE                                                              | 35            | 100              |               |
|                                | 5.5   | 2055  |                      | 16                    | REM00K4035-IE                             | 35            | 75               | REM00K9017-IE                                                              | 17            | 150              |               |
|                                | 7.5   | 2075  |                      | 10                    |                                           |               | 55               | REM01K9017-IE                                                              | 17            | 110              |               |
|                                | 11.0  | 2110  |                      | 7.5                   | REM00K6035-IE                             | 35            | 40               | REM02K1017-IE                                                              | 17            | 75               |               |
|                                | 15.0  | 2150  |                      |                       |                                           |               | 55               | REM03K5010-IE                                                              | 10            | 95               |               |
|                                | 18.5  | 2185  |                      |                       |                                           |               | 75               | REM03K5010-IE                                                              | 10            | 75               | REM19K0008-IE |
|                                | 22.0  | 2220  |                      | 65                    | 80                                        |               |                  |                                                                            |               |                  |               |
|                                | 30.0  | 2300  | 2035090-TE           | 4                     |                                           |               |                  | REM19K0006-IE                                                              | 6             | 80               |               |
|                                | 37.0  | 2370  |                      |                       |                                           |               |                  |                                                                            | 6             | 60               |               |
|                                | 45.0  | 2450  | 2070130-TE           | 2.8                   |                                           |               |                  | 2 x REM19K0006-IE                                                          | 3             | 105              |               |
|                                | 55.0  | 2550  |                      |                       |                                           |               |                  |                                                                            | 3             | 85               |               |
| 400 V<br>(three-phase)         | 0.55  | 4004  | Built-in             | 100                   | REM00K1400-IE                             | 400           | 200              | REM00K1400-IE                                                              | 400           | 200              |               |
|                                | 1.1   | 4007  |                      |                       |                                           |               | 200              |                                                                            |               | 200              |               |
|                                | 1.5   | 4015  |                      |                       | REM00K1200-IE                             | 200           | 190              | REM00K2200-IE                                                              | 200           | 190              |               |
|                                | 2.2   | 4022  |                      |                       | REM00K2200-IE                             | 200           | 130              | REM00K5120-IE                                                              | 120           | 200              |               |
|                                | 4.0   | 4040  |                      | 70                    | REM00K2120-IE                             | 120           | 120              | REM00K6100-IE                                                              | 100           | 140              |               |
|                                | 5.5   | 4055  |                      |                       | REM00K4075-IE                             | 75            | 140              | REM00K9070-IE                                                              | 70            | 150              |               |
|                                | 7.5   | 4075  |                      |                       |                                           |               | 100              | REM01K9070-IE                                                              | 70            | 110              |               |
|                                | 11.0  | 4110  |                      | 35                    | REM00K6100-IE                             | 100           | 50               | REM02K1070-IE                                                              | 70            | 75               |               |
|                                | 15.0  | 4150  |                      |                       | 24                                        | REM00K9070-IE | 70               | 55                                                                         | REM03K5035-IE | 35               | 110           |
|                                | 18.5  | 4185  |                      |                       |                                           | REM03K5035-IE | 35               | 90                                                                         | REM19K0030-IE | 30               | 100           |
|                                | 22.0  | 4220  |                      | 75                    | 85                                        |               |                  |                                                                            |               |                  |               |
|                                | 30.0  | 4300  | 4015045-TE           | 16                    |                                           |               |                  | REM19K0020-IE                                                              | 20            | 95               |               |
|                                | 37.0  | 4370  | 4017068-TE           | 11                    |                                           |               |                  | REM38K0012-IE                                                              | 12            | 125              |               |
|                                | 45.0  | 4450  |                      |                       |                                           |               |                  |                                                                            |               | 100              |               |
|                                | 55.0  | 4550  | 4035090-TE           | 8.5                   |                                           |               |                  | 2 x REM19K0020-IE                                                          | 10            | 100              |               |
|                                | 75.0  | 4750  |                      |                       |                                           |               |                  | 3 x REM19K0030-IE                                                          | 10            | 75               |               |
|                                | 90.0  | 4900  | 4070130-TE           | 5.5                   |                                           |               |                  | 2 x REM38K0012-IE                                                          | 6             | 105              |               |
|                                | 110.0 | 411K  | 4090240-TE           | 3.2                   |                                           |               |                  | 3 x REM38K0012-IE                                                          | 4             | 125              |               |
|                                | 132.0 | 413K  |                      |                       |                                           |               |                  |                                                                            |               | 105              |               |

(1) Inverter specifications (choose voltage, capacity, and model)

The content noted in the table assumes the case of combining one Inverter and one motor of the same capacity.

(2) Select the %ED. Use the %ED that is equivalent to or lower than the value shown.



(3) Table above just contain typical recommended values that could work correctly in a wide range of applications. But special precaution and selection should be done when very large braking torque or continuous regeneration is required (for example cranes).

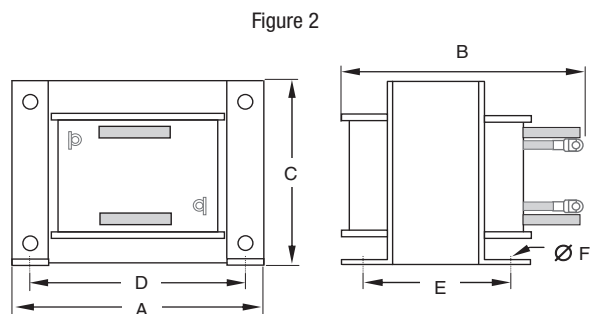
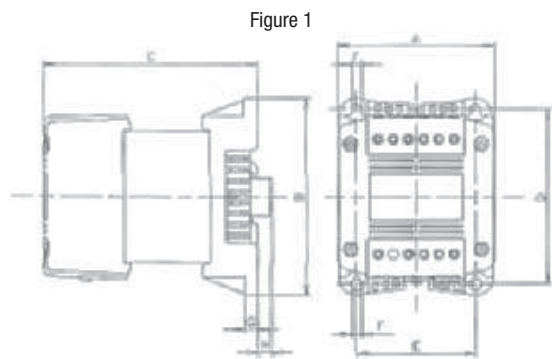
(5) The specified conditions contain restrictions. Make sure there are not any issues

\* Calculated based on using a standard 4-pole motor.

\* The simplified selection table above cannot be used in cases where a 10% ED is exceeded

## DC Reactor (AX-RC□□□□□□□□-DE)

### ■ Dimensional Drawing



| Voltage | Reference<br>AX-RC | Fig | Dimensions |     |       |     |     |      |     |     | Kg   |      |      |     |
|---------|--------------------|-----|------------|-----|-------|-----|-----|------|-----|-----|------|------|------|-----|
|         |                    |     | A          | B   | C     | D   | E   | F    | G   | H   |      |      |      |     |
| 200V    | 10700032-DE        | 1   | 84         | 113 | 96    | 101 | 66  | 5    | 7.5 | 2   | 1.22 |      |      |     |
|         | 06750061-DE        |     |            |     | 105   |     |     |      |     |     | 1.60 |      |      |     |
|         | 03510093-DE        |     |            |     | 116   |     |     |      |     |     | 1.95 |      |      |     |
|         | 02510138-DE        |     | 108        | 135 | 124   | 120 | 82  | 6.5  | 9.5 | 9.5 | 3.20 |      |      |     |
|         | 01600223-DE        |     | 120        | 152 | 136   | 135 | 94  | 7    |     |     | -    | 5.20 |      |     |
|         | 01110309-DE        |     |            |     | 146   |     |     |      |     |     |      | 6.00 |      |     |
|         | 00840437-DE        |     | 150        | 177 | 160   | 160 | 115 |      | 2   | -   |      | 11.4 |      |     |
|         | 00590614-DE        |     |            |     | 182.6 |     |     | 14.3 |     |     |      |      |      |     |
|         | 00440859-DE        |     |            |     |       |     |     |      |     |     |      |      |      |     |
|         | 00301275-DE        | 2   | 195        | 161 | 162.5 | 185 | 88  | 10   | -   | -   | 17.0 |      |      |     |
|         | 00231662-DE        |     |            | 196 |       |     | 123 |      |     |     | 25.5 |      |      |     |
|         | 00192015-DE        |     | 240        | 188 | 200   | 228 | 109 | 12   |     |     | 34.0 |      |      |     |
|         | 00162500-DE        |     |            | 198 |       |     | 119 |      |     |     | 38.0 |      |      |     |
|         | 00133057-DE        |     |            | 228 |       |     | 149 |      |     |     | 42.0 |      |      |     |
| 400V    | 43000020-DE        | 1   | 84         | 113 | 96    | 101 | 66  | 5    | 7.5 | 2   | 1.22 |      |      |     |
|         | 27000030-DE        |     |            |     | 105   |     |     |      |     |     | 1.60 |      |      |     |
|         | 14000047-DE        |     |            |     | 116   |     |     |      |     |     | 1.95 |      |      |     |
|         | 10100069-DE        |     | 108        | 135 | 133   | 120 | 82  | 6.5  | 9.5 | 9.5 | 3.70 |      |      |     |
|         | 06400116-DE        |     | 120        | 152 | 136   | 135 | 94  | 7    |     |     | -    | 5.20 |      |     |
|         | 04410167-DE        |     |            |     | 146   |     |     |      |     |     |      | 6.00 |      |     |
|         | 03350219-DE        |     | 150        | 177 | 160   | 160 | 115 |      | 7   | 2   |      | -    | 11.4 |     |
|         | 02330307-DE        |     |            |     | 182.6 |     |     | 14.3 |     |     |      |      |      |     |
|         | 01750430-DE        |     |            |     |       |     |     |      |     |     |      |      |      |     |
|         | 01200644-DE        | 2   | 195        | 161 | 162.5 | 185 | 88  | 10   | -   | -   | 17.0 |      |      |     |
|         | 00920797-DE        |     |            | 196 |       |     | 123 |      |     |     | 25.5 |      |      |     |
|         | 00741042-DE        |     | 240        | 188 | 200   | 228 | 109 | 12   |     |     | -    | -    | 34.0 |     |
|         | 00611236-DE        |     |            | 198 |       |     | 119 |      |     |     |      |      | 38.0 |     |
|         | 00501529-DE        |     |            | 228 |       |     | 149 |      |     |     |      |      | 42.0 |     |
|         | 00372094-DE        |     |            |     |       |     |     |      |     |     |      |      |      | 133 |
|         | 00312446-DE        |     | 300        | 216 | 250   | 288 | 133 |      |     |     |      |      |      |     |
|         | 00252981-DE        |     |            |     |       |     |     | 236  |     |     | 79.0 |      |      |     |
|         | 00213613-DE        |     |            |     |       |     |     |      |     |     |      |      |      |     |

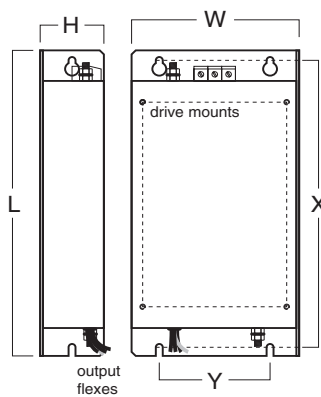
## ■ Specifications

| Voltage | Inverter Type<br>RX- | Max. applicable<br>motor output kW | Reference        | Current value (A) | Inductance (mH) |
|---------|----------------------|------------------------------------|------------------|-------------------|-----------------|
| 200V    | A2004                | 0.4                                | AX-RC10700032-DE | 3.2               | 10.70           |
|         | A2007                | 0.7                                | AX-RC06750061-DE | 6.1               | 6.75            |
|         | A2015                | 1.5                                | AX-RC03510093-DE | 9.3               | 3.51            |
|         | A2022                | 2.2                                | AX-RC02510138-DE | 13.8              | 2.51            |
|         | A2037                | 3.7                                | AX-RC01600223-DE | 22.3              | 1.60            |
|         | A2055                | 5.5                                | AX-RC01110309-DE | 30.9              | 1.11            |
|         | A2075                | 7.5                                | AX-RC00840437-DE | 43.7              | 0.84            |
|         | A2110                | 11.0                               | AX-RC00590614-DE | 61.4              | 0.59            |
|         | A2150                | 15.0                               | AX-RC00440859-DE | 85.9              | 0.44            |
|         | A2185 / A2220        | 18.5 to 22                         | AX-RC00301275-DE | 127.5             | 0.30            |
|         | A2300                | 30                                 | AX-RC00231662-DE | 166.2             | 0.23            |
|         | A2370                | 37                                 | AX-RC00192015-DE | 201.5             | 0.19            |
|         | A2450                | 45                                 | AX-RC00162500-DE | 250.0             | 0.16            |
|         | A2550                | 55                                 | AX-RC00133057-DE | 305.7             | 0.13            |
| 400V    | A4004                | 0.4                                | AX-RC43000020-DE | 2.0               | 43.00           |
|         | A4007                | 0.7                                | AX-RC27000030-DE | 3.0               | 27.00           |
|         | A4015                | 1.5                                | AX-RC14000047-DE | 4.7               | 14.00           |
|         | A4022                | 2.2                                | AX-RC10100069-DE | 6.9               | 10.10           |
|         | A4040                | 4.0                                | AX-RC06400116-DE | 11.6              | 6.40            |
|         | A4055                | 5.5                                | AX-RC04410167-DE | 16.7              | 4.41            |
|         | A4075                | 7.5                                | AX-RC03350219-DE | 21.9              | 3.35            |
|         | A4110                | 11.0                               | AX-RC02330307-DE | 30.7              | 2.33            |
|         | A4150                | 15.0                               | AX-RC01750430-DE | 43.0              | 1.75            |
|         | A4185 / A4220        | 18.5 to 22                         | AX-RC01200644-DE | 64.4              | 1.20            |
|         | A4300                | 30                                 | AX-RC00920797-DE | 79.7              | 0.92            |
|         | A4370                | 37                                 | AX-RC00741042-DE | 104.2             | 0.74            |
|         | A4450                | 45                                 | AX-RC00611236-DE | 123.6             | 0.61            |
|         | A4550                | 55                                 | AX-RC00501529-DE | 152.9             | 0.50            |
|         | B4750                | 75                                 | AX-RC00372094-DE | 209.4             | 0.37            |
|         | B4900                | 90                                 | AX-RC00312446-DE | 244.6             | 0.31            |
|         | B411K                | 110                                | AX-RC00252981-DE | 298.1             | 0.25            |
|         | B413K                | 132                                | AX-RC00213613-DE | 361.3             | 0.21            |

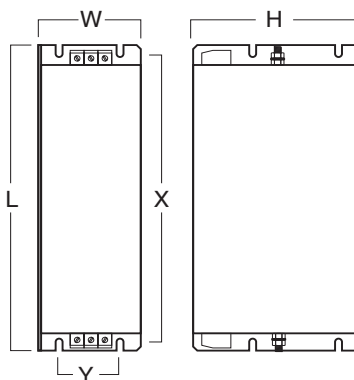
## External EMC Filter (AX-FIR□□□□-RE)

### ■ Dimensional Drawing

Footprint Dimensions



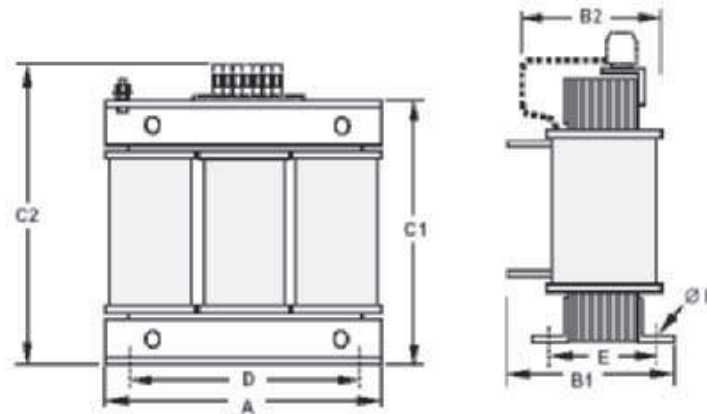
Book Type Dimensions



| Voltage     | Inverter model | Model         | Dimensions |     |     |     |     |    | Filter type | Weight<br>KG |      |
|-------------|----------------|---------------|------------|-----|-----|-----|-----|----|-------------|--------------|------|
|             |                |               | L          | W   | H   | X   | Y   | M  |             |              |      |
| 3x200 V     | 3G3RX-A2004    | AX-FIR2018-RE | 305        | 125 | 45  | 290 | 110 | M5 | Footprint   | 2.0          |      |
|             | 3G3RX-A2007    |               |            |     |     |     |     |    |             |              |      |
|             | 3G3RX-A2015    |               |            |     |     |     |     |    |             |              |      |
|             | 3G3RX-A2022    |               |            |     |     |     |     |    |             |              |      |
|             | 3G3RX-A2037    |               |            |     |     |     |     |    |             |              |      |
|             | 3G3RX-A2055    | AX-FIR2053-RE | 312        | 212 | 56  | 296 | 110 | M6 | Footprint   | 2.5          |      |
|             | 3G3RX-A2075    |               |            |     |     |     |     |    |             |              |      |
|             | 3G3RX-A2110    |               |            |     |     |     |     |    |             |              |      |
|             | 3G3RX-A2150    | AX-FIR2110-RE | 455        | 110 | 240 | 414 | 80  |    | Book type   | 8.0          |      |
|             | 3G3RX-A2185    |               |            |     |     |     |     |    |             |              |      |
|             | 3G3RX-A2220    |               |            |     |     |     |     |    |             |              |      |
|             | 3G3RX-A2300    | AX-FIR2145-RE |            |     |     |     |     |    |             | 8.6          |      |
|             | 3G3RX-A2370    | AX-FIR3250-RE |            |     |     |     |     |    |             |              |      |
|             | 3G3RX-A2450    | AX-FIR3320-RE |            |     |     |     |     |    |             |              | 13   |
| 3G3RX-A2550 |                | 13.2          |            |     |     |     |     |    |             |              |      |
| 3x400 V     | 3G3RX-A4004    | AX-FIR3010-RE | 305        | 125 | 45  | 290 | 110 | M5 | Footprint   | 1.9          |      |
|             | 3G3RX-A4007    |               |            |     |     |     |     |    |             |              |      |
|             | 3G3RX-A4015    |               |            |     |     |     |     |    |             |              |      |
|             | 3G3RX-A4022    |               |            |     |     |     |     |    |             |              |      |
|             | 3G3RX-A4040    |               |            |     |     |     |     |    |             |              |      |
|             | 3G3RX-A4055    | AX-FIR3030-RE | 312        | 212 | 50  | 296 | 189 | M6 | Footprint   | 2.2          |      |
|             | 3G3RX-A4075    |               |            |     |     |     |     |    |             |              |      |
|             | 3G3RX-A4110    |               |            |     |     |     |     |    |             |              |      |
|             | 3G3RX-A4150    | AX-FIR3053-RE | 451        | 252 | 60  | 435 | 229 | M6 | Footprint   | 4.5          |      |
|             | 3G3RX-A4185    |               |            |     |     |     |     |    |             |              |      |
|             | 3G3RX-A4220    |               |            |     |     |     |     |    |             |              |      |
|             | 3G3RX-A4300    | AX-FIR3064-RE | 598        | 310 | 70  | 578 | 265 | M8 | Book type   | 7.0          |      |
|             | 3G3RX-A4370    | AX-FIR3100-RE | 455        | 110 | 240 | 414 | 80  | -  |             | 8.0          |      |
|             | 3G3RX-A4450    | AX-FIR3130-RE |            |     |     |     |     |    |             | 8.6          |      |
|             | 3G3RX-A4550    |               |            |     |     |     |     |    |             |              |      |
|             | 3G3RX-B4750    | AX-FIR3250-RE | 386        | 260 | 135 | 240 | 235 | -  |             | Book type    | 13.0 |
|             | 3G3RX-B4900    |               |            |     |     |     |     |    |             |              |      |
|             | 3G3RX-B411K    |               |            |     |     |     |     |    |             |              |      |
|             | 3G3RX-B413K    | AX-FIR3320-RE |            |     |     |     |     |    |             |              | 13.2 |

## Output AC Reactor (AX-RAO□□□□□□□□-DE)

### ■ Dimensional Drawing



| Reference         | Dimensions |     |     |     |     |     | Weight Kg |
|-------------------|------------|-----|-----|-----|-----|-----|-----------|
|                   | A          | B2  | C2  | D   | E   | F   |           |
| AX-RAO11500026-DE | 120        | 70  | 120 | 80  | 52  | 5.5 | 1.78      |
| AX-RAO07600042-DE | 120        | 70  | 120 | 80  | 52  | 5.5 | 1.78      |
| AX-RAO04100075-DE | 120        | 80  | 120 | 80  | 62  | 5.5 | 2.35      |
| AX-RAO03000105-DE | 120        | 80  | 120 | 80  | 62  | 5.5 | 2.35      |
| AX-RAO01830160-DE | 180        | 85  | 190 | 140 | 55  | 6   | 5.5       |
| AX-RAO01150220-DE | 180        | 85  | 190 | 140 | 55  | 6   | 5.5       |
| AX-RAO00950320-DE | 180        | 85  | 205 | 140 | 55  | 6   | 6.5       |
| AX-RAO00630430-DE | 180        | 95  | 205 | 140 | 65  | 6   | 9.1       |
| AX-RAO00490640-DE | 180        | 95  | 205 | 140 | 65  | 6   | 9.1       |
| AX-RAO00390800-DE | 240        | 110 | 275 | 200 | 75  | 6   | 16.0      |
| AX-RAO00330950-DE | 240        | 110 | 275 | 200 | 75  | 6   | 16.0      |
| AX-RAO00251210-DE | 240        | 110 | 275 | 200 | 75  | 6   | 16.0      |
| AX-RAO00191450-DE | 240        | 120 | 275 | 200 | 85  | 6   | 18.6      |
| AX-RAO00161820-DE | 240        | 150 | 275 | 200 | 110 | 6   | 27.0      |
| AX-RAO00132200-DE | 240        | -   | -   | 200 | 110 | 6   | 27.0      |
| AX-RAO16300038-DE | 120        | 70  | 120 | 80  | 52  | 5.5 | 1.78      |
| AX-RAO11800053-DE | 120        | 80  | 120 | 80  | 52  | 5.5 | 2.35      |
| AX-RAO07300080-DE | 120        | 80  | 120 | 80  | 62  | 5.5 | 2.35      |
| AX-RAO04600110-DE | 180        | 85  | 190 | 140 | 55  | 6   | 5.5       |
| AX-RAO03600160-DE | 180        | 85  | 205 | 140 | 55  | 6   | 6.5       |
| AX-RAO02500220-DE | 180        | 95  | 205 | 140 | 55  | 6   | 9.1       |
| AX-RAO02000320-DE | 180        | 105 | 205 | 140 | 85  | 6   | 11.7      |
| AX-RAO01650400-DE | 240        | 110 | 275 | 200 | 75  | 6   | 16.0      |
| AX-RAO01300480-DE | 240        | 120 | 275 | 200 | 85  | 6   | 18.6      |
| AX-RAO01030580-DE | 240        | 120 | 275 | 200 | 85  | 6   | 18.6      |
| AX-RAO00800750-DE | 240        | 120 | 275 | 200 | 110 | 6   | 27.0      |
| AX-RAO00680900-DE | 240        | 150 | 275 | 200 | 110 | 6   | 27.0      |

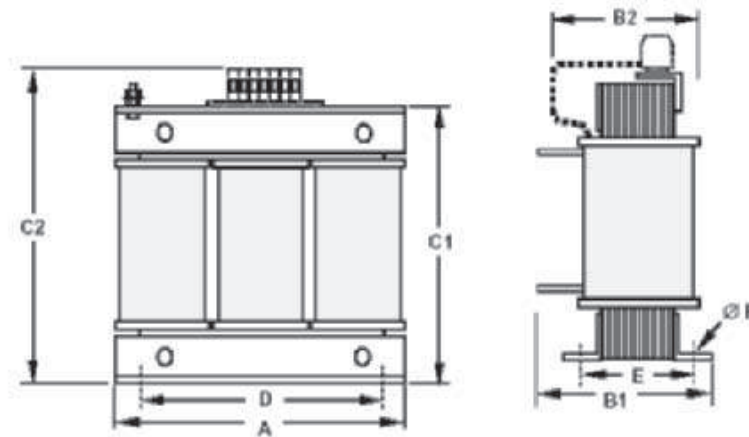
| Reference         | Dimensions |     |     |     |     |   | Weight Kg |
|-------------------|------------|-----|-----|-----|-----|---|-----------|
|                   | A          | B2  | C2  | D   | E   | F |           |
| AX-RAO00531100-DE | 240        | 150 | 275 | 200 | 110 | 6 | 27.0      |
| AX-RAO00401490-DE | 300        | 165 | 320 | 200 | 125 | 6 | 44.0      |
| AX-RAO00331760-DE | 300        | 165 | 320 | 200 | 125 | 6 | 44.0      |
| AX-RAO00262170-DE | 360        | -   | -   | 300 | 145 | 8 | 70.0      |
| AX-RAO00212600-DE | 360        | -   | -   | 300 | 145 | 8 | 70.0      |

## ■ Specifications

| Voltage     | Max. applicable motor output kW | Reference         | Current value (A) | Inductance (mH) |
|-------------|---------------------------------|-------------------|-------------------|-----------------|
| 200 V class | 0.4                             | AX-RAO11500026-DE | 2.6               | 11.50           |
|             | 0.75                            | AX-RAO07600042-DE | 4.2               | 7.60            |
|             | 1.5                             | AX-RAO04100075-DE | 7.5               | 4.10            |
|             | 2.2                             | AX-RAO03000105-DE | 10.5              | 3.00            |
|             | 3.7                             | AX-RAO01830160-DE | 16.0              | 1.83            |
|             | 5.5                             | AX-RAO01150220-DE | 22.0              | 1.15            |
|             | 7.5                             | AX-RAO00950320-DE | 32.0              | 0.95            |
|             | 11                              | AX-RAO00630430-DE | 43.0              | 0.63            |
|             | 15                              | AX-RAO00490640-DE | 64.0              | 0.49            |
|             | 18.5                            | AX-RAO00390800-DE | 80.0              | 0.39            |
|             | 22                              | AX-RAO00330950-DE | 95.0              | 0.33            |
|             | 30                              | AX-RAO00251210-DE | 121.0             | 0.25            |
|             | 37                              | AX-RAO00191450-DE | 145.0             | 0.19            |
|             | 45                              | AX-RAO00161820-DE | 182.0             | 0.16            |
|             | 55                              | AX-RAO00132200-DE | 220.0             | 0.13            |
| 400 V class | 0.4 to 1.5                      | AX-RAO16300038-DE | 3.8               | 16.30           |
|             | 2.2                             | AX-RAO11800053-DE | 5.3               | 11.80           |
|             | 4.0                             | AX-RAO07300080-DE | 8.0               | 7.30            |
|             | 5.5                             | AX-RAO04600110-DE | 11.0              | 4.60            |
|             | 7.5                             | AX-RAO03600160-DE | 16.0              | 3.60            |
|             | 11                              | AX-RAO02500220-DE | 22.0              | 2.50            |
|             | 15.0                            | AX-RAO02000320-DE | 32.0              | 2.00            |
|             | 18.5                            | AX-RAO01650400-DE | 40.0              | 1.65            |
|             | 22                              | AX-RAO01300480-DE | 48.0              | 1.30            |
|             | 30                              | AX-RAO01030580-DE | 58.0              | 1.03            |
|             | 37                              | AX-RAO00800750-DE | 75.0              | 0.80            |
|             | 45                              | AX-RAO00680900-DE | 90.0              | 0.68            |
|             | 55                              | AX-RAO00531100-DE | 110.0             | 0.53            |
|             | 75                              | AX-RAO00401490-DE | 149.0             | 0.40            |
|             | 90                              | AX-RAO00331760-DE | 176.0             | 0.33            |
|             | 110                             | AX-RAO00262170-DE | 217.0             | 0.26            |
|             | 132                             | AX-RAO00212600-DE | 260.0             | 0.21            |

## Input AC Reactor (AX-RAI□□□□□□□□-DE)

### ■ Dimensional Drawing



| Voltage | Reference         | Dimensions |    |     |     |     |      |      |     | Weight<br>Kg |     |      |
|---------|-------------------|------------|----|-----|-----|-----|------|------|-----|--------------|-----|------|
|         |                   | A          | B1 | B2  | C1  | C2  | D    | E    | F   |              |     |      |
| 200V    | AX-RAI02800100-DE | 120        | -  | 80  | -   | 120 | 80   | 62   | 5.5 | 2.35         |     |      |
|         | AX-RAI00880200-DE |            |    |     |     |     |      |      |     |              |     |      |
|         | AX-RAI00350335-DE | 180        |    | 85  | -   | 190 | 140  | 55   | 6   | 5.5          |     |      |
|         | AX-RAI00180670-DE |            |    |     |     |     |      |      |     |              |     |      |
|         | AX-RAI00091000-DE |            |    |     |     | 205 |      |      |     |              |     |      |
|         | AX-RAI00071550-DE |            |    | 105 | 205 | 85  | 11.7 |      |     |              |     |      |
|         | AX-RAI00042300-DE | 240        |    | 130 | -   | 210 |      | -    |     |              | 200 | 75   |
| 400V    | AX-RAI07700050-DE | 120        | -  | 70  | -   |     |      | 52   | 5.5 | 1.78         |     |      |
|         | AX-RAI03500100-DE |            |    | 80  |     | 120 | 80   | 62   |     | 2.35         |     |      |
|         | AX-RAI01300170-DE |            |    |     |     |     |      |      |     |              |     |      |
|         | AX-RAI00740335-DE | 180        |    | 85  |     | -   | 190  | 140  | 55  | 6            | 5.5 |      |
|         | AX-RAI00360500-DE |            |    |     |     |     | 205  |      |     |              | 85  | 6.5  |
|         | AX-RAI00290780-DE |            |    |     |     |     |      |      |     |              |     |      |
|         | AX-RAI00191150-DE |            |    | 240 | 110 |     | 275  |      | 200 |              | 75  | 16.0 |
|         | AX-RAI00111850-DE |            |    |     |     |     |      | 16.0 |     |              |     |      |
|         | AX-RAI00072700-DE | 165        |    |     |     | -   |      | 210  |     |              |     | -    |

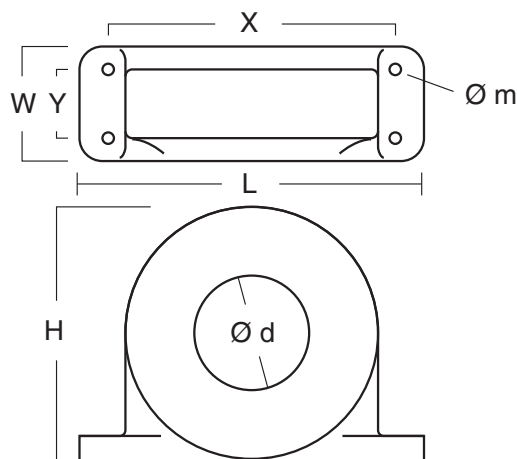
## ■ Specifications

| Voltage      | Max. applicable motor output kW | Reference         | Current value A | Inductance mH |
|--------------|---------------------------------|-------------------|-----------------|---------------|
| 3 phase 200V | 0.4 to 1.5                      | AX-RAI02800100-DE | 10.0            | 2.8           |
|              | 2.2 to 3.7                      | AX-RAI00880200-DE | 20.0            | 0.88          |
|              | 5.5 to 7.5                      | AX-RAI00350335-DE | 33.5            | 0.35          |
|              | 11.0 to 15.0                    | AX-RAI00180670-DE | 67.0            | 0.18          |
|              | 18.5 to 22.0                    | AX-RAI00091000-DE | 100.0           | 0.09          |
|              | 30.0 to 37.0                    | AX-RAI00071550-DE | 155.0           | 0.07          |
|              | 45.0 to 55.0                    | AX-RAI00042300-DE | 230.0           | 0.04          |
| 3 phase 400V | 0.4 to 1.5                      | AX-RAI07700050-DE | 5.0             | 7.7           |
|              | 2.2 to 4.0                      | AX-RAI03500100-DE | 10.0            | 3.5           |
|              | 5.5 to 7.5                      | AX-RAI01300170-DE | 17.0            | 1.3           |
|              | 11.0 to 15.0                    | AX-RAI00740335-DE | 33.5            | 0.74          |
|              | 18.5 to 22.0                    | AX-RAI00360500-DE | 50.0            | 0.36          |
|              | 30.0 to 37.0                    | AX-RAI00290780-DE | 78.0            | 0.29          |
|              | 45.0 to 55.0                    | AX-RAI00191150-DE | 115.0           | 0.19          |
|              | 75.0 to 90.0                    | AX-RAI00111850-DE | 185.0           | 0.11          |
|              | 110.0 to 132.0                  | AX-RAI00072700-DE | 270.0           | 0.07          |

7

## Chokes (AX-FER□□□□-RE)

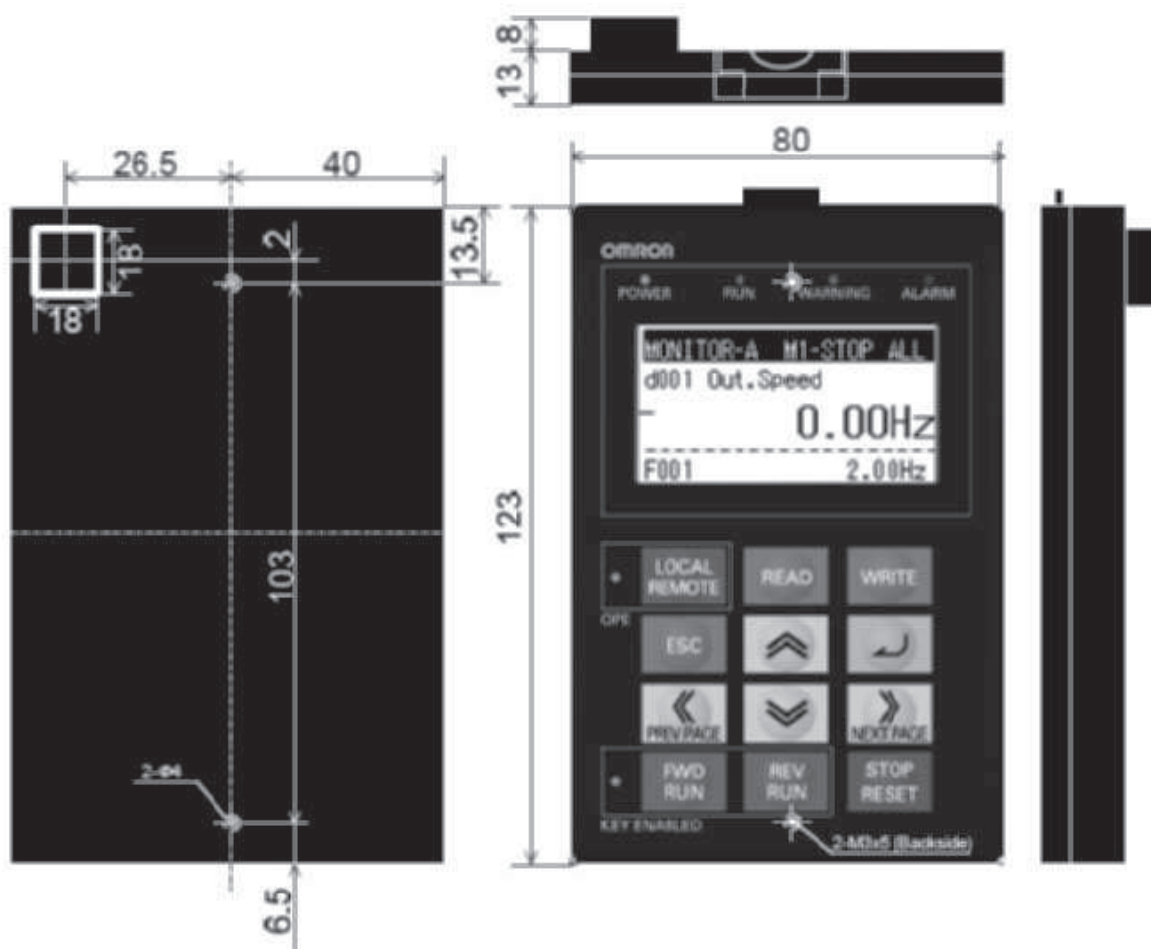
### ■ Dimensional Drawing



| Reference     | D diameter | Motor kW | Dimensions |    |     |     |    |   | Weight Kg |
|---------------|------------|----------|------------|----|-----|-----|----|---|-----------|
|               |            |          | L          | W  | H   | X   | Y  | m |           |
| AX-FER2102-RE | 21         | < 2.2    | 85         | 22 | 46  | 70  | -  | 5 | 0.1       |
| AX-FER2515-RE | 25         | < 15     | 105        | 25 | 62  | 90  | -  | 5 | 0.2       |
| AX-FER5045-RE | 50         | < 45     | 150        | 50 | 110 | 125 | 30 | 5 | 0.7       |
| AX-FER6055-RE | 60         | < 55     | 200        | 65 | 170 | 180 | 45 | 6 | 1.7       |

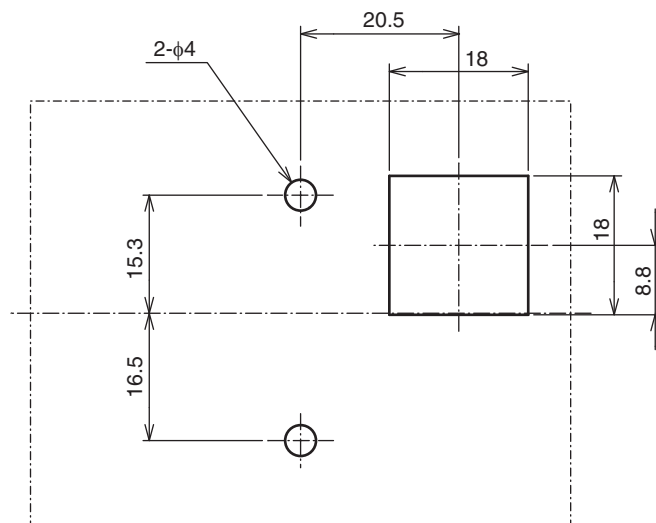
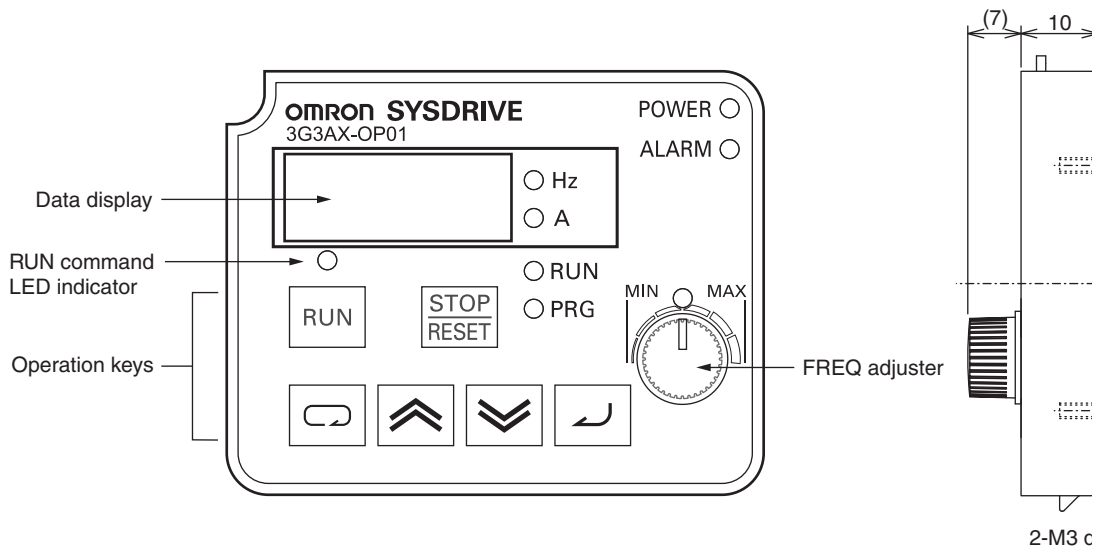


## ■ 3G3AX-OP05



# Digital Operator (3G3AX-OP)

## ■3G3AX-OP01



Panel cut dimensions

|                     |                                                |
|---------------------|------------------------------------------------|
| External dimensions | Height (55 mm) × Width (70 mm) × Depth (10 mm) |
|---------------------|------------------------------------------------|

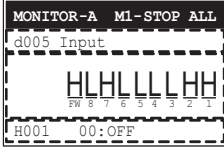
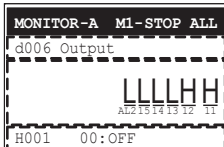
# Appendix

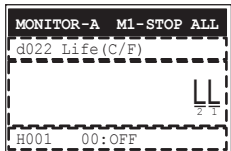
|            |                                   |        |
|------------|-----------------------------------|--------|
| Appendix-1 | Parameter List.....               | App-1  |
| Appendix-2 | Product Life Curve.....           | App-47 |
| Appendix-3 | Life Alarm Output .....           | App-48 |
| Appendix-4 | EC Declaration of Conformity..... | App-49 |

# Appendix-1 Parameter List

## Monitor Mode (d□□□)

•The default setting displays "d001" at power-on. To select the optional display, change the setting in "b038".

| Parameter No. | Function name                                                 | Monitor or data range                                                                                                                                                                                                            | Default setting | Changes during operation | Unit | Page |
|---------------|---------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|--------------------------|------|------|
| d001          | Output frequency monitor<br>[Output FQ]                       | 0.00 to 400.00                                                                                                                                                                                                                   | —               | Yes                      | Hz   | 4-1  |
| d002          | Output current monitor<br>[Output current]                    | 0.0 to 9999.0                                                                                                                                                                                                                    | —               | —                        | A    | 4-1  |
| d003          | Rotation direction monitor<br>[Rotation]                      | FWD: Forward<br>STOP: Stop<br>REV: Reverse                                                                                                                                                                                       | —               | —                        | —    | 4-1  |
| d004          | PID feedback value monitor<br>[PID-FB]                        | 0.00 to 999000.00<br>(Enabled when the PID function is selected)                                                                                                                                                                 | —               | —                        | —    | 4-1  |
| d005          | Multi-function input monitor<br>[Input]                       |  <p>Example<br/>FW, Multi-function input terminals 7, 2, 1: ON<br/>Multi-function input terminals 8, 6, 5, 4, 3: OFF</p>                      | —               | —                        | —    | 4-2  |
| d006          | Multi-function output monitor<br>[Output]                     |  <p>Example<br/>Multi-function output terminals 12, 11: ON<br/>Relay output terminal AL2, Multi-function output terminals 15, 14, 13: OFF</p> | —               | —                        | —    | 4-2  |
| d007          | Output frequency monitor<br>(after conversion)<br>[Scaled FQ] | 0.00 to 39960.00<br>(Output frequency x Conversion factor of b086)                                                                                                                                                               | —               | Yes                      | —    | 4-2  |
| d008          | Real frequency monitor<br>[Actual FQ]                         | -400.00 to 400.00                                                                                                                                                                                                                | —               | —                        | Hz   | 4-3  |
| d009          | Torque reference monitor<br>[Torque command]                  | -200 to 200                                                                                                                                                                                                                      | —               | —                        | %    | 4-3  |
| d010          | Torque bias monitor<br>[Torque bias]                          | -200 to 200                                                                                                                                                                                                                      | —               | —                        | %    | 4-3  |
| d012          | Output torque monitor<br>[Output Torque]                      | -200 to 200                                                                                                                                                                                                                      | —               | —                        | %    | 4-3  |
| d013          | Output voltage monitor<br>[Output Voltage]                    | 0.0 to 600.0                                                                                                                                                                                                                     | —               | —                        | V    | 4-3  |

| Parameter No. | Function name                              | Monitor or data range                                                                            | Default setting | Changes during operation | Unit | Page         |
|---------------|--------------------------------------------|--------------------------------------------------------------------------------------------------|-----------------|--------------------------|------|--------------|
| d014          | Input power monitor<br>[Input Power]       | 0.0 to 999.9                                                                                     | —               | —                        | W    | 4-4          |
| d015          | Power ON time monitor<br>[Watt-hour]       | 0.0 to 999999.9                                                                                  | —               | —                        | —    | 4-4          |
| d016          | Total RUN time<br>[RUN time]               | 0 to 999999                                                                                      | —               | —                        | h    | 4-4          |
| d017          | Power ON time monitor<br>[ON time]         | 0 to 999999                                                                                      | —               | —                        | h    | 4-4          |
| d018          | Fin temperature monitor<br>[Heatsink Tmp.] | -020. to 200.0                                                                                   | —               | —                        | °C   | 4-4          |
| d019          | Motor temperature monitor<br>[Motor tmp.]  | -020. to 200.0                                                                                   | —               | —                        | °C   | 4-5          |
| d022          | Life assessment monitor<br>[Life (C/F)]    |                | —               | —                        | —    | 4-5          |
| d023          | Program counter<br>[Program Counter]       | 0 to 1024                                                                                        | —               | —                        | —    | —            |
| d024          | Program number<br>[Program No.]            | 0 to 9999                                                                                        | —               | —                        | —    | —            |
| d025          | Drive programming monitor (UM0)<br>[UM0]   | -2147483647 to 2147483647                                                                        | —               | —                        | —    | —            |
| d026          | Drive programming monitor (UM1)<br>[UM1]   | -2147483647 to 2147483647                                                                        | —               | —                        | —    | —            |
| d027          | Drive programming monitor (UM2)<br>[UM2]   | -2147483647 to 2147483647                                                                        | —               | —                        | —    | —            |
| d028          | Pulse counter monitor<br>[Pls. Cnt.]       | 0 to 2147483647                                                                                  | —               | —                        | —    | 4-6          |
| d029          | Position command monitor<br>[Set pos]      | -1073741823 to 1073741823 when HAPR is selected<br>-268435456 to 268435456 when APR2 is selected | —               | —                        | —    | 4-6          |
| d030          | Current position monitor<br>[Curnt pos]    | -1073741823 to 1073741823 when HAPR is selected<br>-268435456 to 268435456 when APR2 is selected | —               | —                        | —    | 4-6<br>4-137 |
| d031          | Clock<br>[Clock]                           | Setting Data and Time for the LCD digital operator                                               | —               | —                        | —    | —            |

## Appendix-1 Parameter List

| Parameter No. | Function name                                     | Monitor or data range                                                                                                                            | Default setting | Changes during operation | Unit | Page |
|---------------|---------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|--------------------------|------|------|
| d060          | Inverter mode [Inverter mode]                     | 00 to 01                                                                                                                                         | —               | —                        | —    | —    |
| d080          | Fault frequency monitor [Trip Counter]            | 0 to 65535                                                                                                                                       | —               | —                        | Time | 4-6  |
| d081          | Fault monitor 1 (Latest) [ERR1]                   | Error code (condition of occurrence)<br>→Output frequency [Hz] → Output current [A]<br>→Internal DC voltage [V]<br>→RUN time [h]<br>→ON time [h] | —               | —                        | —    | 4-7  |
| d082          | Fault monitor 2 [ERR2]                            |                                                                                                                                                  |                 |                          |      | 4-7  |
| d083          | Fault monitor 3 [ERR3]                            |                                                                                                                                                  |                 |                          |      | 4-7  |
| d084          | Fault monitor 4 [ERR4]                            |                                                                                                                                                  |                 |                          |      | 4-7  |
| d085          | Fault monitor 5 [ERR5]                            |                                                                                                                                                  |                 |                          |      | 4-7  |
| d086          | Fault monitor 6 [ERR6]                            |                                                                                                                                                  |                 |                          |      | 4-7  |
| d090          | Warning monitor [WARN]                            | Warning code<br>0 to 385                                                                                                                         | —               | —                        | —    | 4-7  |
| d102          | DC voltage monitor [DC Voltage]                   | 0.0 to 999.9                                                                                                                                     | —               | —                        | V    | 4-7  |
| d103          | Regenerative braking load rate monitor [BRD load] | 0.0 to 100.0                                                                                                                                     | —               | —                        | %    | 4-7  |
| d104          | Electronic thermal monitor [E.Thermal]            | 0.0 to 100.0                                                                                                                                     | —               | —                        | %    | 4-7  |

**Basic Function Mode (F□□□)**

| Parameter No. | Function name                                             | Monitor or data range                                                  | Default setting | Changes during operation | Unit | Page |
|---------------|-----------------------------------------------------------|------------------------------------------------------------------------|-----------------|--------------------------|------|------|
| F001          | Output frequency setting/monitor [SetFrequency (TM)]      | 0.0/Starting frequency to 1st/2nd/3rd max. frequency<br>0.00 to 400.00 | 0.00            | Yes                      | Hz   | 4-8  |
| F002          | Acceleration time 1 [Accel.time1]                         | 0.01 to 3600.00                                                        | 10.00           | Yes                      | s    | 4-8  |
| F202          | * 2nd acceleration time 1 [Accel.time1-M2]                | 0.01 to 3600.00                                                        | 10.00           | Yes                      | s    | 4-8  |
| F302          | * 3rd acceleration time 1 [Accel.time1-M3]                | 0.01 to 3600.00                                                        | 10.00           | Yes                      | s    | 4-8  |
| F003          | Deceleration time 1 [Decel.time1]                         | 0.01 to 3600.00                                                        | 10.00           | Yes                      | s    | 4-8  |
| F203          | * 2nd deceleration time 1 [Decel.time1-M2]                | 0.01 to 3600.00                                                        | 10.00           | Yes                      | s    | 4-8  |
| F303          | * 3rd deceleration time 1 [Decel.time1-M3]                | 0.01 to 3600.00                                                        | 10.00           | Yes                      | s    | 4-8  |
| F004          | Operator rotation direction selection [Run key direction] | 00: FWD (Forward)<br>01: REV (Reverse)                                 | 00              | No                       | —    | 4-9  |

\* 2nd/3rd control is displayed when "SET(08)/SET3(17)" is allocated to one of multi-function inputs from C001 to C008.

## Extended Function Mode

| Parameter No.        | Function name | Monitor or data range                                                                                                                                                                                                                                                                                                                                                                                                                                            | Default setting | Changes during operation | Unit | Page          |
|----------------------|---------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|--------------------------|------|---------------|
| Basic setting        | A001          | Frequency reference selection<br>[Frequency source]<br>00: VR (Digital Operator (FREQ adjuster))<br>(Enabled when 3G3AX-OP01 is used.)<br>01: Terminal<br>02: Digital Operator (F001)<br>03: RS485 (ModBus communication)<br>04: Option 1<br>05: Option 2<br>06: Pulse train frequency<br>07: EzSQ (Drive programming)<br>10: (Math) Operation function result                                                                                                   | 01              | No                       | —    | 4-10<br>4-144 |
|                      | A002          | RUN command selection<br>[RUN cmd source]<br>01: Terminal<br>02: Digital Operator (F001)<br>03: RS485 (ModBus communication)<br>04: Option 1<br>05: Option 2                                                                                                                                                                                                                                                                                                     | 01              | No                       | —    | 4-11          |
|                      | A003          | Base frequency<br>[Base Frequency]<br>30 to Maximum frequency [A004]                                                                                                                                                                                                                                                                                                                                                                                             | 50              | No                       | Hz   | 4-11<br>4-112 |
|                      | A203          | * 2nd set base frequency<br>[Base Frequency-M2]<br>30 to 2nd maximum frequency [A204]                                                                                                                                                                                                                                                                                                                                                                            | 50              |                          |      | 4-11          |
|                      | A303          | * 3rd set base frequency<br>[Base Frequency-M3]<br>30 to 3rd maximum frequency [A304]                                                                                                                                                                                                                                                                                                                                                                            | 50              |                          |      |               |
|                      | A004          | Maximum frequency<br>[Max.Frequency]<br>A003 to 400                                                                                                                                                                                                                                                                                                                                                                                                              | 50              | No                       | Hz   | 4-12          |
|                      | A204          | * 2nd maximum frequency<br>[Max.Frequency-M2]<br>A203 to 400                                                                                                                                                                                                                                                                                                                                                                                                     | 50              |                          |      |               |
|                      | A304          | * 3rd maximum frequency<br>[Max.Frequency-M3]<br>A303 to 400                                                                                                                                                                                                                                                                                                                                                                                                     | 50              |                          |      |               |
| Analog input, Others | A005          | O/OI selection<br>[AT Select]<br>00: [O]/[O2] Switches between O/OI terminal AT<br>01: [O]/[O2] Switches between O/O2 terminal AT<br>02: [O]/VR Switches between O/FREQ adjuster via terminal AT<br>(Enabled only when 3G3AX-OP01 is used)<br>03: [OI]/VR Switches between OI/FREQ adjuster via terminal AT<br>(Enabled only when 3G3AX-OP01 is used)<br>04: [O2]/VR Switches between O2/FREQ adjuster via terminal AT<br>(Enabled only when 3G3AX-OP01 is used) | 00              | No                       | —    | 4-12          |

\* 2nd/3rd control is displayed when "SET(08)/SET3(17)" is allocated to one of multi-function inputs from C001 to C008.



| Parameter No.             | Function name | Monitor or data range                                                                                                                                                                            | Default setting | Changes during operation | Unit | Page        |
|---------------------------|---------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|--------------------------|------|-------------|
| Analog input, Others      | A006          | O2 selection<br>[O2 Select]<br>00: [O2] only<br>01: [O/OI-P] auxiliary frequency reference (not reversible)<br>02: [O/OI-PM] auxiliary frequency reference (reversible)<br>03: [OFF] O2 disabled | 03              | No                       | —    | 4-12        |
|                           | A011          | O start frequency<br>[[O] start FQ]                                                                                                                                                              | 0.00            | No                       | Hz   | 4-14        |
|                           | A012          | O end frequency<br>[[O] end FQ]                                                                                                                                                                  | 0.00            | No                       | Hz   |             |
|                           | A013          | O start ratio<br>[[O] start %]                                                                                                                                                                   | 0               | No                       | %    |             |
|                           | A014          | O end ratio<br>[[O] end %]                                                                                                                                                                       | 100             | No                       | %    |             |
|                           | A015          | O start selection<br>[[O] start FQ select]<br>00: External start frequency (A011 set value)<br>01: 0 Hz                                                                                          | 01              | No                       | —    | 4-15        |
|                           | A016          | O, O2, OI sampling<br>[Analog-in filter]<br>1 to 30<br>31 (with 500 ms filter $\pm$ 0.1 Hz hysteresis)                                                                                           | 31              | No                       | —    |             |
| Multi-step speed, Jogging | A017          | Drive Programming (EzSQ) Selection<br>[EzSQ select]<br>0: Disable<br>1: [PRG] start<br>2: Always ON                                                                                              | 00              | No                       | —    | —           |
|                           | A019          | Multi-step speed selection<br>[Multispeed select]<br>00: Binary: 16-step selection with 4 terminals<br>01: Bit: 8-step selection with 7 terminals                                                | 00              | No                       | —    | 4-16        |
|                           | A020          | Multi-step speed reference 0<br>[Multispeed 0]                                                                                                                                                   | 6.00            | Yes                      | Hz   | 4-8<br>4-16 |
|                           | A220          | * 2nd multi-step speed reference 0<br>[Multispeed 0-M2]                                                                                                                                          | 6.00            | Yes                      | Hz   |             |
|                           | A320          | * 3rd multi-step speed reference 0<br>[Multispeed 0-M3]                                                                                                                                          | 6.00            | Yes                      | Hz   |             |

\* 2nd/3rd control is displayed when "SET(08)/SET3(17)" is allocated to one of multi-function inputs from C001 to C008.

## Appendix-1 Parameter List

| Parameter No. | Function name                                    | Monitor or data range                    | Default setting | Changes during operation | Unit | Page |
|---------------|--------------------------------------------------|------------------------------------------|-----------------|--------------------------|------|------|
| A021          | Multi-step speed reference 1<br>[Multispeed 1]   | 0.0/Starting frequency to Max. frequency | 0.00            | Yes                      | Hz   | 4-16 |
| A022          | Multi-step speed reference 2<br>[Multispeed 2]   |                                          | 0.00            |                          |      |      |
| A023          | Multi-step speed reference 3<br>[Multispeed 3]   |                                          | 0.00            |                          |      |      |
| A024          | Multi-step speed reference 4<br>[Multispeed 4]   |                                          | 0.00            |                          |      |      |
| A025          | Multi-step speed reference 5<br>[Multispeed 5]   |                                          | 0.00            |                          |      |      |
| A026          | Multi-step speed reference 6<br>[Multispeed 6]   |                                          | 0.00            |                          |      |      |
| A027          | Multi-step speed reference 7<br>[Multispeed 7]   |                                          | 0.00            |                          |      |      |
| A028          | Multi-step speed reference 8<br>[Multispeed 8]   |                                          | 0.00            |                          |      |      |
| A029          | Multi-step speed reference 9<br>[Multispeed 9]   |                                          | 0.00            |                          |      |      |
| A030          | Multi-step speed reference 10<br>[Multispeed 10] |                                          | 0.00            |                          |      |      |
| A031          | Multi-step speed reference 11<br>[Multispeed 11] |                                          | 0.00            |                          |      |      |
| A032          | Multi-step speed reference 12<br>[Multispeed 12] |                                          | 0.00            |                          |      |      |
| A033          | Multi-step speed reference 13<br>[Multispeed 13] |                                          | 0.00            |                          |      |      |
| A034          | Multi-step speed reference 14<br>[Multispeed 14] |                                          | 0.00            |                          |      |      |
| A035          | Multi-step speed reference 15<br>[Multispeed 15] |                                          | 0.00            |                          |      |      |

\* 2nd/3rd control is displayed when "SET(08)/SET3(17)" is allocated to one of multi-function inputs from C001 to C008.

| Parameter No.             |      | Function name                                              | Monitor or data range                                                                                                                                                                                                                                                                                                                                                                                                                                    | Default setting | Changes during operation | Unit | Page |
|---------------------------|------|------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|--------------------------|------|------|
| Multi-step speed, Jogging | A038 | Jogging frequency<br>[Jog frequency]                       | 0.00/Starting frequency to 9.99                                                                                                                                                                                                                                                                                                                                                                                                                          | 6.00            | Yes                      | Hz   | 4-18 |
|                           | A039 | Jogging stop selection<br>[Jog stop mode]                  | 00: FRS (Free running on jogging stop/<br>Disabled in operation)<br>01: DEC (Deceleration stop on jogging stop/<br>Disabled in operation)<br>02: DB (DC injection braking on jogging stop/<br>Disabled in operation)<br>03: FRS (RUN) (Free running on jogging<br>stop/Enabled in operation)<br>04: DEC (RUN) (Deceleration stop on jogging<br>stop/Enabled in operation)<br>05: DB (RUN) (DC injection braking on<br>jogging stop/Enabled in operation) | 04              | No                       | —    |      |
| V/f characteristics       | A041 | Torque boost selection<br>[TRQ boost sel]                  | 00: Manual torque boost<br>01: Automatic torque boost                                                                                                                                                                                                                                                                                                                                                                                                    | 00              | No                       | —    | 4-19 |
|                           | A241 | * 2nd torque boost selection<br>[TRQ boost sel-M2]         |                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 00              |                          |      |      |
|                           | A042 | Manual torque boost voltage<br>[TRQ boost V%]              | 0.0 to 20.0                                                                                                                                                                                                                                                                                                                                                                                                                                              | 1.0             | Yes                      | %    |      |
|                           | A242 | * 2nd manual torque boost voltage<br>[TRQ boost V%-M2]     |                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 1.0             |                          |      |      |
|                           | A342 | * 3rd manual torque boost voltage<br>[TRQ boost V%-M3]     |                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 1.0             |                          |      |      |
|                           | A043 | Manual torque boost frequency<br>[TRQ boost FQ%]           | 0.0 to 50.0                                                                                                                                                                                                                                                                                                                                                                                                                                              | 5.0             | Yes                      | %    |      |
|                           | A243 | * 2nd manual torque boost frequency<br>[TRQ boost FQ%-M2]  |                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 5.0             |                          |      |      |
|                           | A343 | * 3rd manual torque boost frequency<br>[TRQ boost FQ%-M3]] |                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 5.0             |                          |      |      |

\* 2nd/3rd control is displayed when "SET(08)/SET3(17)" is allocated to one of multi-function inputs from C001 to C008.

## Appendix-1 Parameter List

| Parameter No.       | Function name | Monitor or data range                                                                                                                                                                                                                                                                                             | Default setting | Changes during operation | Unit | Page |
|---------------------|---------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|--------------------------|------|------|
| V/f characteristics | A044          | V/f characteristics selection<br>[V/F select]<br><br>00: VC (Constant torque characteristics)<br>01: VP (Special reduced torque characteristics)<br>02: Free V/f (characteristics)<br>03: SLV (Sensorless vector control)<br>04: 0SLV (0-Hz sensorless vector control)<br>05: V2 (Sensor vector control)          | 00              | No                       | —    | 4-21 |
|                     | A244          | * 2nd V/f characteristics selection<br>[V/F select-M2]<br><br>00: VC (Constant torque characteristics)<br>01: VP (Special reduced torque characteristics)<br>02: Free V/f (characteristics)<br>03: SLV (Sensorless vector control)<br>04: 0SLV (0-Hz sensorless vector control)<br>05: V2 (Sensor vector control) | 00              |                          |      |      |
|                     | A344          | * 3rd V/f characteristics selection<br>[V/F select-M3]<br><br>00: VC (Constant torque characteristics)<br>01: VP (Special reduced torque characteristics)                                                                                                                                                         | 00              |                          |      |      |
|                     | A045          | Output voltage gain<br>[V/F gain]<br><br>20 to 100                                                                                                                                                                                                                                                                | 100             | Yes                      | %    | 4-24 |
|                     | A046          | Automatic torque boost voltage compensation gain<br>[A.TQ-BST V gain]<br><br>0 to 255                                                                                                                                                                                                                             | 100             | Yes                      | —    | 4-20 |
|                     | A246          | * 2nd automatic torque boost voltage compensation gain<br>[A.TQ-BST V gain-M2]<br><br>0 to 255                                                                                                                                                                                                                    | 100             |                          |      |      |
|                     | A047          | Automatic torque boost slip compensation gain<br>[A.TQ-BST SL gain]<br><br>0 to 255                                                                                                                                                                                                                               | 100             | Yes                      | —    |      |
|                     | A247          | * 2nd automatic torque boost slip compensation gain<br>[A.TQ-BST SL gain-M2]<br><br>0 to 255                                                                                                                                                                                                                      | 100             |                          |      |      |

\* 2nd/3rd control is displayed when "SET(08)/SET3(17)" is allocated to one of multi-function inputs from C001 to C008.

| Parameter No.             | Function name                                             | Monitor or data range                                      | Default setting                                                                            | Changes during operation | Unit | Page |               |
|---------------------------|-----------------------------------------------------------|------------------------------------------------------------|--------------------------------------------------------------------------------------------|--------------------------|------|------|---------------|
| DC injection braking      | A051                                                      | DC injection braking selection<br>[DB enable]              | 00: OFF (Disabled)<br>01: ON (Enabled)<br>02: ON (FQ) (Frequency control [A052 set value]) | 00                       | No   | —    | 4-24<br>4-112 |
|                           | A052                                                      | DC injection braking frequency<br>[DB Frequency]           | 0.00 to 400.00                                                                             | 0.50                     | No   | Hz   | 4-24          |
|                           | A053                                                      | DC injection braking delay time<br>[DB wait time]          | 0.0 to 5.0                                                                                 | 0.0                      | No   | s    | 4-24          |
|                           | A054                                                      | DC injection braking power<br>[DB force]                   | 0 to 100 (0.4 to 55 kW)                                                                    | 50                       | No   | %    |               |
|                           |                                                           |                                                            | 0 to 80 (75 to 132 kW)                                                                     | 40                       | No   | %    |               |
|                           | A055                                                      | DC injection braking time<br>[DB decel time]               | 0.0 to 60.0                                                                                | 0.5                      | No   | s    |               |
|                           | A056                                                      | DC injection braking method selection<br>[DB input select] | 00: Edge operation<br>01: Level operation                                                  | 01                       | No   | —    |               |
|                           | A057                                                      | Startup DC injection braking power<br>[DB force start]     | 0 to 100 (0.4 to 55 kW)<br>0 to 80 (75 to 132 kW)                                          | 0                        | No   | %    |               |
|                           | A058                                                      | Startup DC injection braking time<br>[DB time start]       | 0.0 to 60.0                                                                                | 0.0                      | No   | s    |               |
| A059                      | DC injection braking carrier frequency<br>[DB carrier FQ] | 0.5 to 15.0 (0.4 to 55 kW)                                 | 5.0                                                                                        | No                       | kHz  |      |               |
|                           |                                                           | 0.5 to 10.0 (75 to 132 kW)                                 | 3.0                                                                                        | No                       | kHz  |      |               |
| Upper/Lower limiter, Jump | A061                                                      | Frequency upper limit<br>[FQ upper limit]                  | 0.00/Frequency lower limit to Max. Frequency                                               | 0.00                     | No   | Hz   | 4-28          |
|                           | A261                                                      | * 2nd frequency upper limit<br>[FQ upper limit-M2]         | 0.00/2nd frequency lower limit to 2nd Max. Frequency                                       | 0.00                     |      |      |               |
|                           | A062                                                      | Frequency lower limit<br>[FQ lower limit]                  | 0.00/Starting frequency to Frequency upper limit                                           | 0.00                     | No   | Hz   |               |
|                           | A262                                                      | * 2nd frequency lower limit<br>[FQ lower limit-M2]         | 0.00/Starting frequency to 2nd frequency upper limit                                       | 0.00                     |      |      |               |

\* 2nd/3rd control is displayed when "SET(08)/SET3(17)" is allocated to one of multi-function inputs from C001 to C008.

## Appendix-1 Parameter List

| Parameter No.           | Function name | Monitor or data range                           | Default setting                                                                                                                  | Changes during operation | Unit | Page |
|-------------------------|---------------|-------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------|--------------------------|------|------|
| Upper/Lower limit, Jump | A063          | Jump frequency 1<br>[Jump FQ1 Center]           | 0.00                                                                                                                             | No                       | Hz   | 4-30 |
|                         | A064          | Jump frequency width 1<br>[Jump FQ1 Width]      | 0.50                                                                                                                             |                          |      |      |
|                         | A065          | Jump frequency 2<br>[Jump FQ2 Center]           | 0.00                                                                                                                             |                          |      |      |
|                         | A066          | Jump frequency width 2<br>[Jump FQ2 Width]      | 0.50                                                                                                                             |                          |      |      |
|                         | A067          | Jump frequency 3<br>[Jump FQ3 Center]           | 0.00                                                                                                                             |                          |      |      |
|                         | A068          | Jump frequency width 3<br>[Jump FQ3 Width]      | 0.50                                                                                                                             |                          |      |      |
|                         | A069          | Acceleration stop frequency<br>[Accel hold FQ]  | 0.00 to 400.00                                                                                                                   | No                       | Hz   |      |
|                         | A070          | Acceleration stop time<br>[Accel hold time]     | 0.0 to 60.0                                                                                                                      | No                       | s    |      |
| PID control             | A071          | PID selection<br>[PID enable]                   | 00: OFF (Disabled)<br>01: ON (+) (Enabled)<br>02: ON (+/-) (Reverse output enabled)                                              | No                       | —    | 4-31 |
|                         | A072          | PID P gain<br>[PID P gain]                      | 0.2 to 5.0                                                                                                                       | Yes                      | —    |      |
|                         | A073          | PID I gain<br>[PID I gain]                      | 0.0 to 3600.0                                                                                                                    | Yes                      | s    |      |
|                         | A074          | PID D gain<br>[PID D gain]                      | 0.00 to 100.00                                                                                                                   | Yes                      | s    |      |
|                         | A075          | PID scale<br>[PID scale convert]                | 0.01 to 99.99                                                                                                                    | No                       | Time |      |
|                         | A076          | PID feedback selection<br>[PV source select]    | 00: OI<br>01: O<br>02: Modbus (RS485 communication)<br>03: Pulse (Pulse train frequency)<br>10: Math (Operation function output) | No                       | —    |      |
|                         | A077          | Reverse PID function<br>[Reverse PID action]    | 00: OFF (Deviation = Target value - Feedback value)<br>01: ON (Deviation = Feedback value - Target value)                        | No                       | —    |      |
|                         | A078          | PID output limit function<br>[PID limit]        | 0.0 to 100.0                                                                                                                     | No                       | %    |      |
|                         | A079          | PID feedforward selection<br>[PID F-Fwd select] | 00: Disabled<br>01: O<br>02: OI<br>03: O2                                                                                        | No                       | —    | 4-31 |

\* 2nd/3rd control is displayed when "SET(08)/SET3(17)" is allocated to one of multi-function inputs from C001 to C008.

| Parameter No.                                 |      | Function name                                                      | Monitor or data range                                                          | Default setting | Changes during operation | Unit | Page |
|-----------------------------------------------|------|--------------------------------------------------------------------|--------------------------------------------------------------------------------|-----------------|--------------------------|------|------|
| AVR                                           | A081 | AVR selection<br>[AVR select]                                      | 00: Always ON<br>01: Always OFF<br>02: OFF during deceleration                 | 02              | No                       | —    | 4-35 |
|                                               | A082 | AVR voltage selection<br>[AVR voltage sel]                         | 200-V class: 200/215/220/230/240<br>400-V class: 380/400/415/440/460/480       | 200/<br>400     | No                       | V    |      |
| RUN mode, Acceleration/Deceleration functions | A085 | RUN mode selection<br>[Operation mode]                             | 00: Normal operation<br>01: Energy-saving operation<br>02: Automatic operation | 00              | No                       | —    | 4-36 |
|                                               | A086 | Energy-saving response/accuracy adjustment<br>[Energy-saving tune] | 0.0 to 100.0                                                                   | 50.0            | Yes                      | —    |      |

\* 2nd/3rd control is displayed when "SET(08)/SET3(17)" is allocated to one of multi-function inputs from C001 to C008.

## Appendix-1 Parameter List

RUN mode, Acceleration/Deceleration functions

| Parameter No. | Function name                                                        | Monitor or data range                                                                                                                                       | Default setting | Changes during operation | Unit | Page |
|---------------|----------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|--------------------------|------|------|
| A092          | Acceleration time 2 [Accel.time2]                                    | 0.01 to 3600.00                                                                                                                                             | 10.00           | Yes                      | s    | 4-37 |
| A292          | * 2nd acceleration time 2 [Accel.time2-M2]                           |                                                                                                                                                             | 10.00           |                          |      |      |
| A392          | * 3rd acceleration time 2 [Accel.time2-M3]                           |                                                                                                                                                             | 10.00           |                          |      |      |
| A093          | Deceleration time 2 [Decel.time2]                                    |                                                                                                                                                             | 10.00           |                          |      |      |
| A293          | * 2nd deceleration time 2 [Decel.time2-M2]                           |                                                                                                                                                             | 10.00           |                          |      |      |
| A393          | * 3rd deceleration time 2 [Decel.time2-M3]                           |                                                                                                                                                             | 10.00           |                          |      |      |
| A094          | 2-step acceleration/ deceleration selection [Acc2/Dec2 sel]          | 00: 2CH-Terminal (Switched via multi-function input 09)<br>01: Preset FQ (Switched by setting)<br>02: FWD-REV (Enabled only when switching forward/reverse) | 00              | No                       | —    |      |
| A294          | * 2nd 2-step acceleration/ deceleration selection [Acc2/Dec2 sel-M2] |                                                                                                                                                             | 00              |                          |      |      |
| A095          | 2-step acceleration frequency [Acc.1-2 FQ]                           | 0.00 to 400.00                                                                                                                                              | 0.00            | No                       | Hz   | 4-38 |
| A295          | * 2nd 2-step acceleration frequency [Acc.1-2 FQ-M2]                  |                                                                                                                                                             | 0.00            |                          |      |      |
| A096          | 2-step deceleration frequency [Dec.1-2 FQ]                           |                                                                                                                                                             | 0.00            | No                       | Hz   |      |
| A296          | * 2nd 2-step deceleration frequency [Dec. 1-2 FQ-M2]                 |                                                                                                                                                             | 0.00            |                          |      |      |
| A097          | Acceleration pattern selection [Accel.curve select]                  | 00: Line<br>01: S-curve<br>02: U-curve<br>03: inv.U curve<br>04: EL-S curve                                                                                 | 01              | No                       | —    |      |
| A098          | Deceleration pattern selection [Decel. curve select]                 |                                                                                                                                                             | 01              | No                       | —    |      |

\* 2nd/3rd control is displayed when "SET(08)/SET3(17)" is allocated to one of multi-function inputs from C001 to C008.



| Parameter No.                 | Function name | Monitor or data range                                     | Default setting                                                                                                                                                   | Changes during operation | Unit | Page |
|-------------------------------|---------------|-----------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|------|------|
| External frequency adjustment | A101          | OI start frequency<br>[[OI] start FQ]                     | 0.00                                                                                                                                                              | No                       | Hz   | 4-14 |
|                               | A102          | OI end frequency<br>[[OI] end FQ]                         | 0.00                                                                                                                                                              | No                       | Hz   |      |
|                               | A103          | OI start ratio<br>[[OI] start %]                          | 20                                                                                                                                                                | No                       | %    |      |
|                               | A104          | OI end ratio<br>[[OI] end %]                              | 100                                                                                                                                                               | No                       | %    |      |
|                               | A105          | OI start selection<br>[[OI] start FQ select]              | 00: Start FQ (Use OI start frequency [A101])<br>01: 0 Hz                                                                                                          | No                       | —    |      |
| Ext freq adjustment           | A111          | O2 start frequency<br>[[O2] start FQ]                     | 0.00                                                                                                                                                              | No                       | Hz   | 4-15 |
|                               | A112          | O2 end frequency<br>[[O2] end FQ]                         | 0.00                                                                                                                                                              | No                       | Hz   |      |
|                               | A113          | O2 start ratio<br>[[O2] start %]                          | -100                                                                                                                                                              | No                       | %    |      |
|                               | A114          | O2 end ratio<br>[[O2] end %]                              | 100                                                                                                                                                               | No                       | %    |      |
| Accel/Decel                   | A131          | Acceleration curve parameter<br>[Accel.curve const]       | 02                                                                                                                                                                | No                       | —    | 4-38 |
|                               | A132          | Deceleration curve parameter<br>[Decel.curve const]       | 02                                                                                                                                                                | No                       | —    |      |
| Operation frequency           | A141          | Operation frequency input A setting<br>[A-input calc. FQ] | 00: Operator (Digital Operator (F001))<br>01: VR (Digital Operator (FREQ adjuster))<br>(Enabled when 3G3AX-OP01 is used.)<br>02: O (Input O)<br>03: OI (Input OI) | No                       | —    | 4-41 |
|                               | A142          | Operation frequency input B setting<br>[B-input calc. FQ] | 04: Modbus (RS485 communication)<br>05: Option 1<br>06: Option 2<br>07: Pulse (Pulse train frequency)                                                             | No                       | —    |      |
|                               | A143          | Operator selection<br>[Calculation symbol]                | 00: ADD (Addition (A + B))<br>01: SUB (Subtraction (A - B))<br>02: MUL (Multiplication (A × B))                                                                   | No                       | —    |      |
|                               | A145          | Frequency addition amount<br>[Add frequency]              | 0.00 to 99.99<br>100.0 to 400.0                                                                                                                                   | No                       | Hz   | 4-41 |
|                               | A146          | Frequency addition direction<br>[Add direction]           | 00: ADD (Add A145 value to output frequency)<br>01: SUB (Subtract A145 value from output frequency)                                                               | No                       | —    |      |

\* 2nd/3rd control is displayed when "SET(08)/SET3(17)" is allocated to one of multi-function inputs from C001 to C008.

## Appendix-1 Parameter List

| Parameter No.                             | Function name | Monitor or data range                                                                                                                                                                                                                                     | Default setting | Changes during operation | Unit | Page                 |
|-------------------------------------------|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|--------------------------|------|----------------------|
| Acceleration/Deceleration                 | A150          | EL-S-curve ratio 1 during acceleration [EL-S start accel]                                                                                                                                                                                                 | 10              | No                       | %    | 4-39                 |
|                                           | A151          | EL-S-curve ratio 2 during acceleration [EL-S end accel]                                                                                                                                                                                                   | 10              | No                       | %    |                      |
|                                           | A152          | EL-S-curve ratio 1 during deceleration [EL-S start decel]                                                                                                                                                                                                 | 10              | No                       | %    |                      |
|                                           | A153          | EL-S-curve ratio 2 during deceleration [EL-S end decel]                                                                                                                                                                                                   | 10              | No                       | %    |                      |
| Momentary power interruption/Trip restart | b001          | Retry selection [Restart mode UV]<br>00: TRIP (Alarm)<br>01: 0 Hz start<br>02: f-match (Frequency matching start)<br>03: f-match Trip (Trip after frequency matching deceleration stop)<br>04: Actv. f-match (Active Frequency Matching restart)          | 00              | No                       | —    | 4-42                 |
|                                           | b002          | Allowable momentary power interruption time [Allowable UV time]<br>0.3 to 25.0                                                                                                                                                                            | 1.0             | No                       | s    |                      |
|                                           | b003          | Retry wait time [Retry wait time UV]<br>0.3 to 100.0                                                                                                                                                                                                      | 1.0             | No                       | s    | 4-87                 |
|                                           | b004          | Momentary power interruption/ undervoltage trip during stop selection [UV trip on stop]<br>00: OFF (Disabled)<br>01: ON (Enabled)<br>02: Decel-OFF (Disabled during stop and deceleration stop)                                                           | 00              | No                       | —    | 4-42                 |
|                                           | b005          | Momentary power interruption retry time selection [No. Of restart UV]<br>00: 16 times<br>01: No limit                                                                                                                                                     | 00              | No                       | —    |                      |
|                                           | b006          | Input phase loss protection selection [Phase loss detection]<br>00: OFF (Disabled)<br>01: ON (Enabled)                                                                                                                                                    | 01              | No                       | —    | 4-46                 |
|                                           | b007          | Frequency matching lower limit frequency setting [Restart min. FQ]<br>0.00 to 400.00                                                                                                                                                                      | 0.00            | No                       | Hz   | 4-42<br>4-71<br>4-87 |
|                                           | b008          | Trip retry selection [Restart mode OV/ OC]<br>00: TRIP (Alarm)<br>01: 0 Hz start<br>02: f-match (Frequency matching start)<br>03: f-match Trip (Trip after frequency matching deceleration stop)<br>04: Actv. f-match (Active Frequency Matching restart) | 00              | No                       | —    | 4-42                 |

\* 2nd/3rd control is displayed when "SET(08)/SET3(17)" is allocated to one of multi-function inputs from C001 to C008.

| Parameter No.                             | Function name | Monitor or data range                                                           | Default setting                                                                                                                    | Changes during operation | Unit | Page |
|-------------------------------------------|---------------|---------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------|--------------------------|------|------|
| Momentary power interruption/Trip restart | b009          | Undervoltage retry time selection<br>[Under voltage retry]                      | 00: 16 times<br>01: No limit                                                                                                       | 00                       | No   | —    |
|                                           | b010          | Overvoltage/ overcurrent retry time selection<br>[No. Of restart OV/ OC]        | 1 to 3                                                                                                                             | 3                        | No   | Time |
|                                           | b011          | Trip retry wait time<br>[Retry wait time OV/ OC]                                | 0.3 to 100.0                                                                                                                       | 1.0                      | No   | s    |
| Electronic Thermal                        | b012          | Electronic thermal level<br>[E. Thermal Level]                                  | 0.20 × Rated current to 1.00 × Rated current                                                                                       | Rated current            | No   | A    |
|                                           | b212          | * 2nd electronic thermal level<br>[E. Thermal Level-M2]                         |                                                                                                                                    |                          |      |      |
|                                           | b312          | * 3rd electronic thermal level<br>[E. Thermal Level-M3]                         |                                                                                                                                    |                          |      |      |
|                                           | b013          | Electronic thermal characteristics selection<br>[E. Thermal Character]          | 00: Reduced TRQ (Reduced torque characteristics)<br>01: Const TRQ (Constant torque characteristics)<br>02: Free set (Free setting) | 00                       | No   | —    |
|                                           | b213          | * 2nd electronic thermal characteristics selection<br>[E. Thermal Character-M2] |                                                                                                                                    |                          |      |      |
|                                           | b313          | * 3rd electronic thermal characteristics selection<br>[E. Thermal Character-M3] |                                                                                                                                    |                          |      |      |

\* 2nd/3rd control is displayed when "SET(08)/SET3(17)" is allocated to one of multi-function inputs from C001 to C008.

## Appendix-1 Parameter List

| Parameter No.      |      | Function name                                                         | Monitor or data range | Default setting | Changes during operation | Unit | Page |
|--------------------|------|-----------------------------------------------------------------------|-----------------------|-----------------|--------------------------|------|------|
| Electronic Thermal | b015 | Free setting, electronic thermal frequency 1<br>[Free E.Thermal FQ-1] | 0 to 400              | 0               | No                       | Hz   | 4-46 |
|                    | b017 | Free setting, electronic thermal frequency 2<br>[Free E.Thermal FQ-2] |                       |                 |                          |      |      |
|                    | b019 | Free setting, electronic thermal frequency 3<br>[Free E.Thermal FQ-3] |                       |                 |                          |      |      |
|                    | b016 | Free setting, electronic thermal current 1<br>[Free E.Thermal I-1]    | 0.0 to Rated current  | 0.0             | No                       | A    |      |
|                    | b018 | Free setting, electronic thermal current 2<br>[Free E.Thermal I-2]    |                       |                 |                          |      |      |
|                    | b020 | Free setting, electronic thermal current 3<br>[Free E.Thermal I-3]    |                       |                 |                          |      |      |

\* 2nd/3rd control is displayed when "SET(08)/SET3(17)" is allocated to one of multi-function inputs from C001 to C008.

| Parameter No.                          | Function name | Monitor or data range                                                                                                                                                                                                                                                                                                      | Default setting               | Changes during operation | Unit | Page         |
|----------------------------------------|---------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|--------------------------|------|--------------|
| Overload limit, Overcurrent Protection | b021          | Overload limit selection<br>[OL restrict mode]<br>00: OFF (Disabled)<br>01: ON-Acc/Cnst (Enabled in acceleration/<br>constant speed operation)<br>02: ON-Cnst (Enabled in constant speed<br>operation)<br>03: ON-A/C(R) (Enabled in acceleration/<br>constant speed operation (Accelerates<br>during regeneration))        | 01                            | No                       | —    | 4-49         |
|                                        | b022          | Overload limit level<br>[OL restrict level]<br>0.20 × Rated current to 2.00 × Rated current<br>(0.4 to 55 kW)<br>0.20 × Rated current to 1.80 × Rated current<br>(75 to 132 kW)                                                                                                                                            | 1.50<br>×<br>Rated<br>current | No                       | A    |              |
|                                        | b023          | Overload limit<br>parameter<br>[Decel.rate OL<br>restrict]<br>0.10 to 30.00                                                                                                                                                                                                                                                | 1.00                          | No                       | s    |              |
|                                        | b024          | Overload limit<br>selection 2<br>[OL restrict 2 mode]<br>00: OFF (Disabled)<br>01: ON-Acc/Cnst (Enabled in acceleration/<br>constant speed operation)<br>02: ON-Cnst (Enabled in constant speed<br>operation)<br>03: ON-A/C(R) (Enabled in acceleration/<br>constant speed operation (Accelerates<br>during regeneration)) | 01                            | No                       | —    |              |
|                                        | b025          | Overload limit level 2<br>[OL restrict 2 level]<br>0.20 × Rated current to 2.00 × Rated current<br>(0.4 to 55 kW)<br>0.20 × Rated current to 1.80 × Rated current<br>(75 to 132 kW)                                                                                                                                        | 1.50<br>×<br>Rated<br>current | No                       | A    |              |
|                                        | b026          | Overload limit<br>parameter 2<br>[Decel.rate OL2 rstr]<br>0.10 to 30.00                                                                                                                                                                                                                                                    | 1.00                          | No                       | s    |              |
|                                        | b027          | Overcurrent<br>suppression function<br>[OC suppress select]<br>00: OFF (Disabled)<br>01: ON (Enabled)                                                                                                                                                                                                                      | 00                            | No                       | —    | 4-51         |
|                                        | b028          | Active Frequency<br>Matching restart level<br>[Curnt Active F-<br>match]<br>0.20 × Rated current to 2.00 × Rated current<br>(0.4 to 55 kW)<br>0.20 × Rated current to 1.80 × Rated current<br>(75 to 132 kW)                                                                                                               | Rated<br>current              | No                       | A    | 4-43<br>4-71 |
|                                        | b029          | Active Frequency<br>Matching restart<br>parameter<br>[Decel.rate act.F-<br>match]<br>0.10 to 30.00                                                                                                                                                                                                                         | 0.50                          | No                       | s    |              |
|                                        | b030          | Starting frequency at<br>Active Frequency<br>Matching restart<br>[Start FQ act.F-<br>match]<br>00: Off FQ (Frequency at interruption)<br>01: Max.FQ (Max. Frequency)<br>02: Set FQ (Set Frequency)                                                                                                                         | 00                            | No                       | —    |              |

\* 2nd/3rd control is displayed when "SET(08)/SET3(17)" is allocated to one of multi-function inputs from C001 to C008.

## Appendix-1 Parameter List

| Parameter No. |      | Function name                                                                   | Monitor or data range                                                                                                                                                                                                                                                                                                                                                                                                                                         | Default setting | Changes during operation | Unit | Page         |
|---------------|------|---------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|--------------------------|------|--------------|
| Lock          | b031 | Soft lock selection<br>[Softlock select]                                        | 00: Lock (SFT) (Data other than b031 cannot be changed when terminal SFT is ON)<br>01: Only FQ (SFT) (Data other than b031 and the specified frequency parameter cannot be changed when terminal SFT is ON)<br>02: Lock (Data other than b031 cannot be changed)<br>03: Only FQ (Data other than b031 and the specified frequency parameter cannot be changed)<br>10: RUN chg mode (Data other than parameters changeable during operation cannot be changed) | 01              | No                       | —    | 4-51         |
|               |      |                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                 |                          |      |              |
| Others        | b034 | RUN time/Power ON time setting<br>[RNT/ONT time]                                | 0 to 65535                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 0               | No                       | h    | 4-52         |
|               | b035 | Rotation direction limit selection<br>[Rotation restriction]                    | 00: FREE (Forward and Reverse are enabled)<br>01: FWD (Only Forward is enabled)<br>02: REV (Only Reverse is enabled)                                                                                                                                                                                                                                                                                                                                          | 00              | No                       | —    | 4-52         |
|               | b036 | Reduced voltage startup selection<br>[Reduced V start]                          | 0 (Reduced voltage startup time: small) to 255 (Reduced voltage startup time: large)                                                                                                                                                                                                                                                                                                                                                                          | 6               | No                       | —    | 4-53         |
|               | b037 | Display selection<br>[Display restriction]                                      | 00: All (Complete display)<br>01: Utilized (Individual display of functions)<br>02: User (User setting)<br>03: Compare (Data comparison display)<br>04: Basic (Basic display)                                                                                                                                                                                                                                                                                 | 00              | No                       | —    | 4-53         |
|               | b038 | Initial screen selection<br>[Initial display]                                   | 000 to 202                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 001             | No                       | —    | 4-56         |
|               | b039 | User parameter automatic setting function selection<br>[Auto U param. regist]   | 00: OFF (Disabled)<br>01: ON (Enabled)                                                                                                                                                                                                                                                                                                                                                                                                                        | 00              | No                       | —    | 4-57         |
| Torque limit  | b040 | Torque limit selection<br>[TRQ limit select]                                    | 00: 4-quadrant (Four-quadrant separate setting)<br>01: TRQ input (Terminal switch)<br>02: [O] input (Analog input)<br>03: Option 1<br>04: Option 2                                                                                                                                                                                                                                                                                                            | 00              | No                       | —    | 4-57<br>4-59 |
|               | b041 | Torque limit 1 (Four-quadrant mode forward power running)<br>[TRQ limit FW/POW] | 0 to 200 (0.4 to 55 kW)<br>0 to 180 (75 to 132 kW)<br>no (Torque limit disabled)                                                                                                                                                                                                                                                                                                                                                                              | 150             | No                       | %    | 4-57<br>4-59 |

\* 2nd/3rd control is displayed when "SET(08)/SET3(17)" is allocated to one of multi-function inputs from C001 to C008.

| Parameter No. | Function name | Monitor or data range                                                              | Default setting                                                                  | Changes during operation | Unit | Page |              |
|---------------|---------------|------------------------------------------------------------------------------------|----------------------------------------------------------------------------------|--------------------------|------|------|--------------|
| Torque limit  | b042          | Torque limit 2<br>(Four-quadrant mode reverse regeneration)<br>[TRQ limit RV/REG]  | 0 to 200 (0.4 to 55 kW)<br>0 to 180 (75 to 132 kW)<br>no (Torque limit disabled) | 150                      | No   | %    | 4-57<br>4-59 |
|               | b043          | Torque limit 3<br>(Four-quadrant mode reverse power running)<br>[TRQ limit RV/POW] | 0 to 200 (0.4 to 55 kW)<br>0 to 180 (75 to 132 kW)<br>no (Torque limit disabled) | 150                      | No   | %    |              |
|               | b044          | Torque limit 4<br>(Four-quadrant mode forward regeneration)<br>[TRQ limit FW/REG]  | 0 to 200 (0.4 to 55 kW)<br>0 to 180 (75 to 132 kW)<br>no (Torque limit disabled) | 150                      | No   | %    |              |
|               | b045          | Torque LADSTOP selection<br>[TRQ limit LADSTOP]                                    | 00: OFF (Disabled)<br>01: ON (Enabled)                                           | 00                       | No   | —    | 4-59         |
| Others        | b046          | Reverse rotation prevention selection<br>[Rev RUN protect]                         | 00: OFF (Disabled)<br>01: ON (Enabled)                                           | 00                       | No   | —    | 4-59         |
|               | b049          | Dual rate selection<br>[Dual rate select]                                          | 00: CT (Constant torque)<br>01: VT (Variable torque)                             | 00                       | No   | —    | —            |

\* 2nd/3rd control is displayed when "SET(08)/SET3(17)" is allocated to one of multi-function inputs from C001 to C008.

## Appendix-1 Parameter List

| Parameter No. | Function name | Monitor or data range                                                                                                                                                                                                                       | Default setting | Changes during operation | Unit | Page |
|---------------|---------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|--------------------------|------|------|
| Others        | b050          | Selection of non-stop function at momentary power interruption [Ctrl'd decel. select]<br>00: OFF (Disabled)<br>01: V-Cnst (STOP) (Enabled (deceleration stop))<br>02: NS1 (Enabled (without recovery))<br>03: NS2 (Enabled (with recovery)) | 00              | No                       | —    | 4-60 |
|               | b051          | Starting voltage of non-stop function at momentary power interruption [DC Volt ctrl'd. decel]                                                                                                                                               | 220/440         | No                       | V    |      |
|               | b052          | Stop deceleration level of non-stop function at momentary power interruption [OV lvl ctrl'd. decel]                                                                                                                                         | 360/720         | No                       | V    |      |
|               | b053          | Deceleration time of non-stop function at momentary power interruption [Decel time ctrl'd. dec]                                                                                                                                             | 1.00            | No                       | s    |      |
|               | b054          | Deceleration starting width of non-stop function at momentary power interruption [FQ drop ctrl'd. decel]                                                                                                                                    | 0.00            | No                       | Hz   |      |
|               | b055          | Proportional gain setting of non-stop function at momentary power interruption [P gain ctrl'd. decel]                                                                                                                                       | 0.20            | Yes                      | —    |      |
|               | b056          | Integral time setting of non-stop function at momentary power interruption [I gain ctrl'd. decel]                                                                                                                                           | 0.100           | Yes                      | s    | 4-63 |

\* 2nd/3rd control is displayed when "SET(08)/SET3(17)" is allocated to one of multi-function inputs from C001 to C008.



| Parameter No. | Function name | Monitor or data range                                                   | Default setting                                                                                                                                    | Changes during operation | Unit | Page |      |
|---------------|---------------|-------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|------|------|------|
| Others        | b060          | Window comparator<br>O upper limit level<br>[Windw comp [O] max]        | Set an upper limit level.<br>Setting range: 0 to 100<br>Lower limit: Lower limit level + Hysteresis width × 2                                      | 100                      | Yes  | %    | 4-66 |
|               | b061          | Window comparator<br>O lower limit level<br>[Windw comp [O] min]        | Set a lower limit level.<br>Setting range: 0 to 100<br>Upper limit: Upper limit level - Hysteresis width × 2                                       | 0                        | Yes  | %    |      |
|               | b062          | Window comparator<br>O hysteresis width<br>[Windw comp [O] hys]         | Set a hysteresis width for the upper and lower limit levels.<br>Setting range: 0 to 10<br>Upper limit: (Upper limit level - Lower limit level) × 2 | 0                        | Yes  | %    |      |
|               | b063          | Window comparator<br>OI upper limit level<br>[Windw comp [OI] max]      | Set an upper limit level.<br>Setting range: 0 to 100<br>Lower limit: Lower limit level + Hysteresis width × 2                                      | 100                      | Yes  | %    |      |
|               | b064          | Window comparator<br>OI lower limit level<br>[Windw comp [OI] min]      | Set a lower limit level.<br>Setting range: 0 to 100<br>Upper limit: Upper limit level - Hysteresis width × 2                                       | 0                        | Yes  | %    |      |
|               | b065          | Window comparator<br>OI hysteresis width<br>[Windw comp [OI] hys]       | Set a hysteresis width for the upper and lower limit levels.<br>Setting range: 0 to 10<br>Upper limit: (Upper limit level - Lower limit level) × 2 | 0                        | Yes  | %    |      |
|               | b066          | Window comparator<br>O2 upper limit level<br>[Windw comp [O2] max]      | Set an upper limit level.<br>Setting range: -100 to 100<br>Lower limit: Lower limit level + Hysteresis width × 2                                   | 100                      | Yes  | %    | 4-66 |
|               | b067          | Window comparator<br>O2 lower limit level<br>[Windw comp [O2] min]      | Set a lower limit level.<br>Setting range: -100 to 100<br>Upper limit: Upper limit level - Hysteresis width × 2                                    | -100                     | Yes  | %    |      |
|               | b068          | Window comparator<br>O2 hysteresis width<br>[Windw comp [O2] hys]       | Set a hysteresis width for the upper and lower limit levels.<br>Setting range: 0 to 10<br>Upper limit: (Upper limit level - Lower limit level) × 2 | 0                        | Yes  | %    |      |
|               | b070          | Analog operation<br>level at O<br>disconnection<br>[Discon Level [O]]   | 0 to 100/no (ignored)                                                                                                                              | no                       | No   | —    |      |
|               | b071          | Analog operation<br>level at OI<br>disconnection<br>[Discon Level [OI]] | 0 to 100/no (ignored)                                                                                                                              | no                       | No   | —    |      |
|               | b072          | Analog operation<br>level at O2<br>disconnection<br>[Discon Level [O2]] | -100 to 100/no (ignored)                                                                                                                           | no                       | No   | —    |      |

\* 2nd/3rd control is displayed when "SET(08)/SET3(17)" is allocated to one of multi-function inputs from C001 to C008.

## Appendix-1 Parameter List

| Parameter No. | Function name                                                          | Monitor or data range                                                                                                                                                                                                                                                    | Default setting | Changes during operation | Unit | Page          |
|---------------|------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|--------------------------|------|---------------|
| b078          | Integrated power clear<br>[Clear kWh data]                             | Cleared with the Enter key after changing to 01                                                                                                                                                                                                                          | 00              | Yes                      | —    | 4-4           |
| b079          | Integrated power display gain<br>[kWh display gain]                    | 1 to 1000                                                                                                                                                                                                                                                                | 1               | No                       | —    |               |
| b082          | Starting frequency<br>[Start Frequency]                                | 0.10 to 9.99                                                                                                                                                                                                                                                             | 0.50            | No                       | Hz   | 4-68          |
| b083          | Carrier frequency<br>[Carrier frequency]                               | 0.5 to 15.0 (0.4 to 55 kW)<br>*Derating enabled                                                                                                                                                                                                                          | 5.0             | No                       | kHz  | 4-68<br>4-120 |
|               |                                                                        | 0.5 to 10.0 (75 to 132 kW)<br>*Derating enabled                                                                                                                                                                                                                          | 3.0             | No                       | kHz  |               |
| b084          | Initialization selection<br>[Initialize Mode]                          | 00: no (Clears the trip monitor)<br>01: Trip data (Initializes data)<br>02: Parameters )Clears the trip monitor and initializes data)<br>03: Trip+Param (Clears the trip monitor and parameters)<br>04: Trp+Prm+EzSQ (Clears trip monitor, parameters and Drive program) | 00              | No                       | —    | 4-70          |
| b085          | Initialization parameter selection<br>[Initial data select]            | 01<br>*Do not change.                                                                                                                                                                                                                                                    | 01              | No                       | —    |               |
| b086          | Frequency conversion coefficient<br>[FQ scale factor]                  | 0.1 to 99.9                                                                                                                                                                                                                                                              | 1.0             | Yes                      | —    | 4-2           |
| b087          | STOP key selection<br>[STOP key enable]                                | 00: ON (Enabled)<br>01: OFF (Disabled)<br>02: Only RESET (Disabled only during stop)                                                                                                                                                                                     | 00              | No                       | —    | 4-70          |
| b088          | Free-run stop selection<br>[Restart after FRS]                         | 00: 0 Hz start<br>01: f-match (Frequency matching start)<br>02: Actv. f-match (Active Frequency Matching restart)                                                                                                                                                        | 00              | No                       | —    | 4-71          |
| b089          | Automatic carrier reduction<br>[Auto.Carrier reduce]                   | 00: OFF (Disabled)<br>01: ON (Enabled)                                                                                                                                                                                                                                   | 00              | No                       | —    | 4-73          |
| b090          | Usage rate of regenerative braking function<br>[BRD use ratio]         | 0.0 to 100.0                                                                                                                                                                                                                                                             | 0.0             | No                       | %    | 4-74          |
| b091          | Stop selection<br>[Stop mode select]                                   | 00: Decel-Stop (Deceleration → Stop)<br>01: Free-RUN (Free-run stop)                                                                                                                                                                                                     | 00              | No                       | —    | 4-70          |
| b092          | Cooling fan control<br>[Cooling fan ctrl]                              | 00: Alws-ON (Always ON)<br>01: ON in RUN (ON during RUN)                                                                                                                                                                                                                 | 01              | No                       | —    | 4-74          |
| b095          | Regenerative braking function operation selection<br>[BRD ctrl select] | 00: OFF (Disabled)<br>01: RUN-ON (Enabled (Disabled during stop))<br>02: Alws-ON (Enabled (Enabled during stop))                                                                                                                                                         | 00              | No                       | —    |               |
| b096          | Regenerative braking function ON level<br>[BRD activation]             | 330 to 380<br>660 to 760                                                                                                                                                                                                                                                 | 360/<br>720     | No                       | V    |               |

\* 2nd/3rd control is displayed when "SET(08)/SET3(17)" is allocated to one of multi-function inputs from C001 to C008.

| Parameter No.   | Function name | Monitor or data range                                                                             | Default setting | Changes during operation | Unit | Page |
|-----------------|---------------|---------------------------------------------------------------------------------------------------|-----------------|--------------------------|------|------|
| Others          | b098          | Thermistor selection<br>[Thermistor select]<br>00: Disabled<br>01: PTC enabled<br>02: NTC enabled | 00              | No                       | —    | 4-75 |
|                 | b099          | Thermistor error level<br>[Thermistor level]<br>0 to 9999                                         | 3000            | No                       | Ω    |      |
| Vf free setting | b100          | Free V/f frequency 1<br>[Free V/F-F1]<br>0 to Free V/f frequency 2                                | 0               | No                       | Hz   | 4-22 |
|                 | b101          | Free V/f voltage 1<br>[Free V/F-V1]<br>0.0 to 800.0                                               | 0.0             | No                       | V    |      |
|                 | b102          | Free V/f frequency 2<br>[Free V/F-F2]<br>0 to Free V/f frequency 3                                | 0               | No                       | Hz   |      |
|                 | b103          | Free V/f voltage 2<br>[Free V/F-V2]<br>0.0 to 800.0                                               | 0.0             | No                       | V    |      |
|                 | b104          | Free V/f frequency 3<br>[Free V/F-F3]<br>0 to Free V/f frequency 4                                | 0               | No                       | Hz   |      |
|                 | b105          | Free V/f voltage 3<br>[Free V/F-V3]<br>0.0 to 800.0                                               | 0.0             | No                       | V    |      |
|                 | b106          | Free V/f frequency 4<br>[Free V/F-F4]<br>0 to Free V/f frequency 5                                | 0               | No                       | Hz   |      |
|                 | b107          | Free V/f voltage 4<br>[Free V/F-V4]<br>0.0 to 800.0                                               | 0.0             | No                       | V    |      |
|                 | b108          | Free V/f frequency 5<br>[Free V/F-F5]<br>0 to Free V/f frequency 6                                | 0               | No                       | Hz   |      |
|                 | b109          | Free V/f voltage 5<br>[Free V/F-V5]<br>0.0 to 800.0                                               | 0.0             | No                       | V    |      |
|                 | b110          | Free V/f frequency 6<br>[Free V/F-F6]<br>0. to Free V/f frequency 7                               | 0               | No                       | Hz   |      |
|                 | b111          | Free V/f voltage 6<br>[Free V/F-V6]<br>0.0 to 800.0                                               | 0.0             | No                       | V    |      |
|                 | b112          | Free V/f frequency 7<br>[Free V/F-F7]<br>0. to 400                                                | 0               | No                       | Hz   |      |
|                 | b113          | Free V/f voltage 7<br>[Free V/F-V7]<br>0.0 to 800.0                                               | 0.0             | No                       | V    |      |

\* 2nd/3rd control is displayed when "SET(08)/SET3(17)" is allocated to one of multi-function inputs from C001 to C008.

## Appendix-1 Parameter List

| Parameter No. | Function name                                                                         | Monitor or data range                                                                            | Default setting | Changes during operation | Unit | Page |
|---------------|---------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|-----------------|--------------------------|------|------|
| b120          | Brake control selection<br>[Brake control sel]                                        | 00: OFF (Disabled)<br>01: ON (Enabled)                                                           | 00              | No                       | —    | 4-77 |
| b121          | Brake wait time for release<br>[Brake w.time Rels]                                    | 0.00 to 5.00                                                                                     | 0.00            | No                       | s    |      |
| b122          | Brake wait time for acceleration<br>[Brake w.time Accel]                              | 0.00 to 5.00                                                                                     | 0.00            | No                       | s    |      |
| b123          | Brake wait time for stopping<br>[Brake w.time Stop]                                   | 0.00 to 5.00                                                                                     | 0.00            | No                       | s    |      |
| b124          | Brake wait time for confirmation<br>[Brake w.time Confirm]                            | 0.00 to 5.00                                                                                     | 0.00            | No                       | s    |      |
| b125          | Brake release frequency<br>[Brake Release FQ]                                         | 0.00 to 400.00                                                                                   | 0.00            | No                       | Hz   |      |
| b126          | Brake release current<br>[Brake Release I]                                            | 0.0 to 2.00 × Rated current (0.4 to 55 kW)<br>0.0 to 1.80 × Rated current (75 to 132 kW)         | Rated current   | No                       | —    |      |
| b127          | Brake input frequency<br>[Braking Frequency]                                          | 0.00 to 400.00                                                                                   | 0.00            | No                       | Hz   | 4-78 |
| b130          | Overvoltage protection function selection during deceleration<br>[Over-V supp.select] | 00: OFF (Disabled)<br>01: V-const (DC voltage kept constant)<br>02: Accel (Acceleration enabled) | 01              | No                       | —    |      |
| b131          | Overvoltage protection level during deceleration<br>[Over-V supp. level]              | 200-V class: 330 to 390<br>400-V class: 660 to 780                                               | 380/<br>760     | No                       | V    |      |
| b132          | Overvoltage protection parameter<br>[Over-V supp. constant]                           | 0.10 to 30.00                                                                                    | 1.00            | No                       | s    |      |
| b133          | Overvoltage protection proportional gain setting<br>[Over-V supp.P-gain]              | 0.00 to 2.55                                                                                     | 0.50            | Yes                      | —    |      |
| b134          | Overvoltage protection integral time setting<br>[Over-V supp.I-gain]                  | 0.000 to 65.535                                                                                  | 0.060           | Yes                      | s    |      |
| b164          | Auto return initial display<br>[Auto return init.disp]                                | 00: OFF<br>01: ON                                                                                | 00              | No                       | —    | —    |
| b166          | Data Read/Write selection<br>[Data R/W select]                                        | 00: R/W OK (Read/Write Ok)<br>01: R/W Protected (Read/Write Protected)                           | 00              | No                       | —    | —    |

\* 2nd/3rd control is displayed when "SET(08)/SET3(17)" is allocated to one of multi-function inputs from C001 to C008.

| Parameter No.                  | Function name | Monitor or data range                                                   | Default setting                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Changes during operation | Unit | Page |      |
|--------------------------------|---------------|-------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|------|------|------|
| Others                         | b180          | Initialize trigger<br>[Initialize trigger]                              | 00: No action<br>01: Initialize                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 00                       | No   | —    |      |
| Multi-function input terminals | C001          | Multi-function input 1 selection * <sup>1</sup><br>[Input [1] Function] | 01: RV (reverse)<br>02: CF1 (multi-step speed setting binary 1)<br>03: CF2 (multi-step speed setting binary 2)<br>04: CF3 (multi-step speed setting binary 3)<br>05: CF4 (multi-step speed setting binary 4)<br>06: JG (jogging)<br>07: DB (external DC injection braking)<br>08: SET (2nd control)<br>09: 2CH (2-step acceleration/deceleration)<br>11: FRS (free-run stop)<br>12: EXT (external trip)<br>13: USP (USP function)<br>14: CS (commercial switch)<br>15: SFT (soft lock)<br>16: AT (analog input switching)<br>17: SET3 (3rd control)<br>18: RS (reset)<br>20: STA (3-wire start)<br>21: STP (3-wire stop)<br>22: F/R (3-wire forward/reverse)<br>23: PID (PID enabled/disabled)<br>24: PIDC (PID integral reset)<br>26: CAS (control gain switching)<br>27: UP (UP/DWN function accelerated)<br>28: DWN (UP/DWN function decelerated)<br>29: UDC (UP/DWN function data clear)<br>31: OPE (forced operator) | 01 * <sup>1</sup>        | No   | —    | 4-79 |
|                                | C002          | Multi-function input 2 selection<br>[Input [2] Function]                | 12                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                          |      |      |      |
|                                | C003          | Multi-function input 3 selection * <sup>1</sup><br>[Input [3] Function] | 18                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                          |      |      |      |
|                                | C004          | Multi-function input 4 selection<br>[Input [4] Function]                | 02                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                          |      |      |      |
|                                | C005          | Multi-function input 5 selection<br>[Input [5] Function]                | 03                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                          |      |      |      |
|                                | C006          | Multi-function input 6 selection<br>[Input [6] Function]                | 06                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                          |      |      |      |
|                                | C007          | Multi-function input 7 selection<br>[Input [7] Function]                | 08                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                          |      |      |      |
|                                | C008          | Multi-function input 8 selection<br>[Input [8] Function]                | no                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                          |      |      |      |

\*1. C001 and C003 are forcibly rewritten into 18 (RS) and 64 (EMR), respectively, when the emergency shutoff function is enabled (SW1 = ON). (64 cannot be set optionally.)  
When SW1 is turned ON once and then OFF, C003 has no allocations ("no").

\* 2nd/3rd control is displayed when "SET(08)/SET3(17)" is allocated to one of multi-function inputs from C001 to C008.

## Appendix-1 Parameter List

| Parameter No.                  | Function name | Monitor or data range                                              | Default setting | Changes during operation | Unit | Page |
|--------------------------------|---------------|--------------------------------------------------------------------|-----------------|--------------------------|------|------|
| Multi-function input terminals | C011          | Multi-function input 1 operation selection [Input [1] actv. State] | 00              | No                       | —    | 4-81 |
|                                | C012          | Multi-function input 2 operation selection [Input [2] actv. State] | 00              |                          |      |      |
|                                | C013          | Multi-function input 3 operation selection [Input [3] actv. State] | 00              |                          |      |      |
|                                | C014          | Multi-function input 4 operation selection [Input [4] actv. State] | 00              |                          |      |      |
|                                | C015          | Multi-function input 5 operation selection [Input [5] actv. State] | 00              |                          |      |      |
|                                | C016          | Multi-function input 6 operation selection [Input [6] actv. State] | 00              |                          |      |      |
|                                | C017          | Multi-function input 7 operation selection [Input [7] actv. State] | 00              |                          |      |      |
|                                | C018          | Multi-function input 8 operation selection [Input [8] actv. State] | 00              |                          |      |      |
|                                | C019          | FW terminal operation selection [Input [FW] actv. State]           | 00              |                          |      |      |
|                                |               | 00: NO<br>01: NC                                                   |                 |                          |      |      |

\* 2nd/3rd control is displayed when "SET(08)/SET3(17)" is allocated to one of multi-function inputs from C001 to C008.

| Parameter No.                  | Function name | Monitor or data range                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Default setting | Changes during operation | Unit | Page |
|--------------------------------|---------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|--------------------------|------|------|
| Multi-function output terminal | C021          | Multi-function output terminal 11 selection [Output [11] function]<br>00: RUN (signal during RUN)<br>01: FA1 (constant speed arrival signal)<br>02: FA2 (over set frequency arrival signal)<br>03: OL (overload warning)<br>04: OD (excessive PID deviation)<br>05: AL (alarm output)<br>06: FA3 (set-frequency-only arrival signal)<br>07: OTQ (overtorque)<br>08: IP (signal during momentary power interruption)<br>09: UV (signal during undervoltage)                 | 00              | No                       | —    | 4-95 |
|                                | C022          | Multi-function output terminal 12 selection [Output [12] function]<br>10: TRQ (torque limit)<br>11: RNT (RUN time over)<br>12: ONT (Power ON time over)<br>13: THM (thermal warning)<br>19: BRK (brake release)<br>20: BER (brake error)<br>21: ZS (0 Hz signal)<br>22: DSE (excessive speed deviation)<br>23: POK (position ready)                                                                                                                                        | 21              |                          |      |      |
|                                | C023          | Multi-function output terminal 13 selection [Output [13] function]<br>24: FA4 (set frequency exceeded 2)<br>25: FA5 (set frequency only 2)<br>26: OL2 (overload warning 2)<br>27: ODc (analog O disconnection detection)<br>28: OIdc (analog OI disconnection detection)<br>29: O2Dc (analog O2 disconnection detection)<br>31: FBV (PID FB status output)<br>32: NDc (network error)                                                                                      | 03              |                          |      |      |
|                                | C024          | Multi-function output terminal 14 selection [Output [14] function]<br>33: LOG1 (logic operation output 1)<br>34: LOG2 (logic operation output 2)<br>35: LOG3 (logic operation output 3)<br>36: LOG4 (logic operation output 4)<br>37: LOG5 (logic operation output 5)<br>38: LOG6 (logic operation output 6)<br>39: WAC (capacitor life warning signal)<br>40: WAF (cooling fan life warning signal)<br>41: FR (starting contact signal)<br>42: OHF (fin overheat warning) | 07              |                          |      |      |
|                                | C025          | Multi-function output terminal 15 selection [Output [15] function]<br>43: LOC (light load detection signal)<br>44: MO1 (Drive programming output 1)<br>45: MO2 (Drive programming output 2)<br>46: MO3 (Drive programming output 3)<br>47: MO4 (Drive programming output 4)<br>48: MO5 (Drive programming output 5)<br>49: MO6 (Drive programming output 6)<br>50: IRDY (operation ready signal)<br>51: FWR (forward run signal)<br>52: RVR (reverse run signal)           | 01              |                          |      |      |
|                                | C026          | Relay output (AL2, AL1) function selection [Alarm relay function]<br>53: MJA (fatal fault signal)<br>54: WCO (window comparator O)<br>55: WCOI (window comparator OI)<br>56: WCO2 (window comparator O2)<br>63: OPO (Option board output)<br>no: Not used<br>(When C062 is used to select the alarm code output, the multi-function output terminals 11 to 13, or 11 to 14 are forcibly changed to AC0 to AC2 or AC0 to AC3 [Acn 'Alarm code output'], respectively.)      | 05              |                          |      |      |

\* 2nd/3rd control is displayed when "SET(08)/SET3(17)" is allocated to one of multi-function inputs from C001 to C008.

## Appendix-1 Parameter List

| Parameter No.  | Function name | Monitor or data range                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Default setting | Changes during operation | Unit | Page           |
|----------------|---------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|--------------------------|------|----------------|
| Analog monitor | C027          | FM selection<br>[[FM] Function]<br>When inverter is in sensor vector control (A044=05) the real motor speed from the motor encoder (d008 monitor) is used instead of the output frequency.<br>00: Output FQ (Output frequency)<br>01: Output I (Output current)<br>02: Output TRQ (Output torque)<br>03: Pulse FQ (Digital output frequency)<br>04: Output V (Output voltage)<br>05: Power<br>06: Thermal (Thermal load rate)<br>07: LAD-FQ (LAD frequency)<br>08: Pulse I (Digital current monitor)<br>09: Motor tmp (Motor temperature)<br>10: Heatsink tmp (Fin temperature)<br>12: YA0 (Drive programming)<br>19: OP1 (Option board 1)<br>20: OP2 (Option board 2)   | 00              | No                       | —    | 4-109<br>4-118 |
|                | C028          | AM selection<br>[[AM] Function]<br>When inverter is in sensor vector control (A044=05) the real motor speed from the motor encoder (d008 monitor) is used instead of the output frequency.<br>00: Output FQ (Output frequency)<br>01: Output I (Output current)<br>02: Output TRQ (Output torque)<br>04: Output V (Output voltage)<br>05: Power<br>06: Thermal (Thermal load rate)<br>07: LAD-FQ (LAD frequency)<br>08: Pulse I (Digital current monitor)<br>09: Motor tmp (Motor temperature)<br>10: Heatsink tmp (Fin temperature)<br>11: Out TRQ sign (Output torque <signed>)<br>13: YA1 (Drive programming)<br>19: OP1 (Option board 1)<br>20: OP2 (Option board 2) | 00              | No                       | —    | 4-110<br>4-118 |
|                | C029          | AMI selection<br>[[AMI] Function]<br>When inverter is in sensor vector control (A044=05) the real motor speed from the motor encoder (d008 monitor) is used instead of the output frequency.<br>00: Output FQ (Output frequency)<br>01: Output I (Output current)<br>02: Output TRQ (Output torque)<br>04: Output V (Output voltage)<br>05: Power<br>06: Thermal (Thermal load rate)<br>07: LAD-FQ (LAD frequency)<br>09: Motor tmp (Motor temperature)<br>10: Heatsink tmp (Fin temperature)<br>14: YA2 (Drive programming)                                                                                                                                             | 00              | No                       | —    |                |
|                | C030          | Digital current monitor reference value<br>[Digital I Ref.]<br>0.20 × Rated current to<br>2.00 × Rated current (Under 55 kW)<br>0.20 × Rated current to<br>1.50 × Rated current (Over 75 kW)<br>(Current value at the digital current monitor output 1440 Hz)                                                                                                                                                                                                                                                                                                                                                                                                            | Rated current   | Yes                      | A    | 4-109          |

\* 2nd/3rd control is displayed when "SET(08)/SET3(17)" is allocated to one of multi-function inputs from C001 to C008.



| Parameter No.                    | Function name | Monitor or data range                                                            | Default setting | Changes during operation | Unit | Page  |
|----------------------------------|---------------|----------------------------------------------------------------------------------|-----------------|--------------------------|------|-------|
| Multi-function output terminal   | C031          | Multi-function output terminal 11 contact selection<br>[Output [11] actv. state] | 00              | No                       | —    | 4-96  |
|                                  | C032          | Multi-function output terminal 12 contact selection<br>[Output [12] actv. state] |                 |                          |      |       |
|                                  | C033          | Multi-function output terminal 13 contact selection<br>[Output [13] actv. state] |                 |                          |      |       |
|                                  | C034          | Multi-function output terminal 14 contact selection<br>[Output [14] actv. state] |                 |                          |      |       |
|                                  | C035          | Multi-function output terminal 15 contact selection<br>[Output [15] actv. state] |                 |                          |      |       |
|                                  | C036          | Relay output (AL2, AL1) contact selection<br>[Alarm RLY active state]            | 01              |                          |      |       |
| Level and output terminal status | C038          | Light load signal output mode<br>[LOC out mode select]                           | 01              | No                       | —    | 4-106 |
|                                  | C039          | Light load detection level<br>[LOC out level]                                    | Rated current   | No                       | A    |       |
|                                  | C040          | Overload warning signal output mode<br>[Overload warn mode]                      | 01              | No                       | —    | 4-49  |
|                                  | C041          | Overload warning level<br>[Overload warn level]                                  | Rated current   | No                       | A    |       |

\* 2nd/3rd control is displayed when "SET(08)/SET3(17)" is allocated to one of multi-function inputs from C001 to C008.

## Appendix-1 Parameter List

| Level and output terminal status |                                                             |                                              |                 |                          |      |       |  |
|----------------------------------|-------------------------------------------------------------|----------------------------------------------|-----------------|--------------------------|------|-------|--|
| Parameter No.                    | Function name                                               | Monitor or data range                        | Default setting | Changes during operation | Unit | Page  |  |
| C042                             | Arrival frequency during acceleration [FQ arrive accel.1]   | 0.00 to 400.00                               | 0.00            | No                       | Hz   | 4-98  |  |
| C043                             | Arrival frequency during deceleration [FQ arrive decel.1]   | 0.00 to 400.00                               | 0.00            | No                       | Hz   |       |  |
| C044                             | PID deviation excessive level [PID deviation]               | 0.0 to 100.0                                 | 3.0             | No                       | %    | 4-31  |  |
| C045                             | Arrival frequency during acceleration 2 [FQ arrive accel.2] | 0.00 to 400.00                               | 0.00            | No                       | Hz   | 4-98  |  |
| C046                             | Arrival frequency during deceleration 2 [FQ arrive decel.2] | 0.00 to 400.00                               | 0.00            | No                       | Hz   |       |  |
| C052                             | PID FB upper limit [PID FBV high limit]                     | 0.0 to 100.0                                 | 100.0           | No                       | %    | 4-31  |  |
| C053                             | PID FB lower limit [PID FBV low limit]                      | 0.0 to 100.0                                 | 0.0             | No                       | %    |       |  |
| C055                             | Overtorque level (Forward power running) [OV-TRQ FW/POW]    | 0 to 200 (0.4 to 55 kW)                      | 200             | No                       | %    | 4-100 |  |
|                                  |                                                             | 0 to 180 (75 to 132 kW)                      | 180             |                          |      |       |  |
| C056                             | Overtorque level (Reverse regeneration) [OV-TRQ RV/REG]     | 0 to 200 (0.4 to 55 kW)                      | 200             | No                       | %    |       |  |
|                                  |                                                             | 0 to 180 (75 to 132 kW)                      | 180             |                          |      |       |  |
| C057                             | Overtorque level (Reverse power running) [OV-TRQ RVPOW]     | 0 to 200 (0.4 to 55 kW)                      | 200             | No                       | %    |       |  |
|                                  |                                                             | 0 to 180 (75 to 132 kW)                      | 180             |                          |      |       |  |
| C058                             | Overtorque level (Forward regeneration) [OV-TRQ FW/REG]     | 0 to 200 (0.4 to 55 kW)                      | 200             | No                       | %    |       |  |
|                                  |                                                             | 0 to 180 (75 to 132 kW)                      | 180             |                          |      |       |  |
| C061                             | Thermal warning level [E-Thermal warning]                   | 0 to 100                                     | 80              | No                       | %    | 4-46  |  |
| C062                             | Alarm code selection [Alarm code output]                    | 00: OFF (Disabled)<br>01: 3-bit<br>02: 4-bit | 00              | No                       | —    | 4-101 |  |
| C063                             | 0 Hz detection level [0Hz detection level]                  | 0.00 to 100.00                               | 0.00            | No                       | Hz   | 4-101 |  |
| C064                             | Fin overheat warning level [Heatsink warning]               | 0 to 200                                     | 120             | No                       | ℃    | 4-105 |  |

\* 2nd/3rd control is displayed when "SET(08)/SET3(17)" is allocated to one of multi-function inputs from C001 to C008.

| Parameter No.          | Function name | Monitor or data range                                                                                                                                                                            | Default setting | Changes during operation | Unit | Page           |
|------------------------|---------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|--------------------------|------|----------------|
| Communication function | C071          | Communication speed selection (Baud rate selection) [Comm. baud rate]<br>02: Loop-back test<br>03: 2400 bps<br>04: 4800 bps<br>05: 9600 bps<br>06: 19200 bps                                     | 05              | No                       | —    | 4-146          |
|                        | C072          | Communication station No. selection [Modbus address]<br>1 to 247                                                                                                                                 | 1               | No                       | —    |                |
|                        | C073          | Communication bit length selection [Comm. Data length]<br>7: 7-bit<br>8: 8-bit                                                                                                                   | 8               | No                       | —    |                |
|                        | C074          | Communication parity selection [Parity]<br>00: No parity<br>01: Even<br>02: Odd                                                                                                                  | 00              | No                       | —    |                |
|                        | C075          | Communication stop bit selection [Stop bit]<br>1: 1-bit<br>2: 2-bit                                                                                                                              | 1               | No                       | —    |                |
|                        | C076          | Communication error selection [Comm.error mode]<br>00: Trip<br>01: Decel-Trip (Trip after deceleration stop)<br>02: Ignore<br>03: Free-RUN (Free-run stop)<br>04: Decel-Stop (Deceleration stop) | 02              | No                       | —    | 4-104<br>4-146 |
|                        | C077          | Communication error timeout [Comm. Timeout]<br>0.00 to 99.99                                                                                                                                     | 0.00            | No                       | s    |                |
|                        | C078          | Communication wait time [Comm.wait time]<br>0 to 1000                                                                                                                                            | 0               | No                       | ms   |                |
|                        | C079          | Communication method selection [Comm.mode]<br>00: ASCII<br>01: ModBus-RTU                                                                                                                        | 01              | No                       | —    | 4-146          |
| Adjustment             | C081          | O adjustment [[O] span calibration]<br>0 to 65535                                                                                                                                                | Factory default | Yes                      | —    | —              |
|                        | C082          | OI adjustment [[OI] span calibration]<br>0 to 65535                                                                                                                                              | Factory default | Yes                      | —    | —              |
|                        | C083          | O2 adjustment [[O2] span calibration]<br>0 to 65535                                                                                                                                              | Factory default | Yes                      | —    | —              |
|                        | C085          | Thermistor adjustment [PTC span calibration]<br>0.0 to 1000.0                                                                                                                                    | Factory default | Yes                      | —    | 4-75           |
|                        | C091          | Debug mode selection [Debug mode select]<br>Use "00".<br>* Do not change.                                                                                                                        | 00              | No                       | —    | —              |

\* 2nd/3rd control is displayed when "SET(08)/SET3(17)" is allocated to one of multi-function inputs from C001 to C008.

## Appendix-1 Parameter List

| Parameter No.    | Function name | Monitor or data range                                                                                                                                                                                                                          | Default setting | Changes during operation | Unit | Page          |
|------------------|---------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|--------------------------|------|---------------|
| Others           | C101          | UP/DWN selection [UP/DWN memory mode]<br>00: Not save (Do not store the frequency data)<br>01: Save (Store the frequency data)                                                                                                                 | 00              | No                       | —    | 4-90          |
|                  | C102          | Reset selection [Reset mode select]<br>00: ON-RESET (Trip reset at power-on)<br>01: OFF-RESET (Trip reset when the power is OFF)<br>02: On in Trip (Enabled only during trip (Reset when the power is ON))<br>03: Trip RESET (Trip reset only) | 00              | Yes                      | —    | 4-87<br>4-137 |
|                  | C103          | Reset frequency matching selection [Restart after reset]<br>00: 0 Hz start<br>01: f-match (Frequency matching start)<br>02: Actv.f-match (Active Frequency Matching restart)                                                                   | 00              | No                       | —    | 4-87          |
| Meter adjustment | C105          | FM gain setting [FM gain adjust]<br>50 to 200                                                                                                                                                                                                  | 100             | Yes                      | %    | 4-110         |
|                  | C106          | AM gain setting [AM gain adjust]<br>50 to 200                                                                                                                                                                                                  | 100             | Yes                      | %    | 4-111         |
|                  | C107          | AMI gain setting [AMI gain adjust]<br>50 to 200                                                                                                                                                                                                | 100             | Yes                      | %    |               |
|                  | C109          | AM bias setting [AM bias adjust]<br>0 to 100                                                                                                                                                                                                   | 0               | Yes                      | %    |               |
|                  | C110          | AMI bias setting [AMI bias adjust]<br>0 to 100                                                                                                                                                                                                 | 20              | Yes                      | %    |               |
| Terminal         | C111          | Overload warning level 2 [Overload warn lvl 2]<br>0.0 to 2.00 × Rated current (0.4 to 55 kW)<br>0.0 to 1.80 × Rated current (75 to 132 kW)                                                                                                     | Rated current   | No                       | A    | 4-49          |
| Adjustment       | C121          | O zero adjustment [[O] 0 calibration]<br>0 to 65535                                                                                                                                                                                            | Factory default | Yes                      | —    | —             |
|                  | C122          | OI zero adjustment [[OI] 0 calibration]<br>0 to 65535                                                                                                                                                                                          | Factory default | Yes                      | —    |               |
|                  | C123          | O2 zero adjustment [[O2] 0 calibration]<br>0 to 65535                                                                                                                                                                                          | Factory default | Yes                      | —    |               |

\* 2nd/3rd control is displayed when "SET(08)/SET3(17)" is allocated to one of multi-function inputs from C001 to C008.

| Parameter No.                      | Function name                                              | Monitor or data range                                        | Default setting                                              | Changes during operation | Unit | Page |       |
|------------------------------------|------------------------------------------------------------|--------------------------------------------------------------|--------------------------------------------------------------|--------------------------|------|------|-------|
| Output terminal operation function | C130                                                       | Output 11 ON delay<br>[Output [11] ON delay]                 | 0.0 to 100.0                                                 | 0.0                      | No   | s    | 4-108 |
|                                    | C131                                                       | Output 11 OFF delay<br>[Output [11] OFF delay]               | 0.0 to 100.0                                                 | 0.0                      |      |      |       |
|                                    | C132                                                       | Output 12 ON delay<br>[Output [12] ON delay]                 | 0.0 to 100.0                                                 | 0.0                      |      |      |       |
|                                    | C133                                                       | Output 12 OFF delay<br>[Output [12] OFF delay]               | 0.0 to 100.0                                                 | 0.0                      |      |      |       |
|                                    | C134                                                       | Output 13 ON delay<br>[Output [13] ON delay]                 | 0.0 to 100.0                                                 | 0.0                      |      |      |       |
|                                    | C135                                                       | Output 13 OFF delay<br>[Output [13] OFF delay]               | 0.0 to 100.0                                                 | 0.0                      |      |      |       |
|                                    | C136                                                       | Output 14 ON delay<br>[Output [14] ON delay]                 | 0.0 to 100.0                                                 | 0.0                      |      |      |       |
|                                    | C137                                                       | Output 14 OFF delay<br>[Output [14] OFF delay]               | 0.0 to 100.0                                                 | 0.0                      |      |      |       |
|                                    | C138                                                       | Output 15 ON delay<br>[Output [15] ON delay]                 | 0.0 to 100.0                                                 | 0.0                      |      |      |       |
|                                    | C139                                                       | Output 15 OFF delay<br>[Output [15] OFF delay]               | 0.0 to 100.0                                                 | 0.0                      |      |      |       |
|                                    | C140                                                       | Relay output ON delay<br>[Alarm-RLY ON delay]                | 0.0 to 100.0                                                 | 0.0                      |      |      |       |
|                                    | C141                                                       | Relay output OFF delay<br>[Alarm-RLY OFF delay]              | 0.0 to 100.0                                                 | 0.0                      |      |      |       |
|                                    | C142                                                       | Logic output signal 1 selection 1<br>[Log.out 1 operand A]   | Same as options for C021 to C026<br>(excluding LOG1 to LOG6) | 00                       |      |      |       |
| C143                               | Logic output signal 1 selection 2<br>[Log.out 2 operand B] | Same as options for C021 to C026<br>(excluding LOG1 to LOG6) | 00                                                           |                          |      |      |       |

\* 2nd/3rd control is displayed when "SET(08)/SET3(17)" is allocated to one of multi-function inputs from C001 to C008.

## Appendix-1 Parameter List

| Parameter No. | Function name                                                    | Monitor or data range                                     | Default setting | Changes during operation | Unit | Page  |
|---------------|------------------------------------------------------------------|-----------------------------------------------------------|-----------------|--------------------------|------|-------|
| C144          | Logic output signal 1 operator selection<br>[Log.out 1 operator] | 00: AND<br>01: OR<br>02: XOR                              | 00              | No                       | —    | 4-102 |
| C145          | Logic output signal 2 selection 1<br>[Log.out 2 operand A]       | Same as options for C021 to C026 (excluding LOG1 to LOG6) | 00              |                          |      |       |
| C146          | Logic output signal 2 selection 2<br>[Log.out 2 operand B]       | Same as options for C021 to C026 (excluding LOG1 to LOG6) | 00              |                          |      |       |
| C147          | Logic output signal 2 operator selection<br>[Log.out 2 operator] | 00: AND<br>01: OR<br>02: XOR                              | 00              |                          |      |       |
| C148          | Logic output signal 3 selection 1<br>[Log.out 3 operand A]       | Same as options for C021 to C026 (excluding LOG1 to LOG6) | 00              |                          |      |       |
| C149          | Logic output signal 3 selection 2<br>[Log.out 3 operand B]       | Same as options for C021 to C026 (excluding LOG1 to LOG6) | 00              |                          |      |       |
| C150          | Logic output signal 3 operator selection<br>[Log.out 3 operator] | 00: AND<br>01: OR<br>02: XOR                              | 00              |                          |      |       |
| C151          | Logic output signal 4 selection 1<br>[Log.out 4 operand A]       | Same as options for C021 to C026 (excluding LOG1 to LOG6) | 00              | No                       | —    | 4-102 |
| C152          | Logic output signal 4 selection 2<br>[Log.out 4 operand B]       | Same as options for C021 to C026 (excluding LOG1 to LOG6) | 00              |                          |      |       |
| C153          | Logic output signal 4 operator selection<br>[Log.out 4 operator] | 00: AND<br>01: OR<br>02: XOR                              | 00              |                          |      |       |
| C154          | Logic output signal 5 selection 1<br>[Log.out 5 operand A]       | Same as options for C021 to C026 (excluding LOG1 to LOG6) | 00              |                          |      |       |
| C155          | Logic output signal 5 selection 2<br>[Log.out 5 operand B]       | Same as options for C021 to C026 (excluding LOG1 to LOG6) | 00              |                          |      |       |
| C156          | Logic output signal 5 operator selection<br>[Log.out 5 operator] | 00: AND<br>01: OR<br>02: XOR                              | 00              |                          |      |       |
| C157          | Logic output signal 6 selection 1<br>[Log.out 6 operand A]       | Same as options for C021 to C026 (excluding LOG1 to LOG6) | 00              |                          |      |       |
| C158          | Logic output signal 6 selection 2<br>[Log.out 6 operand B]       | Same as options for C021 to C026 (excluding LOG1 to LOG6) | 00              |                          |      |       |
| C159          | Logic output signal 6 operator selection<br>[Log.out 6 operator] | 00: AND<br>01: OR<br>02: XOR                              | 00              |                          |      |       |

\* 2nd/3rd control is displayed when "SET(08)/SET3(17)" is allocated to one of multi-function inputs from C001 to C008.

| Parameter No.           | Function name | Monitor or data range                                                    | Default setting    | Changes during operation | Unit | Page          |
|-------------------------|---------------|--------------------------------------------------------------------------|--------------------|--------------------------|------|---------------|
| Input terminal response | C160          | Input terminal response time 1<br>[Input [1] resp.time]                  | 0 to 200 (× 2 ms)  | 1                        | No   | ms            |
|                         | C161          | Input terminal response time 2<br>[Input [2] resp.time]                  | 0 to 200 (× 2 ms)  | 1                        |      |               |
|                         | C162          | Input terminal response time 3<br>[Input [3] resp.time]                  | 0 to 200 (× 2 ms)  | 1                        |      |               |
|                         | C163          | Input terminal response time 4<br>[Input [4] resp.time]                  | 0 to 200 (× 2 ms)  | 1                        |      |               |
|                         | C164          | Input terminal response time 5<br>[Input [5] resp.time]                  | 0 to 200 (× 2 ms)  | 1                        |      |               |
|                         | C165          | Input terminal response time 6<br>[Input [6] resp.time]                  | 0 to 200 (× 2 ms)  | 1                        |      |               |
|                         | C166          | Input terminal response time 7<br>[Input [7] resp.time]                  | 0 to 200 (× 2 ms)  | 1                        |      |               |
|                         | C167          | Input terminal response time 8<br>[Input [8] resp.time]                  | 0 to 200 (× 2 ms)  | 1                        |      |               |
|                         | C168          | FW terminal response time<br>[Input [FW] resp.time]                      | 0 to 200 (× 2 ms)  | 1                        |      |               |
| Others                  | C169          | Multi-step speed/ position determination time<br>[Multi-spd determ.time] | 0 to 200 (× 10 ms) | 0                        | No   | ms            |
|                         |               |                                                                          |                    |                          |      | 4-16<br>4-137 |

\* 2nd/3rd control is displayed when "SET(08)/SET3(17)" is allocated to one of multi-function inputs from C001 to C008.

## Appendix-1 Parameter List

| Parameter No.     |      | Function name                                             | Monitor or data range                                                                                                  | Default setting | Changes during operation | Unit | Page                            |
|-------------------|------|-----------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|-----------------|--------------------------|------|---------------------------------|
| Control parameter | H001 | Auto-tuning selection<br>[Auto-tuning select]             | 00: OFF (Disabled)<br>01: ON (STOP)<br>02: ON (Rotation)                                                               | 00              | No                       | —    | 4-111                           |
|                   | H002 | Motor parameter selection<br>[Motor data select]          | 00: Standard motor parameter<br>01: Auto-tuning parameter<br>02: Auto-tuning parameter<br>(online auto-tuning enabled) | 00              | No                       | —    | 4-111<br>4-113<br>4-115         |
|                   | H202 | * 2nd motor parameter selection<br>[Motor data select-M2] |                                                                                                                        | 00              |                          |      |                                 |
|                   | H003 | Motor capacity selection<br>[Motor capacity]              | 0.20 to 160.0                                                                                                          | Factory default | No                       | kW   | 4-19<br>4-111<br>4-115<br>4-118 |
|                   | H203 | * 2nd motor capacity selection<br>[Motor capacity-M2]     |                                                                                                                        | Factory default |                          |      |                                 |
|                   | H004 | Motor pole number selection<br>[Motor poles]              | 2/4/6/8/10                                                                                                             | 4               | No                       | Pole |                                 |
|                   | H204 | * 2nd motor pole number selection<br>[Motor poles-M2]     |                                                                                                                        | 4               |                          |      |                                 |
|                   | H005 | Speed response<br>[M.speed const]                         | 0.001 to 80.000                                                                                                        | 1.590           | Yes                      | —    | 4-89<br>4-92                    |
|                   | H205 | * 2nd speed response<br>[M.speed const-M2]                |                                                                                                                        | 1.590           |                          |      |                                 |
|                   | H006 | Stabilization parameter<br>[M.stabil.const]               | 0 to 255                                                                                                               | 100             | Yes                      | —    | 4-120                           |
|                   | H206 | * 2nd stabilization parameter<br>[M.stabil.const-M2]      |                                                                                                                        | 100             |                          |      |                                 |
|                   | H306 | * 3rd stabilization parameter<br>[M.stabil.const-M3]      |                                                                                                                        | 100             |                          |      |                                 |

\* 2nd/3rd control is displayed when "SET(08)/SET3(17)" is allocated to one of multi-function inputs from C001 to C008.



| Parameter No.     |      | Function name                               | Monitor or data range | Default setting                | Changes during operation | Unit             | Page  |
|-------------------|------|---------------------------------------------|-----------------------|--------------------------------|--------------------------|------------------|-------|
| Control parameter | H020 | Motor parameter R1<br>[M.const R1]          | 0.001 to 65.535       | Depends on the motor capacity. | No                       | $\Omega$         | 4-115 |
|                   | H220 | * 2nd motor parameter R1<br>[M.const R1-M2] |                       | Depends on the motor capacity. |                          |                  |       |
|                   | H021 | Motor parameter R2<br>[M.const R2]          | 0.001 to 65.535       | Depends on the motor capacity. | No                       | $\Omega$         |       |
|                   | H221 | * 2nd motor parameter R2<br>[M.const R2-M2] |                       | Depends on the motor capacity. |                          |                  |       |
|                   | H022 | Motor parameter L<br>[M.const L]            | 0.01 to 655.35        | Depends on the motor capacity. | No                       | mH               |       |
|                   | H222 | * 2nd motor parameter L<br>[M.const L-M2]   |                       | Depends on the motor capacity. |                          |                  |       |
|                   | H023 | Motor parameter IO<br>[M.const IO]          | 0.01 to 655.35        | Depends on the motor capacity. | No                       | A                | 4-115 |
|                   | H223 | * 2nd motor parameter IO<br>[M.const IO-M2] |                       | Depends on the motor capacity. |                          |                  |       |
|                   | H024 | Motor parameter J<br>[M.const J]            | 0.001 to 9999.000     | Depends on the motor capacity. | No                       | kgm <sup>2</sup> |       |
|                   | H224 | * 2nd motor parameter J<br>[M.const J-M2]   |                       | Depends on the motor capacity. |                          |                  |       |

\* 2nd/3rd control is displayed when "SET(08)/SET3(17)" is allocated to one of multi-function inputs from C001 to C008.

## Appendix-1 Parameter List

| Parameter No.     |      | Function name                                                           | Monitor or data range | Default setting                | Changes during operation | Unit             | Page           |
|-------------------|------|-------------------------------------------------------------------------|-----------------------|--------------------------------|--------------------------|------------------|----------------|
| Control parameter | H030 | Motor parameter R1 (auto-tuning data)<br>[M.const R1 (A.Tune)]          | 0.001 to 65.535       | Depends on the motor capacity. | No                       | $\Omega$         | 4-111<br>4-115 |
|                   | H230 | * 2nd motor parameter R1 (auto-tuning data)<br>[M.const R1-M2 (A.Tune)] |                       | Depends on the motor capacity. |                          |                  |                |
|                   | H031 | Motor parameter R2 (auto-tuning data)<br>[M.const R2 (A.Tune)]          | 0.001 to 65.535       | Depends on the motor capacity. | No                       | $\Omega$         |                |
|                   | H231 | * 2nd motor parameter R2 (auto-tuning data)<br>[M.const R2-M2 (A.Tune)] |                       | Depends on the motor capacity. |                          |                  |                |
|                   | H032 | Motor parameter L (auto-tuning data)<br>[M.const L (A.Tune)]            | 0.01 to 655.35        | Depends on the motor capacity. | No                       | mH               |                |
|                   | H232 | * 2nd motor parameter L (auto-tuning data)<br>[M.const L-M2 (A.Tune)]   |                       | Depends on the motor capacity. |                          |                  |                |
|                   | H033 | Motor parameter Io (auto-tuning data)<br>[M.const IO (A.Tune)]          | 0.01 to 655.35        | Depends on the motor capacity. | No                       | A                |                |
|                   | H233 | * 2nd motor parameter Io (auto-tuning data)<br>[M.const IO-M2 (A.Tune)] |                       | Depends on the motor capacity. |                          |                  |                |
|                   | H034 | Motor parameter J (auto-tuning data)<br>[M.const J (A.Tune)]            | 0.001 to 9999.000     | Depends on the motor capacity. | No                       | kgm <sup>2</sup> |                |
|                   | H234 | * 2nd motor parameter J (auto-tuning data)<br>[M.const J-M2 (A.Tune)]   |                       | Depends on the motor capacity. |                          |                  |                |

\* 2nd/3rd control is displayed when "SET(08)/SET3(17)" is allocated to one of multi-function inputs from C001 to C008.

| Parameter No.     |      | Function name                                                      | Monitor or data range | Default setting | Changes during operation | Unit | Page         |
|-------------------|------|--------------------------------------------------------------------|-----------------------|-----------------|--------------------------|------|--------------|
| Control parameter | H050 | PI proportional gain<br>[PI P gain]                                | 0.0 to 1000.0         | 100.0           | Yes                      | —    | 4-89<br>4-92 |
|                   | H250 | * 2nd PI proportional gain<br>[PI P gain-M2]                       |                       | 100.0           |                          |      |              |
|                   | H051 | PI integral gain<br>[PI I gain]                                    | 0.0 to 1000.0         | 100.0           | Yes                      | —    |              |
|                   | H251 | *2nd PI integral gain<br>[PI I gain-M2]                            |                       | 100.0           |                          |      |              |
|                   | H052 | P proportional gain<br>[P gain]                                    | 0.01 to 10.00         | 1.00            | Yes                      | —    |              |
|                   | H252 | *2nd P proportional gain<br>[P gain-M2]                            |                       | 1.00            |                          |      |              |
|                   | H060 | Limit at 0 Hz<br>[0Hz Speed limit]                                 | 0.0 to 100.0          | 100.0           | Yes                      | %    | 4-117        |
|                   | H260 | * 2nd limit at 0 Hz<br>[0Hz Speed limit-M2]                        |                       | 100.0           |                          |      |              |
|                   | H061 | Boost amount at SLV startup, 0 Hz<br>[Bst HiTQ start SLV]          | 0 to 50               | 50              | Yes                      | %    |              |
|                   | H261 | * 2nd boost amount at SLV startup, 0 Hz<br>[Bst HiTQ start SLV-M2] |                       | 50              |                          |      |              |
|                   | H070 | For PI proportional gain switching<br>[PI P gain term.]            | 0.0 to 1000.0         | 100.0           | Yes                      | —    | 4-89         |
|                   | H071 | For PI integral gain switching<br>[PI I gain term.]                | 0.0 to 1000.0         | 100.0           | Yes                      | —    |              |
|                   | H072 | For P proportional gain switching<br>[P gain term.]                | 0.00 to 10.00         | 1.00            | Yes                      | —    |              |
|                   | H073 | Gain switching time<br>[Gain switching time]                       | 0 to 9999             | 100             | Yes                      | ms   |              |

\* 2nd/3rd control is displayed when "SET(08)/SET3(17)" is allocated to one of multi-function inputs from C001 to C008.

## Appendix-1 Parameter List

| Parameter No. | Function name                                               | Monitor or data range                                                                                                                                                                 | Default setting | Changes during operation | Unit  | Page                    |
|---------------|-------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|--------------------------|-------|-------------------------|
| P001          | Operation selection at option 1 error [Error mode OP1 card] | 00: Trip<br>01: RUN (Continues operation)                                                                                                                                             | 00              | No                       | —     | 4-111                   |
| P002          | Operation selection at option 2 error [Error mode OP2 card] | 00: Trip<br>01: RUN (Continues operation)                                                                                                                                             | 00              | No                       | —     |                         |
| P011          | Encoder pulses [FB Encoder PPR]                             | 128 to 65535                                                                                                                                                                          | 1024            | No                       | Pulse | 4-124<br>4-133<br>4-134 |
| P012          | V2 control mode selection [Control pulse setting]           | 00: ASR (speed control mode)<br>01: APR (pulse train position control mode)<br>02: APR2 (absolute position control mode)<br>03: HAPR (High resolution absolute position control mode) | 00              | No                       | —     | 4-124<br>4-136          |
| P013          | Pulse train mode selection [Pulse train mode]               | 00: Mode 1<br>01: Mode 2<br>02: Mode 3                                                                                                                                                | 00              | No                       | —     | 4-127                   |
| P014          | Orientation stop position [Home search stop]                | 0 to 4095                                                                                                                                                                             | 0               | No                       | —     | 4-134                   |
| P015          | Orientation speed setting [Home search speed]               | Starting frequency to Max. frequency (upper limit: 120.0)                                                                                                                             | 5.00            | No                       | Hz    |                         |
| P016          | Orientation direction setting [Home search direction]       | 00: FWD (Forward side)<br>01: REV (Reverse side)                                                                                                                                      | 00              | No                       | —     |                         |

\* 2nd/3rd control is displayed when "SET(08)/SET3(17)" is allocated to one of multi-function inputs from C001 to C008.

| Parameter No. | Function name                                                                    | Monitor or data range                                                                      | Default setting | Changes during operation | Unit  | Page                                      |
|---------------|----------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------|-----------------|--------------------------|-------|-------------------------------------------|
| P017          | Position ready range setting<br>[Home search range]                              | 0 to 10000                                                                                 | 5               | No                       | Pulse | 4-127<br>4-134                            |
| P018          | Position ready delay time setting<br>[Home search delay]                         | 0.00 to 9.99                                                                               | 0.00            | No                       | s     | 4-127<br>4-134                            |
| P019          | Electronic gear setting position selection<br>[E.gear position]                  | 00: FB (Position feedback side)<br>01: REF (Position command side)                         | 00              | Yes                      | —     | 4-128<br>4-129                            |
| P020          | Electronic gear ratio numerator<br>[E.gear ratio-Num.]                           | 1 to 9999                                                                                  | 1               | Yes                      | —     |                                           |
| P021          | Electronic gear ratio denominator<br>[E.gear ratio-Den.]                         | 1 to 9999                                                                                  | 1               | Yes                      | —     |                                           |
| P022          | Position control feedforward gain<br>[Feed-FW gain]                              | 0.00 to 655.35                                                                             | 0.00            | Yes                      | —     |                                           |
| P023          | Position loop gain<br>[Position loop gain]                                       | 0.00 to 100.00                                                                             | 0.50            | Yes                      | rad/s |                                           |
| P024          | Position bias amount<br>[Position bias]                                          | -2048 to 2048                                                                              | 0               | Yes                      | rad/s | 4-124<br>4-128<br>4-129<br>4-134<br>4-136 |
| P025          | Secondary resistance compensation enable/disable selection<br>[Temp.comp. Therm] | 00: OFF (Disabled)<br>01: ON (Enabled)                                                     | 00              | No                       | —     | 4-114                                     |
| P026          | Overspeed error detection level<br>[OverSpeed err level]                         | 0.0 to 150.0                                                                               | 135.0           | No                       | %     | 5-7                                       |
| P027          | Speed deviation error detection level<br>[SpeedDev. Err level]                   | 0.00 to 120.00                                                                             | 7.50            | No                       | Hz    | 4-124                                     |
| P028          | Motor gear ratio numerator<br>[M.gear ratio-num]                                 | 1 to 9999                                                                                  | 1               | No                       | —     | 4-133                                     |
| P029          | Motor gear ratio denominator<br>[M.gear ratio-den]                               | 1 to 9999                                                                                  | 1               | No                       | —     |                                           |
| P031          | Acceleration/ deceleration time input type<br>[Acc/Dec time source]              | 00: OPE (Digital Operator)<br>01: Option 1<br>02: Option 2<br>03: EzSQ (Drive Programming) | 00              | No                       | —     | 4-8                                       |
| P032          | Orientation stop position input type<br>[Positioning cmd src.]                   | 00: OPE (Digital Operator)<br>01: Option 1<br>02: Option 2                                 | 00              | No                       | —     | —                                         |

Options

Appendix

\* 2nd/3rd control is displayed when "SET(08)/SET3(17)" is allocated to one of multi-function inputs from C001 to C008.

## Appendix-1 Parameter List

| Parameter No. | Function name                                                     | Monitor or data range                                                                                                                                                                                                                                                           | Default setting | Changes during operation | Unit | Page           |
|---------------|-------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|--------------------------|------|----------------|
| P033          | Torque reference input selection [TRQ cmd source]                 | 00: O (Terminal O)<br>01: OI (Terminal OI)<br>02: O2 (Terminal O2)<br>03: OPE (Digital Operator)<br>06: Option 1<br>07: Option 2                                                                                                                                                | 00              | No                       | —    | 4-126          |
| P034          | Torque reference setting [TRQ cmd setting]                        | 0 to 200 (0.4 to 55 kW)<br>0 to 180 (75 to 132 kW)                                                                                                                                                                                                                              | 0               | Yes                      | %    |                |
| P035          | Polarity selection at torque reference via O2 [O2 TRQ polarity]   | 00: Sign (Signed)<br>01: Direction (Depends on the RUN direction)                                                                                                                                                                                                               | 00              | No                       | —    |                |
| P036          | Torque bias mode [TRQ bias mode]                                  | 00: OFF (None)<br>01: OPE (Digital Operator)<br>02: O2 (Terminal O2)<br>05: Option 1<br>06: Option 2                                                                                                                                                                            | 00              | No                       | —    | 4-126<br>4-127 |
| P037          | Torque bias value [TRQ bias value]                                | -200 to 200 (0.4 to 55 kW)<br>-180 to 180 (75 to 132 kW)                                                                                                                                                                                                                        | 0               | Yes                      | %    |                |
| P038          | Torque bias polarity selection [TRQ bias polarity]                | 00: Sign (Signed)<br>01: Direction (Depends on the RUN direction)                                                                                                                                                                                                               | 00              | No                       | —    |                |
| P039          | Speed limit value in torque control (forward) [TRQ SpeedLmt (FW)] | 0.00 to Maximum frequency                                                                                                                                                                                                                                                       | 0.00            | Yes                      | Hz   | 4-126          |
| P040          | Speed limit value in torque control (reverse) [TRQ SpeedLmt (RV)] | 0.00 to Maximum frequency                                                                                                                                                                                                                                                       | 0.00            | Yes                      | Hz   |                |
| P044          | DeviceNet comm Watch dog timer [DeviceNet comm WDT]               | 0.00 to 99.99                                                                                                                                                                                                                                                                   | 1.00            | No                       | s    | —              |
| P045          | Operation setting at communications error [Act. Network com loss] | 00: Trip<br>01: Decel-Trip (Trip after deceleration stop)<br>02: Ignore<br>03: Free RUN<br>04: Decel-Stop (Deceleration stop)                                                                                                                                                   | 00              | No                       | —    | —              |
| P046          | Instance Number [Instance No.]                                    | 0: Basic speed I/O<br>1: Extended speed I/O<br>2: Extended speed and Torque control<br>3: Special I/O<br>4: Extended control I/O<br>5: Extended control I/O and multifunction I/O monitor<br>6: Flexible format<br>7: Extended speed and Acceleration control<br>8-20: Not used | 1               | No                       | —    | —              |

\* 2nd/3rd control is displayed when "SET(08)/SET3(17)" is allocated to one of multi-function inputs from C001 to C008.

| Parameter No.             | Function name | Monitor or data range                                                                                                                                                                            | Default setting | Changes during operation | Unit | Page  |
|---------------------------|---------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|--------------------------|------|-------|
| Options                   | P048          | Operation setting at idle mode detection<br>[Act. Network idle]<br>00: Trip<br>01: Decel-Trip (Trip after deceleration stop)<br>02: Ignore<br>03: Free RUN<br>04: Decel-Stop (Deceleration stop) | 00              | No                       | —    | —     |
|                           | P049          | Polarity setting for rotation speed<br>[Poles of RPM]<br>0/2/4/6/8/10/12/14/16/18/20/22/24/26/28/30/32/34/36/38                                                                                  | 0               | No                       | —    | —     |
|                           | P055          | Pulse train frequency scale<br>[Pulse FQ scale]<br>1.0 to 50.0                                                                                                                                   | 25.0            | No                       | kHz  | 4-144 |
|                           | P056          | Pulse train frequency filter time constant<br>[Pulse FQ filter]<br>0.01 to 2.00                                                                                                                  | 0.10            | No                       | s    |       |
|                           | P057          | Pulse train frequency bias amount<br>[Pulse FQ bias]<br>-100 to 100                                                                                                                              | 0               | No                       | %    |       |
|                           | P058          | Pulse train frequency limit<br>[Pulse FQ limit]<br>0 to 100                                                                                                                                      | 100             | No                       | %    |       |
| Absolute position control | P060          | Multi-step position command 0<br>[Position set 0]<br>Position range specification (reverse side) to Position range specification (forward side)<br>-268435455 to 268435455                       | 0               | Yes                      | —    | 4-136 |
|                           | P061          | Multi-step position command 1<br>[Position set 1]<br>Position range specification (reverse side) to Position range specification (forward side)<br>-268435455 to 268435455                       | 0               |                          |      |       |
|                           | P062          | Multi-step position command 2<br>[Position set 2]<br>Position range specification (reverse side) to Position range specification (forward side)<br>-268435455 to 268435455                       | 0               |                          |      |       |
|                           | P063          | Multi-step position command 3<br>[Position set 3]<br>Position range specification (reverse side) to Position range specification (forward side)<br>-268435455 to 268435455                       | 0               |                          |      |       |
|                           | P064          | Multi-step position command 4<br>[Position set 4]<br>Position range specification (reverse side) to Position range specification (forward side)<br>-268435455 to 268435455                       | 0               |                          |      |       |
|                           | P065          | Multi-step position command 5<br>[Position set 5]<br>Position range specification (reverse side) to Position range specification (forward side)<br>-268435455 to 268435455                       | 0               |                          |      |       |
|                           | P066          | Multi-step position command 6<br>[Position set 6]<br>Position range specification (reverse side) to Position range specification (forward side)<br>-268435455 to 268435455                       | 0               |                          |      |       |
|                           | P067          | Multi-step position command 7<br>[Position set 7]<br>Position range specification (reverse side) to Position range specification (forward side)<br>-268435455 to 268435455                       | 0               |                          |      |       |
|                           | P068          | Zero return mode<br>[Homing mode select]<br>00: Low speed<br>01: High speed 1<br>02: High speed 2                                                                                                | 00              | Yes                      | —    |       |
|                           | P069          | Zero return direction selection<br>[Homing direction]<br>00: FWD (Forward side)<br>01: REV (Reverse side)                                                                                        | 00              | Yes                      | —    |       |

\* 2nd/3rd control is displayed when "SET(08)/SET3(17)" is allocated to one of multi-function inputs from C001 to C008.

## Appendix-1 Parameter List

| Parameter No. | Function name                                                                           | Monitor or data range                                                                                                                                                                                                                                                                                                                                                                                        | Default setting | Changes during operation | Unit | Page  |
|---------------|-----------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|--------------------------|------|-------|
| P070          | Low-speed zero return frequency [LowSpeed homing FQ]                                    | 0.00 to 10.00                                                                                                                                                                                                                                                                                                                                                                                                | 0.00            | Yes                      | Hz   | 4-136 |
| P071          | High-speed zero return frequency [HiSpeed homing FQ]                                    | 0.00 to Maximum frequency                                                                                                                                                                                                                                                                                                                                                                                    | 0.00            | Yes                      | Hz   |       |
| P072          | Position range specification (forward) [Position range FWD]                             | 0 to 268435455 (at P012 = 02)<br>0 to 1073741823 (at P012 = 03)                                                                                                                                                                                                                                                                                                                                              | 268435455       | Yes                      | —    |       |
| P073          | Position range specification (reverse) [Position range REV]                             | -268435455 to 0 (at P012 = 02)<br>-1073741823 to 0 (at P012 = 03)                                                                                                                                                                                                                                                                                                                                            | -268435455      | Yes                      | —    | 4-137 |
| P074          | Teaching selection [Teaching select]                                                    | 00: X00 (Multi-step position command 0 (P060))<br>01: X01 (Multi-step position command 1 (P061))<br>02: X02 (Multi-step position command 2 (P062))<br>03: X03 (Multi-step position command 3 (P063))<br>04: X04 (Multi-step position command 4 (P064))<br>05: X05 (Multi-step position command 5 (P065))<br>06: X06 (Multi-step position command 6 (P066))<br>07: X07 (Multi-step position command 7 (P067)) | 00              | Yes                      | —    |       |
| P100 to P131  | Drive Program parameter U(00) to U(31) [EzSQ parameter U(00)] to [EzSQ parameter U(31)] | 0 to 65535                                                                                                                                                                                                                                                                                                                                                                                                   | 0               | Yes                      | —    | —     |
| P160 to P169  | Option I/F cmd W register 1 to 10 [Op I/F cmd W reg.1] to [Op I/F cmd W reg.10]         | 0000 to FFFF                                                                                                                                                                                                                                                                                                                                                                                                 | 0000            | Yes                      | —    | —     |
| P170 to P179  | Option I/F cmd R register 1 to 10 [Op I/F cmd R reg.1] to [Op I/F cmd R reg.10]         | 0000 to FFFF                                                                                                                                                                                                                                                                                                                                                                                                 | 0000            | Yes                      | —    | —     |
| P180          | Profibus node address [Profibus Node adrs]                                              | 0 to 125                                                                                                                                                                                                                                                                                                                                                                                                     | 0               | No                       | —    | —     |
| P181          | Profibus clear mode [Profibus CLR mode]                                                 | 00: Clear<br>01: Last value                                                                                                                                                                                                                                                                                                                                                                                  | 00              | No                       | —    | —     |

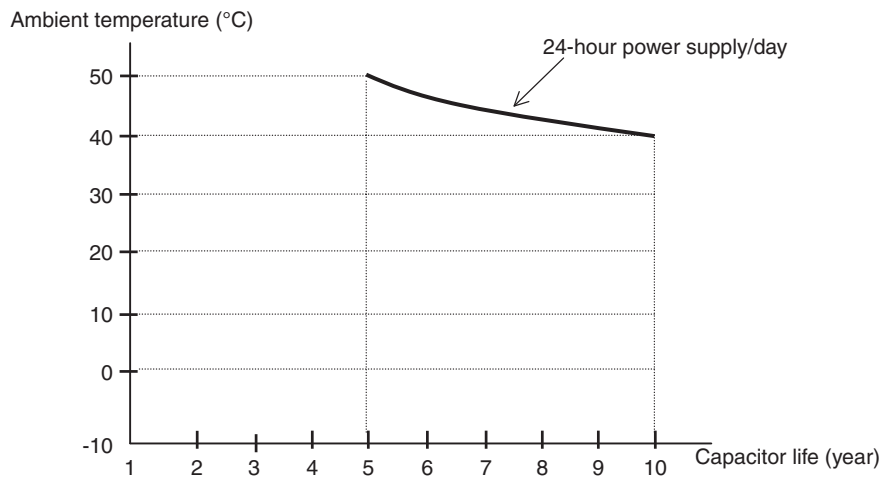
\* 2nd/3rd control is displayed when "SET(08)/SET3(17)" is allocated to one of multi-function inputs from C001 to C008.



| Parameter No.  | Function name                                      | Monitor or data range                                                                                                       | Default setting | Changes during operation | Unit | Page |
|----------------|----------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|-----------------|--------------------------|------|------|
| P182           | Profibus Map selection<br>[Profibus Map selection] | 00: PPO<br>01: Conventional<br>02: Flexible Mode                                                                            | 00              | No                       | —    | —    |
| P185           | CANOpen Node address<br>[CANOpen Node adrs]        | 0 to 127                                                                                                                    | 0               | No                       | —    | —    |
| P186           | CANOpen communication speed<br>[CANOpen com speed] | 00: Auto<br>01: 10Kbps<br>02: 20Kbps<br>03: 50Kbps<br>04: 125Kbps<br>05: 250Kbps<br>06: 500Kbps<br>07: 800Kbps<br>08: 1Mbps | 06              | No                       | —    | —    |
| P190           | CompoNet node address<br>[CompoNet Node address]   | 0 to 63                                                                                                                     | 0               | No                       | —    | —    |
| P192           | DeviceNet node address<br>[DeviceNet MAC ID]       | 0 to 63                                                                                                                     | 63              | No                       | —    | —    |
| P195           | ML2 frame length<br>[ML2 frame length]             | 00: 32 bytes<br>01: 17 bytes                                                                                                | 00              | No                       | —    | —    |
| P196           | ML2 node address<br>[ML2 node address]             | 21 to 3E                                                                                                                    | 21              | No                       | —    | —    |
| User parameter | U001                                               | User 1 selection                                                                                                            | no/d001 to P196 | Yes                      | —    | 4-53 |
|                | U002                                               | User 2 selection                                                                                                            | no/d001 to P196 |                          |      |      |
|                | U003                                               | User 3 selection                                                                                                            | no/d001 to P196 |                          |      |      |
|                | U004                                               | User 4 selection                                                                                                            | no/d001 to P196 |                          |      |      |
|                | U005                                               | User 5 selection                                                                                                            | no/d001 to P196 |                          |      |      |
|                | U006                                               | User 6 selection                                                                                                            | no/d001 to P196 |                          |      |      |
|                | U007                                               | User 7 selection                                                                                                            | no/d001 to P196 |                          |      |      |
|                | U008                                               | User 8 selection                                                                                                            | no/d001 to P196 |                          |      |      |
|                | U009                                               | User 9 selection                                                                                                            | no/d001 to P196 |                          |      |      |
|                | U010                                               | User 10 selection                                                                                                           | no/d001 to P196 |                          |      |      |
|                | U011                                               | User 11 selection                                                                                                           | no/d001 to P196 |                          |      |      |
|                | U012                                               | User 12 selection                                                                                                           | no/d001 to P196 |                          |      |      |

\* 2nd/3rd control is displayed when "SET(08)/SET3(17)" is allocated to one of multi-function inputs from C001 to C008.

## Appendix-2 Product Life Curve



Note 1: Ambient temperature refers to the temperature measured at the location approximately 5 cm from the bottom center of the Inverter. (atmospheric temperature)

It refers to the temperature inside if the Inverter is stored in an enclosure.

Note 2: The smoothing capacitor, which will deteriorate because of the chemical reaction caused by the temperatures of the parts, should normally be replaced once every 10 years (which is the expected design life, and not guaranteed).

However, if the ambient temperature is high, or the Inverter is used with a current exceeding the rated current, for example, under overload conditions, its life will be significantly shortened.

---

## Appendix-3 Life Alarm Output

---

- When the product life becomes close to the end for the parts including the on-board smoothing capacitor or cooling fan, but excluding the main circuit smoothing capacitor, an alarm can be output through the self-diagnostic function. Use it as a reference of the parts replacement period. For details, refer to "Life Assessment Monitor [d022]" (page 4-5), "Multi-function Pulse Counter (PCNT, PCC)" (page 4-94), or "Multi-function Output Terminal Contact Selection" (page 4-96). This alarm is output through the self-diagnosis based on the expected design life (not a guaranteed value). Therefore, it has a margin of error depending on your environment or operation conditions.

# Appendix-4 EC Declaration of Conformity

No. EMEC035C (1/3)

**OMRON**

## EC Declaration of Conformity

We hereby declare that the following products are in conformity with the requirements of the following EC Directive:

Product: Inverter  
 Type: 3G3RX series (Refer to appending types list)  
 Title and No. of Directive: EMC Directive 2004/108/EC  
 Low Voltage Directive 2006/95/EC

These products are designed and manufactured in accordance with the following standards.

EMI (Electromagnetic Interference): EN61800-3:2004

Test methods:

Conducted/Radiated: EN61800-3:2004

EMS (Electromagnetic Susceptibility): EN61800-3:2004

Test methods:

ESD: EN61800-3:2004/IEC61000-4-2:2001

RF EM Field: EN61800-3:2004/IEC61000-4-3:2002

Conducted RF common mode: EN61800-3:2004/IEC61000-4-6:2004

Fast Transient: EN61800-3:2004/IEC61000-4-4:2004

Surge Power ports: EN61800-3:2004/IEC61000-4-5:2001

Voltage Dips and short Interruptions: EN61800-3:2004/IEC61000-2-1:1990

The examination was performed by Category C3.

LVD (Low Voltage Directive): EN61800-5-1:2003

The year in which the CE marking was affixed : 2007

Manufacturer:

Name: OMRON Corporation, Industrial Automation Company,  
 Control Device Division H.Q.  
 Address: 2-2-1, Nishikusatsu, Kusatsu-city Shiga-pref., 525-0035 Japan  
 Date: Nov 27<sup>th</sup> 08

Signed:

E. Ikano  
 General Manager

Representative in EU:

Name: OMRON Europe B.V.  
 Address: Zilverenberg 2, 5234 GM, 's-Hertogenbosch,  
 THE NETHERLANDS  
 Date: 3.12.2008  
 Signed:

H. Sintnicolaas  
 European Manufacturing Manager

No. EMEC035C (2/3)

**OMRON**

| <i>Model Type</i> | <i>Rated Input</i>         | <i>Capacity</i> | <i>Remarks</i> | <i>Rev.</i> |
|-------------------|----------------------------|-----------------|----------------|-------------|
| 3G3RX-A2055       | 3-phase AC200-240V 50/60Hz | 5.5kW           | Standard       | <A>         |
| 3G3RX-A2075       | 3-phase AC200-240V 50/60Hz | 7.5kW           | Standard       | <A>         |
| 3G3RX-A2110       | 3-phase AC200-240V 50/60Hz | 11.0kW          | Standard       | <A>         |
| 3G3RX-A2150       | 3-phase AC200-240V 50/60Hz | 15.0kW          | Standard       | <A>         |
| 3G3RX-A2185       | 3-phase AC200-240V 50/60Hz | 18.5kW          | Standard       | <A>         |
| 3G3RX-A2220       | 3-phase AC200-240V 50/60Hz | 22.0kW          | Standard       | <A>         |
| 3G3RX-A2300       | 3-phase AC200-240V 50/60Hz | 30.0kW          | Standard       | <A>         |
| 3G3RX-A2370       | 3-phase AC200-240V 50/60Hz | 37.0kW          | Standard       | <A>         |
| 3G3RX-A2450       | 3-phase AC200-240V 50/60Hz | 45.0kW          | Standard       | <A>         |
| 3G3RX-A2550       | 3-phase AC200-240V 50/60Hz | 55.0kW          | Standard       | <A>         |
| 3G3RX-A4055       | 3-phase AC380-480V 50/60Hz | 5.5kW           | Standard       | <A>         |
| 3G3RX-A4075       | 3-phase AC380-480V 50/60Hz | 7.5kW           | Standard       | <A>         |
| 3G3RX-A4110       | 3-phase AC380-480V 50/60Hz | 11.0kW          | Standard       | <A>         |
| 3G3RX-A4150       | 3-phase AC380-480V 50/60Hz | 15.0kW          | Standard       | <A>         |
| 3G3RX-A4185       | 3-phase AC380-480V 50/60Hz | 18.5kW          | Standard       | <A>         |
| 3G3RX-A4220       | 3-phase AC380-480V 50/60Hz | 22.0kW          | Standard       | <A>         |
| 3G3RX-A4300       | 3-phase AC380-480V 50/60Hz | 30.0kW          | Standard       | <A>         |
| 3G3RX-A4370       | 3-phase AC380-480V 50/60Hz | 37.0kW          | Standard       | <A>         |
| 3G3RX-A4450       | 3-phase AC380-480V 50/60Hz | 45.0kW          | Standard       | <A>         |
| 3G3RX-A4550       | 3-phase AC380-480V 50/60Hz | 55.0kW          | Standard       | <A>         |
| 3G3RX-A2004       | 3-phase AC200-240V 50/60Hz | 0.4kW           | Standard       | <B>         |
| 3G3RX-A2007       | 3-phase AC200-240V 50/60Hz | 0.75kW          | Standard       | <B>         |
| 3G3RX-A2015       | 3-phase AC200-240V 50/60Hz | 1.5kW           | Standard       | <B>         |
| 3G3RX-A2022       | 3-phase AC200-240V 50/60Hz | 2.2kW           | Standard       | <B>         |
| 3G3RX-A2037       | 3-phase AC200-240V 50/60Hz | 3.7kW           | Standard       | <B>         |
| 3G3RX-A4004       | 3-phase AC380-480V 50/60Hz | 0.4kW           | Standard       | <B>         |
| 3G3RX-A4007       | 3-phase AC380-480V 50/60Hz | 0.75kW          | Standard       | <B>         |
| 3G3RX-A4015       | 3-phase AC380-480V 50/60Hz | 1.5kW           | Standard       | <B>         |
| 3G3RX-A4022       | 3-phase AC380-480V 50/60Hz | 2.2kW           | Standard       | <B>         |
| 3G3RX-A4037       | 3-phase AC380-480V 50/60Hz | 3.7kW           | Standard       | <B>         |
| 3G3RX-A4750       | 3-phase AC380-480V 50/60Hz | 75kW            | Standard       | <C>         |
| 3G3RX-A4900       | 3-phase AC380-480V 50/60Hz | 90kW            | Standard       | <C>         |
| 3G3RX-A411K       | 3-phase AC380-480V 50/60Hz | 110kW           | Standard       | <C>         |
| 3G3RX-A413K       | 3-phase AC380-480V 50/60Hz | 132kW           | Standard       | <C>         |



# Index

# Index

## Numerics

|                                       |       |
|---------------------------------------|-------|
| 0-Hz sensorless vector control .....  | 4-117 |
| 2-step acceleration/deceleration..... | 4-37  |
| 3-wire input function .....           | 4-88  |

## A

|                                                   |            |
|---------------------------------------------------|------------|
| acceleration stop .....                           | 4-30       |
| acceleration time 2 .....                         | 4-37       |
| acceleration/deceleration pattern .....           | 4-38       |
| acceleration/deceleration time.....               | 4-8        |
| ADD .....                                         | 4-41       |
| AHD .....                                         | 4-93       |
| AL .....                                          | 4-95       |
| alarm code output.....                            | 4-101      |
| allowable momentary power interruption time ..... | 4-42       |
| AM .....                                          | 2-7, 4-110 |
| AMI .....                                         | 2-7, 4-110 |
| analog command hold function.....                 | 4-93       |
| automatic energy-saving operation function.....   | 4-36       |
| automatic optimum acceleration/deceleration ..... | 4-36       |
| automatic torque boost.....                       | 4-20       |

## B

|                       |      |
|-----------------------|------|
| base frequency .....  | 4-11 |
| basic display .....   | 4-56 |
| BER .....             | 4-76 |
| binary operation..... | 4-17 |
| bit operation.....    | 4-18 |
| BOK .....             | 4-76 |
| brake control.....    | 4-76 |
| BRK .....             | 4-76 |

## C

|                                            |       |
|--------------------------------------------|-------|
| capacitor life warning.....                | 4-103 |
| carrier frequency.....                     | 4-68  |
| CAS .....                                  | 4-89  |
| commercial switching .....                 | 4-85  |
| communication function.....                | 4-145 |
| constant torque characteristics (VC) ..... | 4-21  |
| control circuit terminal.....              | 2-6   |
| control gain switching .....               | 4-89  |
| control method.....                        | 4-21  |
| cooling fan control .....                  | 4-74  |
| cooling fan speed drop signal.....         | 4-104 |
| current position monitor.....              | 4-6   |

## D

|                              |            |
|------------------------------|------------|
| data comparison display..... | 4-53, 4-55 |
| DC injection braking .....   | 4-24       |
| DC voltage monitor.....      | 4-7        |
| deceleration time 2 .....    | 4-37       |
| derating.....                | 4-68       |
| digital operator.....        | 2-22, 3-3  |
| display selection .....      | 3-18, 4-53 |
| DWN .....                    | 4-90       |

## E

|                                    |                  |
|------------------------------------|------------------|
| electronic gear .....              | 4-129            |
| electronic thermal monitor .....   | 4-7              |
| EMC.....                           | 2-14, 2-15, 2-16 |
| emergency shutoff .....            | 2-8, 2-9         |
| end frequency.....                 | 4-14             |
| end ratio.....                     | 4-14             |
| excess speed.....                  | 5-7              |
| EXT.....                           | 4-84             |
| extended function mode .....       | 3-20             |
| external analog input .....        | 4-12             |
| external DC injection braking..... | 4-25             |
| external thermistor.....           | 4-75             |
| external trip (EXT) .....          | 4-84             |

## F

|                                                  |           |
|--------------------------------------------------|-----------|
| F/R.....                                         | 4-88      |
| fatal fault signal.....                          | 4-107     |
| fault monitor.....                               | 4-7       |
| FBV.....                                         | 4-34      |
| FC.....                                          | 2-20      |
| FE .....                                         | 2-6, 2-20 |
| feedback .....                                   | 4-32      |
| feedback option .....                            | 4-123     |
| FI .....                                         | 2-20      |
| fin overheat warning .....                       | 4-105     |
| fin temperature monitor .....                    | 4-4       |
| FOC.....                                         | 4-119     |
| forced operator .....                            | 4-91      |
| forced terminal.....                             | 4-93      |
| forward run signal .....                         | 4-107     |
| FR.....                                          | 4-105     |
| free-run stop .....                              | 4-71      |
| free-run stop selection and stop selection ..... | 4-70      |
| frequency addition function.....                 | 4-41      |
| frequency arrival signal.....                    | 4-98      |
| frequency conversion coefficient .....           | 4-2       |
| frequency jump .....                             | 4-30      |
| frequency limit .....                            | 4-28      |
| lower limit .....                                | 4-28      |
| upper limit .....                                | 4-28      |



|                                     |            |
|-------------------------------------|------------|
| frequency matching .....            | 4-71       |
| frequency pull-in restart .....     | 4-43, 4-45 |
| frequency reference selection ..... | 4-10       |
| FRS .....                           | 4-71       |
| F-TM .....                          | 4-93       |
| function mode .....                 | 4-8        |
| FV .....                            | 2-20       |
| FW .....                            | 2-8        |
| FWR .....                           | 4-107      |

## H

|                                   |       |
|-----------------------------------|-------|
| high-torque multi-operation ..... | 4-119 |
|-----------------------------------|-------|

## I

|                                     |            |
|-------------------------------------|------------|
| initial screen .....                | 4-56       |
| initialization .....                | 4-70       |
| input power monitor .....           | 4-4        |
| internal DC injection braking ..... | 4-26, 4-28 |
| IP .....                            | 4-44, 4-45 |

## J

|                         |      |
|-------------------------|------|
| JG .....                | 4-18 |
| jogging operation ..... | 4-18 |

## K

|           |     |
|-----------|-----|
| KHC ..... | 4-4 |
|-----------|-----|

## L

|                                   |            |
|-----------------------------------|------------|
| LAC .....                         | 4-9, 4-40  |
| LAD .....                         | 4-9, 4-80  |
| life assessment monitor .....     | 4-5, 4-103 |
| light load detection signal ..... | 4-106      |
| LOC .....                         | 4-106      |
| LOG1 to LOG6 .....                | 4-102      |

## M

|                                                                            |            |
|----------------------------------------------------------------------------|------------|
| main circuit terminal .....                                                | 2-6, 2-14  |
| manual torque boost .....                                                  | 4-20       |
| maximum frequency .....                                                    | 4-12       |
| MJA .....                                                                  | 4-107      |
| momentary power interruption non-stop .....                                | 4-60       |
| momentary power interruption/undervoltage trip during stop selection ..... | 4-42, 4-44 |
| MP .....                                                                   | 4-109      |
| multi-function input monitor .....                                         | 4-2        |
| multi-function input terminal selection .....                              | 4-79       |
| multi-function output monitor .....                                        | 4-2        |
| multi-function output terminal .....                                       | 4-95       |

## N

|           |       |
|-----------|-------|
| NDc ..... | 4-104 |
| no .....  | 4-79  |

## O

|                                                           |          |
|-----------------------------------------------------------|----------|
| OD .....                                                  | 4-34     |
| offline auto-tuning .....                                 | 4-111    |
| OHF .....                                                 | 4-105    |
| OL, OL2 .....                                             | 4-50     |
| OLR .....                                                 | 4-49     |
| online auto-tuning .....                                  | 4-113    |
| ONT .....                                                 | 4-52     |
| OPE .....                                                 | 4-91     |
| operation frequency function .....                        | 4-41     |
| operation method .....                                    | 3-3      |
| operation ready signal .....                              | 4-106    |
| operation selection during option error .....             | 4-111    |
| orientation function .....                                | 4-134    |
| OTQ .....                                                 | 4-100    |
| output current monitor .....                              | 4-1      |
| output frequency monitor .....                            | 4-1, 4-2 |
| output frequency setting/monitor .....                    | 4-8      |
| output signal delay/hold .....                            | 4-108    |
| output signal logic operation .....                       | 4-102    |
| output torque monitor .....                               | 4-3      |
| output voltage gain .....                                 | 4-24     |
| output voltage monitor .....                              | 4-3      |
| overcurrent suppression .....                             | 4-51     |
| overload limit .....                                      | 4-49     |
| overload warning .....                                    | 4-49     |
| overtorque .....                                          | 4-100    |
| overvoltage protection function during deceleration ..... | 4-78     |

## P

|                                         |       |
|-----------------------------------------|-------|
| P/PI switching .....                    | 4-92  |
| P24 .....                               | 2-7   |
| phase loss protection .....             | 4-46  |
| PID .....                               | 4-31  |
| PID feedback value monitor .....        | 4-1   |
| PIDC .....                              | 4-35  |
| power ON time .....                     | 4-4   |
| power recovery restart prevention ..... | 4-84  |
| PPI .....                               | 4-92  |
| preliminary excitation .....            | 4-119 |
| pulse train frequency input .....       | 4-144 |

# Index

## R

|                                         |            |
|-----------------------------------------|------------|
| real frequency monitor.....             | 4-3        |
| reduced voltage startup.....            | 4-53       |
| relay output terminals.....             | 4-97       |
| reset.....                              | 4-87       |
| retry selection.....                    | 4-42       |
| reverse rotation prevention.....        | 4-59       |
| reverse run signal.....                 | 4-107      |
| RNT.....                                | 4-52       |
| rotation direction limit selection..... | 4-52       |
| rotation direction selection.....       | 4-9        |
| RS.....                                 | 2-9        |
| RUN.....                                | 4-98       |
| RUN command selection.....              | 4-11       |
| RUN direction monitor.....              | 4-1        |
| RUN direction selection.....            | 4-9        |
| RV.....                                 | 2-11, 4-79 |
| RVR.....                                | 4-107      |

## S

|                                             |            |
|---------------------------------------------|------------|
| SC.....                                     | 2-20       |
| secondary resistance compensation.....      | 4-114      |
| sensor vector control.....                  | 4-125      |
| sensorless vector control.....              | 4-116      |
| servo ON.....                               | 4-143      |
| SF1 to SF7.....                             | 4-18       |
| signal during RUN.....                      | 4-98       |
| sink logic.....                             | 2-21       |
| slide switch.....                           | 2-10       |
| soft lock.....                              | 4-51       |
| SON.....                                    | 4-143      |
| source logic.....                           | 2-21       |
| special reduced torque characteristics..... | 4-22       |
| STA.....                                    | 4-88       |
| stabilization parameter.....                | 4-120      |
| start frequency.....                        | 4-14       |
| start ratio.....                            | 4-14       |
| start selection.....                        | 4-14       |
| starting contact signal.....                | 4-105      |
| starting frequency.....                     | 4-68       |
| stop key selection.....                     | 4-70       |
| stop selection.....                         | 4-70, 4-71 |
| STP.....                                    | 4-88       |
| synchronous operation.....                  | 4-130      |

## T

|                               |      |
|-------------------------------|------|
| test run.....                 | 3-4  |
| thermistor.....               | 4-75 |
| THM.....                      | 4-48 |
| TL.....                       | 4-58 |
| torque bias monitor.....      | 4-3  |
| torque boost.....             | 4-19 |
| torque LADSTOP function.....  | 4-59 |
| torque limit.....             | 4-57 |
| torque reference monitor..... | 4-3  |
| total RUN time.....           | 4-4  |
| trip monitor display.....     | 5-9  |
| trip retry.....               | 4-42 |
| TRQ.....                      | 4-95 |
| TRQ1, TRQ2.....               | 4-58 |

## U

|                       |            |
|-----------------------|------------|
| UDC.....              | 4-90       |
| UP.....               | 4-90       |
| UP/DOWN function..... | 4-90       |
| user parameter.....   | 4-57       |
| user selection.....   | 4-53       |
| USP.....              | 4-84       |
| UV.....               | 4-45, 4-95 |

## V

|         |       |
|---------|-------|
| V2..... | 4-124 |
|---------|-------|

## W

|                                        |       |
|----------------------------------------|-------|
| WAF.....                               | 4-104 |
| wiring control circuit terminals.....  | 2-20  |
| wiring the main circuit terminals..... | 2-11  |

## Z

|         |       |
|---------|-------|
| ZS..... | 4-101 |
|---------|-------|



**OMRON EUROPE B.V.** Wegalaan 67-69, NL-2132 JD, Hoofddorp, The Netherlands.  
Tel: +31 (0) 23 568 13 00 Fax: +31 (0) 23 568 13 88 industrial.omron.eu

**Austria**

Tel: +43 (0) 2236 377 800  
industrial.omron.at

**Belgium**

Tel: +32 (0) 2 466 24 80  
industrial.omron.be

**Czech Republic**

Tel: +420 234 602 602  
industrial.omron.cz

**Denmark**

Tel: +45 43 44 00 11  
industrial.omron.dk

**Finland**

Tel: +358 (0) 207 464 200  
industrial.omron.fi

**France**

Tel: +33 (0) 1 56 63 70 00  
industrial.omron.fr

**Germany**

Tel: +49 (0) 2173 6800 0  
industrial.omron.de

**Hungary**

Tel: +36 (0) 1 399 30 50  
industrial.omron.hu

**Italy**

Tel: +39 02 32 681  
industrial.omron.it

**South Africa**

Tel: +27 (0) 11 579 2600  
industrial.omron.eu

**Netherlands**

Tel: +31 (0) 23 568 11 00  
industrial.omron.nl

**Norway**

Tel: +47 (0) 22 65 75 00  
industrial.omron.no

**Poland**

Tel: +48 22 458 66 66  
industrial.omron.pl

**Portugal**

Tel: +351 21 942 94 00  
industrial.omron.pt

**Russia**

Tel: +7 495 648 94 50  
industrial.omron.ru

**Spain**

Tel: +34 902 100 221  
industrial.omron.es

**Sweden**

Tel: +46 (0) 8 632 35 00  
industrial.omron.se

**Switzerland**

Tel: +41 (0) 41 748 13 13  
industrial.omron.ch

**Turkey**

Tel: +90 212 467 30 00  
industrial.omron.com.tr

**United Kingdom**

Tel: +44 (0) 870 752 08 61  
industrial.omron.co.uk

Note: Specifications subject to change without notice.  
Cat. No. I560-E2-05A

**OMRON**

www.nicsanat.com  
021-87700210

