SIEMENS







Industrial Controls

SIRIUS

Soft Starter 3RW30 / 3RW40

Manual





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damage to property. The notices referring to your personal safety are highlighted in the manual by a safety alert symbol, notices referring only to property damage have no safety alert symbol. These notices shown below are graded according to the degree of danger.

A DANGER

indicates that death or severe personal injury will result if proper precautions are not taken.

▲WARNING

indicates that death or severe personal injury may result if proper precautions are not taken.

ACAUTION

indicates that minor personal injury can result if proper precautions are not taken.

NOTICE

indicates that property damage can result if proper precautions are not taken.

If more than one degree of danger is present, the warning notice representing the highest degree of danger will be used. A notice warning of injury to persons with a safety alert symbol may also include a warning relating to property damage.

Qualified Personnel

The product/system described in this documentation may be operated only by **personnel qualified** for the specific task in accordance with the relevant documentation, in particular its warning notices and safety instructions. Qualified personnel are those who, based on their training and experience, are capable of identifying risks and avoiding potential hazards when working with these products/systems.

Proper use of Siemens products

Note the following:

WARNING

Siemens products may only be used for the applications described in the catalog and in the relevant technical documentation. If products and components from other manufacturers are used, these must be recommended or approved by Siemens. Proper transport, storage, installation, assembly, commissioning, operation and maintenance are required to ensure that the products operate safely and without any problems. The permissible ambient conditions must be complied with. The information in the relevant documentation must be observed.

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Disclaimer of Liability

We have reviewed the contents of this publication to ensure consistency with the hardware and software described. Since variance cannot be precluded entirely, we cannot guarantee full consistency. However, the information in this publication is reviewed regularly and any necessary corrections are included in subsequent editions.



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Introduction

1.1 Important notes

Purpose of the manual

This manual contains fundamental information and practical tips for using SIRIUS soft starters. The SIRIUS 3RW30 and 3RW40 soft starters are electronic motor control devices that facilitate optimal starting and stopping three-phase induction motors.

The manual describes all of the functions of the SIRIUS 3RW30 and 3RW40 soft starters.

Target group

This manual is intended for any user involved in

- Commissioning
- Servicing and maintaining
- Planning and configuring systems

Basic knowledge required

A general knowledge of the field of electrical engineering is required to understand this manual.

Scope of validity

The manual is valid for the SIRIUS 3RW30 and 3RW40 soft starters. It describes the components that are valid at the time of publication. SIEMENS reserves the right to include a Product Information for each new component, and for each component of a later version.

Standards and approvals

The SIRIUS 3RW30 and 3RW40 soft starters are based on the IEC/EN 60947-4-2 standard.

Disclaimer of liability

It is the responsibility of the manufacturer to ensure that a system or machine is functioning properly as a whole. SIEMENS AG, its regional offices, and associated companies (hereinafter referred to as "SIEMENS") cannot guarantee all the properties of a whole plant system or machine that has not been designed by SIEMENS.

Similarly, SIEMENS can assume no liability for recommendations that appear or are implied in the following description. No new guarantee, warranty, or liability claims beyond the scope of the SIEMENS general terms of supply are to be derived or inferred from the following description.



Orientation aids

The manual contains various features supporting quick access to specific information:

- At the beginning of the manual you will find a table of contents.
- A comprehensive index at the end of the manual allows quick access to information on specific subjects.

Continuously updated information

Your regional contact for low-voltage switchgear with communications capability will be happy to help you with any queries you have regarding the soft starters. A list of contacts and the latest version of the manual are available on the Internet at: (http://www.siemens.com/softstarter)

For all technical queries, please contact:

Technical Assistance:	Phone: +49 (0) 911-895-5900 (8°° - 17°° CET) Fax: +49 (0) 911-895-5907
	e-mail: (mailto:technical-assistance@siemens.com)
	Internet: (http://www.siemens.com/industrial-controls/technical-assistance)

Correction sheet

A correction sheet is included at the end of the manual. Please use it to record your suggestions for improvements, additions, and corrections, and return the sheet to us. This will help us to improve the next edition of the manual.



Safety information

2.1 Before commencing work: Isolating the equipment from the supply system and ensuring that it cannot be reconnected.

DANGER

Hazardous voltage Will cause death or serious injury.

- Disconnect the system and all devices from the power supply before starting work.
- · Secure against switching on again.
- · Verify that the equipment is not live.
- · Ground and short-circuit.
- Erect barriers around or cover adjacent live parts.

DANGER

Hazardous voltage Will cause death or serious injury.

Qualified Personnel.

The equipment / system may only be commissioned and operated by qualified personnel. For the purpose of the safety information in these Operating Instructions, a "qualified person" is someone who is authorized to energize, ground, and tag equipment, systems, and circuits in accordance with established safety procedures.



2.2 Five safety rules for work in or on electrical systems

A set of rules, which are summarized in DIN VDE 0105 as the "five safety rules", are defined for work in or on electrical systems as a preventative measure against electrical accidents:

- 1 Isolate
- 2. Secure against switching on again
- 3. Verify that the equipment is not live
- 4. Ground and short-circuit
- 5. Erect barriers around or cover adjacent live parts

These five safety rules must be applied in the above order prior to starting work on an electrical system. After completing the work, proceed in the reverse order.

It is assumed that every electrician is familiar with these rules.

Explanations

- 1. The isolating distances between live and deenergized parts of the system must vary according to the operating voltage that is applied.
 - "Isolate" refers to the all-pole disconnection of live parts.
 - All-pole disconnection can be achieved, e.g. by .:
 - Switching off the miniature circuit breaker
 - Switching off the motor circuit breaker
 - Unscrewing fusible links
 - Removing LV HRC fuses
- 2. The feeder must be secured against inadvertent restarting to ensure that it remains isolated for the duration of the work. This can be achieved, for instance, by securing the motor and miniature circuit breakers with lockable blocking elements in the disconnected state, either using a lock or by unscrewing the fuses.
- 3. The deenergized state of the equipment should be verified using suitable test equipment, e.g. a two-pole voltmeter. Single-pole test pins are not suitable for this purpose. The absence of power must be established for all poles, phase to phase, and phase to N/PE.
- 4. Grounding and short-circuiting are only mandatory if the system has a nominal voltage greater than 1 kV. In this case, the system should always be grounded first and then connected to the live parts to be short-circuited.
- 5. These parts should be covered, or barriers erected around them, to avoid accidental contact during the work with adjacent parts that are still live.



Product description

3

3.1 Fields of application

Soft starters are used to start three-phase induction motors with reduced torque and reduced starting current.

SIRIUS soft starter family

The SIEMENS SIRIUS soft starter family comprises three different versions with different functionalities and prices.

3RW30 and 3RW40

Simple or standard applications are covered by the SIRIUS 3RW30 and 3RW40 soft starters and are described in this manual.

3RW44

The SIRIUS 3RW44 soft starter is used if higher functionality is specified, e.g. communication over PROFIBUS or the availability of measuring and monitoring values, as well as for ultra-heavy-duty starting. The SIRIUS 3RW44 soft starter is described in a separate system manual.

Download from 3RW44 manual (http://support.automation.siemens.com/WW/view/de/21772518).



3.2 Basic physical principles of a three-phase induction motor

SIRIUS soft starters are used to reduce the current and torque of a three-phase induction motor during the startup process.

3.2.1 Three-phase induction motor

Fields of application

Three-phase induction motors are used in a wide range of applications in commerce, industry, and trade owing to their simple, robust design and their minimal maintenance.

Problem

If a three-phase induction motor is started directly, its typical current and torque characteristics can cause disturbances in the supply system and the load machine.

Starting current

Three-phase induction motors have a high direct starting current I_{starting} . Depending on the motor type, this current can be between three and fifteen times as high as the rated operational current. Seven or eight times the motor's rated current can be assumed as a typical value.



Disadvantage

This results in the following disadvantage:

 Higher load on the electrical supply system. The supply system must therefore be dimensioned for this higher power during the motor startup.

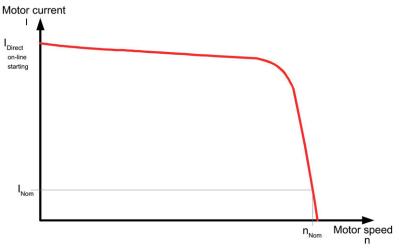


Figure 3-1 Typical starting current characteristic of a three-phase induction motor

Starting torque

The starting torque and the breakdown torque can usually be assumed to be between two and four times the rated torque. From the point of view of the load machine, this means that the starting and acceleration forces exert a higher mechanical load on the machine and the product being conveyed compared to nominal operation.



Disadvantages

This results in the following disadvantages

- A higher load is placed on the machine's mechanical components
- The costs for replacing worn parts and maintaining the application are higher

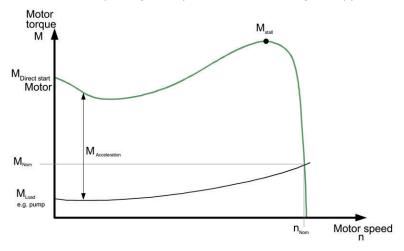


Figure 3-2 Typical starting torque characteristic of a three-phase induction motor

Remedy

The SIRIUS 3RW30 and 3RW40 electronic soft starters allow the current and torque characteristics during starting to be optimally adapted to the requirements of each application.



3.3 Functional principle of the SIRIUS 3RW30 and 3RW40 soft starters

The SIRIUS 3RW30 and 3RW40 soft starters have two antiparallel thyristors in two out of the three phases. One thyristor for the positive half-wave and one for the negative half-wave is provided in each phase (refer to Fig. "Phase angle control and schematic diagram of a two-phase controlled soft starter with integral bypass contacts"). The current in the third, uncontrolled phase is the sum of the currents in the controlled phases.

The rms value of the motor voltage is increased (from a settable starting voltage) to the rated motor voltage within a definable ramp-up time by means of the phase angle control.

The motor current changes in proportion to the voltage applied to the motor. As a result, the starting current is reduced by the factor of this voltage.

There is a quadratic relationship between the torque and the voltage applied to the motor. As a result, the starting torque is reduced quadratically in relation to this voltage.

Example

SIEMENS 1LG4253AA motor (55 kW)

Rated data at 400 V

P_e: 55 kW l_e: 100 A

I_{direct starting}: Approx. 700 A

 M_e : 355 Nm; e.g.: $M_e = 9.55 \times 55 \text{ kW } \times \frac{1000}{1480 \text{ min}^{-1}}$

n_e: 1480 rpm

Mdirect starting: Approx. 700 Nm

Set starting voltage: 50 % (½ of mains voltage)

=> I_{starting} ½ of direct starting current (approx. 350 A) => M_{starting} ¼ of direct starting torque (approx. 175 Nm)



The diagrams below show the starting current and torque characteristics for a three-phase induction motor in combination with a soft starter:

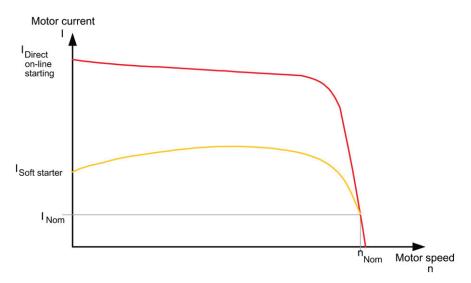


Figure 3-3 Reduced current characteristic of a three-phase induction motor during starting with a SIRIUS 3RW30 or 3RW40 soft starter

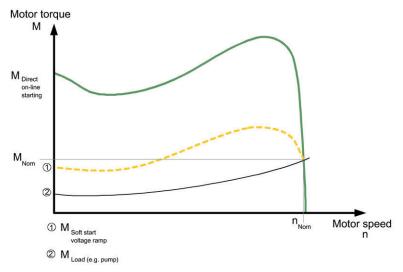


Figure 3-4 Reduced torque characteristic of a three-phase induction motor during starting with a SIRIUS 3RW30 or 3RW40 soft starter



Soft start /soft stop

This means that, since the motor voltage is controlled by the electronic soft starter during the startup process, the consumed starting current and the starting torque generated in the motor are also controlled.

The same principle is applied during the stop process. This ensures that the torque generated in the motor is gradually reduced, so that the application can stop smoothly (the soft stop function is only supported by the 3RW40).

The frequency remains constant during this process and corresponds to the mains frequency, in contrast to frequency controlled starting and stopping of a frequency converter.

Bypass mode

Once the motor has been started up correctly, the thyristors are subject to fully advanced control, meaning that the whole mains voltage is applied to the motor terminals. As the motor voltage does not have to be controlled during operation, the thyristors are bridged by integral bypass contacts that are rated for AC1 current. This minimizes the waste heat generated during uninterrupted duty (which is caused by the thyristor's power loss), and minimizes heating up of the switching device's environment.

The bypass contacts are protected by an integrated, electronic arc quenching system during operation. If they are opened in the event of a fault, e.g. if the control voltage is temporarily interrupted, mechanical vibrations occur, or the coil operating mechanism or the main contact spring has reached the end of its service life and is defective, the equipment is not damaged.

The diagram below shows the method of operation of the SIRIUS 3RW30 and 3RW40 soft starters:

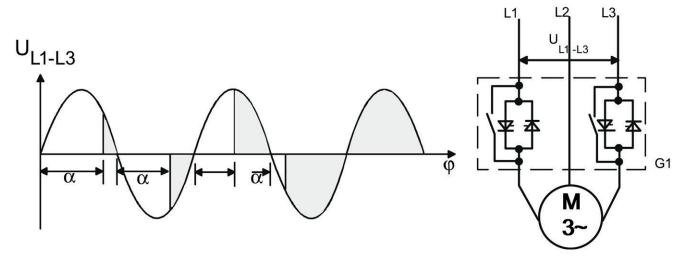


Figure 3-5 Phase angle control and schematic diagram of a two-phase controlled soft starter with integral bypass contacts



3.3.1 Method of operation of a two-phase controlled soft starter

A special method of operation is used for the SIRIUS 3RW30 and 3RW40 two-phase controlled soft starters based on SIEMENS' patented "polarity balancing" control principle.

Two-phase control

The SIRIUS 3RW30 and 3RW40 soft starters are two-phase controlled soft starters, in other words they are designed with two antiparallel thyristors in each of phases L1 and L3. Phase 2 is an uncontrolled phase, which is merely guided through the starter by a copper connection.

In a two-phase controlled soft starter, the current that results from the superimposition of the two controlled phases flows in the uncontrolled phase. The main advantages of two-phase control include the more compact size compared to a three-phase version and the lower hardware costs.

The occurrence of DC components, caused by the phase angle and the overlapping phase currents, is a negative physical effect of two-phase control during the startup process that can mean a louder noise is produced by the motor. The "polarity balancing" control principle was developed and patented by SIEMENS to prevent these DC components during starting.

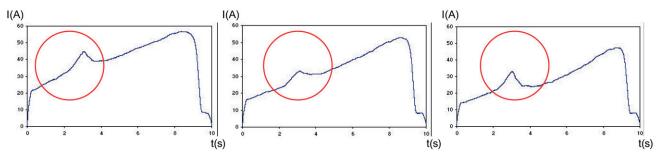


Figure 3-6 Current characteristic and occurrence of DC components in the three phases without "polarity balancing"



Polarity balancing

"Polarity balancing" effectively eliminates these DC components during the ramp-up phase. It allows the motor to be started up with a constant speed, torque, and current rise.

The acoustic quality of the startup process comes very close to that of a three-phase controlled startup. This is made possible by the continuous dynamic alignment and balancing of current half-waves with different polarities during the motor startup.

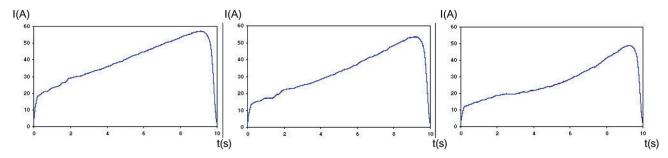


Figure 3-7 Current characteristic in the three phases without DC components thanks to "polarity balancing"



3.3.2 Starting current asymmetry

With two-phase control the starting current is asymmetrical for physical reasons, because the current in the uncontrolled phase is the sum of the currents in the two controlled phases.

This asymmetry can be as much as 30 to 40% during starting (ratio of minimum current to maximum current in all three phases).

Even though this cannot be influenced, it is not critical in most applications. It could cause an insufficiently rated fuse to trip in the uncontrolled phase, for instance. For recommended fuse ratings, refer to the tables in chapter Technical data (Page 135).

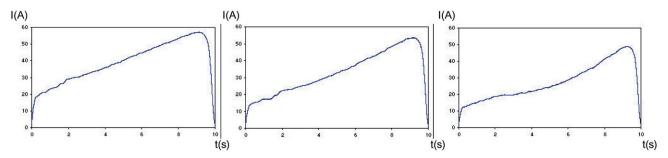


Figure 3-8 Starting current asymmetry

Note

If wye-delta starters are exchanged for soft starters in an existing system, you should check the fuse ratings in the feeder in order to avoid false tripping. This is particularly important in connection with heavy-duty starting or if the fuse that is installed has already been operated close to the thermal tripping limit with the wye-delta assembly.

All elements of the main circuit (such as fuses, motor starter protectors, and switching devices) must be dimensioned for direct starting and according to the on-site short-circuit conditions, and ordered separately.

For recommended fuse and motor starter protector ratings for the feeder with soft starter, refer to chapter Technical data (Page 135).



3.3.3 Applications and use

Applications and selection criteria

The SIRIUS 3RW30 and 3RW40 soft starters represent a good alternative to direct or wyedelta starters.

The most important advantages are:

- Soft start
- Soft stop (3RW40 only)
- Uninterrupted switching without current peaks that place a heavy load on the system
- Simple installation and commissioning
- Compact, space-saving design

Applications

The typical applications include:

- Conveyor belts
- Roller conveyors
- Compressors
- Fans
- Pumps
- Hydraulic pumps
- Agitators
- Circular saws / band saws

Advantages

Conveyor belts and transport systems:

- Smooth starting
- Smooth stopping

Rotary pumps and piston pumps:

- No pressure surges
- Increased service life of the pipe system

Agitators and mixers:

Reduced starting current

Fans:

• Protection for the gearbox and V belt



3.4 Comparison of device functions

				Danian anima ()
		SIRIUS 3RW30 Standard applications	SIRIUS 3RW40 Standard applications	SIRIUS 3RW44 High Feature applications
Rated current at 40 °C / 50 °C	Α	3106 / 3 98	1.1	29 1214 / 26 1076
Rated operational voltage	V	200480	200600	200690
Motor rating at 400 V / 460 V •Standard connection •Inside-delta circuit	kW /hp	1.555 / 1.5 75	5.5250 / 7.5 300 –	15710 / 15 950 221200 / 30 1700
Ambient temperature	°C	-25+60	-25+60	0 + 6 0
Soft start/soft stop		✓ ¹⁾	V	V
Voltage ramp		/	V	V
Starting/stopping voltage	%	40100	40100	20100
Ramp-up and ramp-down time	s	020	020	1360
Torque control			CONTRACTOR DESCRIPTION	V
Starting/stopping torque	%	_		20100
Torque limiting	%	_	-	20200
Ramp time	S	_	_	1360
Integrated jumper contact system		<u> </u>	V	V
Intrinsic device protection		_	V	V
Motor overload protection		_	✓ ⁷⁾	~
Thermistor motor protection			√ ²⁾	V
Integrated remote RESET		_	/ ³⁾	V
Settable current limiting		_	V	V
Inside-delta circuit		_	_	~
Breakaway torque		_	_	~
Creep speed in both directions of rotation		_	_	~
Pump stop		<u>-</u>	_	✓ ⁴⁾
DC braking		-	-	√ ^{4) 5)}
Combined braking		-	_	4) 5)
Motor heating		_	_	~
Communication		=	_	With PROFIBUS DP (option)
External display and operator control module		_	_	(option)
Status measured value display		_	=	V
Error log		_	_	V
Events list		_	_	v
Min/max pointer function		_	-	~
Trace function		_		√ 6)
Programmable control inputs and outputs		_	-	✓
Number of parameter sets		1	1	3
Parameterizing software (SoftStarterES)		-	-	V
Power semiconductors (thyristors)		2 controlled phases	2 controlled phases	3 controlled phases
Screw terminals		✓	✓	V
Spring-loaded terminals		✓	✓	V
UL/CSA		✓	✓	V
CE mark		V	V	V
Soft starting under heavy-duty starting		<u></u>	_	✓ ⁴⁾

3) For 3RW402. to 3RW404.; for

3RW405. and 3RW407. optional.

4) If necessary, overdimension soft starter and motor.

✔ Function available; – function not available.

1) For 3RW30 only soft start.
2) Optional up to size S3 (device variants).

5) Not possible in inside-delta circuit.

6) Trace function with SoftStarterES software.
7) Acc. to ATEX



Product combinations

4

4.1 SIRIUS modular system

Switching, protecting, and starting motors

In order to simplify the assembly of load feeders, the SIRIUS modular system offers standard components that are optimally harmonized and are easy to combine. Just 7 sizes cover the entire performance range up to 250 kW / 300 hp. The individual switching devices can be assembled to form complete load feeders, either using link modules or by mounting directly.

For a selection of matching device combinations, e.g. soft starters and motor starter protectors, refer to chapter Technical data (Page 135).

For further information on individual products, refer to System manual (http://support.automation.siemens.com/WW/view/en/39740306) "SIRIUS Innovations", Order No. 3ZX1012-0RA01-1AB1.



SIRIUS motor starter protectors

SENTRON circuit breakers















VL400/3VL4

SIRIUS contactors















3RT20 1 (S00) 3RT20 2 (S0)

3RT10 3 (S2)

3RT1. 4 (S3)

3RT1. 5 (S6)

3RT1. 6 (S10)

3RT1. 7 (S12)

SIRIUS overload relays













3RB30 16 (S00) 3RB30 26 (S0) 3RB20 36 (S2)

3RB20 46 (S3)

3RB20 56 (S6)

SIRIUS soft starters













Figure 4-1 SIRIUS modular system



Functions

5.1 Start modes

You can choose between different startup functions reflecting the wide range of applications and functionality of the SIRIUS 3RW30 and 3RW40 soft starters. The motor start can be optimally adapted to each particular application.

5.1.1 Voltage ramp

The SIRIUS 3RW30 and 3RW40 soft starters achieve soft starting by means of a voltage ramp. The motor terminal voltage is increased from a parameterizable starting voltage up to the mains voltage within a definable ramp-up time.

Starting voltage

The starting voltage determines the starting torque of the motor. A lower starting voltage results in a lower starting torque and a lower starting current. The starting voltage selected must be sufficiently high to ensure that motor starts up smoothly as soon as the start command is received by the soft starter.

Ramp time

The length of the set ramp time determines the time taken to increase the motor voltage from the parameterized starting voltage to the mains voltage. This influences the motor's acceleration torque, which drives the load during the ramp-up process. A longer ramp time results in a lower acceleration torque as the motor is started up. The startup is slower and smoother as a result. The ramp time should be long enough for the motor to reach its nominal speed. If the time selected is too short, in other words if the ramp time ends before the motor has started up successfully, a very high starting current that can even equal the direct starting current at the same speed occurs at this instant.

The SIRIUS 3RW40 soft starter limits the current to the value set with the current limiting potentiometer (refer to chapter Current limiting and ramp-up detection (3RW40 only) (Page 32)). As soon as the current limiting value is also reached, the voltage ramp or the ramp time is interrupted and the motor is started with the current limiting value until it has started up successfully. In this case, the motor ramp-up time may be longer than the maximum parameterizable 20 seconds ramp time (for further information about the maximum ramp-up times and switching frequencies, refer to chapter 3RW40 2. to 7. power electronics (Page 163) ff).



The SIRIUS 3RW40 soft starter has intrinsic device protection, current limiting, and ramp-up detection functions. These functions do not form part of the SIRIUS 3RW30 soft starter.

NOTICE

Risk of property damage

When using the 3RW30: Make sure the selected ramp time is longer than the actual motor ramp-up time. If not, the SIRIUS 3RW30 may be damaged because the internal bypass contacts close when the set ramp time elapses. If the motor has not finished starting up, an AC3 current that could damage the bypass contact system will flow.

When using the 3RW40: The 3RW40 has an integrated ramp-up detection function that prevents this operating state from occurring.

The maximum ramp time for the SIRIUS 3RW30 soft starter is 20 seconds An appropriately dimensioned SIRIUS 3RW40 or 3RW44 soft starter should be chosen for startup processes with a motor ramp-up time > 20 seconds.

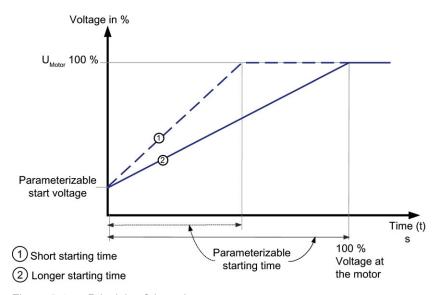


Figure 5-1 Principle of the voltage ramp



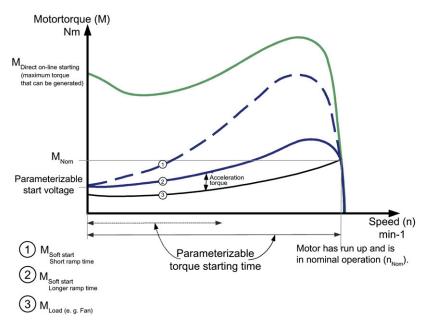


Figure 5-2 Principle of the voltage ramp for the torque characteristic

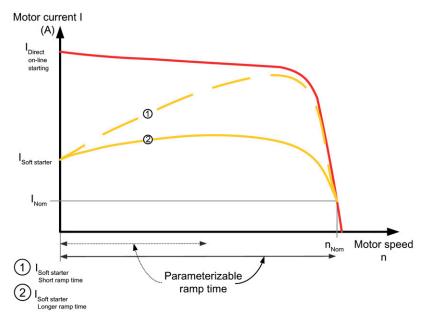


Figure 5-3 Principle of the voltage ramp for the starting current characteristic

Typical applications of the voltage ramp

The voltage ramp principle is valid for all applications, e.g. pumps, compressors, conveyor belts.



5.1.2 Current limiting and ramp-up detection (3RW40 only)

The SIRIUS 3RW40 soft starter measures the phase current (motor current) continuously with the help of integrated current transformers.

The motor current that flows during the startup process can be actively limited by means of the soft starter. The current limiting function takes priority over the voltage ramp function. As soon as a parameterizable current limit is reached, in other words, the voltage ramp is interrupted and the motor is started with the current limiting value until it has started up successfully. The current limiting function is always active with SIRIUS 3RW40 soft starters. If the current limiting potentiometer is set to clockwise stop, the starting current is limited to the maximum possible current (refer to chapter Setting the current limiting value (Page 114)).

Current limiting value

The current limiting value is set to the current required during starting as a factor of the rated motor current (refer to chapter Setting the current limiting value (Page 114)). Since the starting current is asymmetrical, the set current corresponds to the arithmetic mean value for the three phases.

Example

If the current limiting value is set to 100 A, the currents might be approx. 80 A in L1, 120 A in L2, and 100 A in L3 (refer to chapter Starting current asymmetry (Page 24)).

As soon as the selected current limiting value is reached, the motor voltage is reduced or controlled by the soft starter to prevent the current from exceeding the limit. The set current limiting value must be high enough to ensure that the torque generated in the motor is sufficient to accelerate the motor to nominal speed. Three to four times the value of the motor's rated operational current (Ie) can be assumed as typical here.

The current limiting function is always active because it is required by the intrinsic device protection. If the current limiting potentiometer is set to clockwise stop, the starting current is limited to the maximum possible current (refer to chapter Setting the current limiting value (Page 114)).



Ramp-up detection (3RW40 only)

The SIRIUS 3RW40 soft starter is equipped with an integrated ramp-up detection function. If it detects a motor startup, the motor voltage is immediately increased to 100% of the mains voltage. The internal bypass contacts close and the thyristors are bridged.

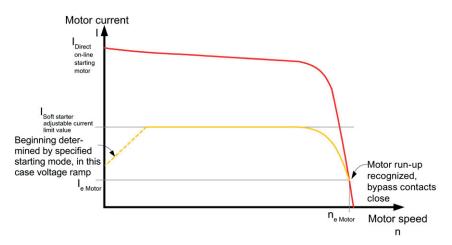


Figure 5-4 Current limiting with soft starter

Typical applications for current limiting

Current limiting is used for applications with large centrifugal masses (mass inertias) and therefore longer starting times, e.g. fans, circular saws etc.



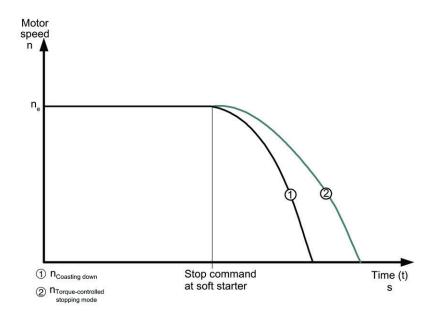
5.2 Stop modes

You can choose between different stop modes reflecting the wide range of applications for SIRIUS soft starters. The motor stop can be optimally adapted to each particular application.

If a start command is issued during the stop process, the process is interrupted and the motor is started again with the set start mode.

Note

If you select "soft stop" (3RW40 only) as the stop mode, the feeder (soft starter, cables, feeder protective devices, and motor) may need to be dimensioned for higher values because the current exceeds the rated motor current during the stop process.



5.2.1 Stop without load (3RW30 and 3RW40)

"Stop without load" means the power supplied to the motor via the soft starter is interrupted when the ON command is removed from the starter. The motor coasts to a standstill, driven only by the mass inertia (centrifugal mass) of the rotor and load. This is also referred to as a natural stop. A large centrifugal mass means a longer stop time without load.

Typical applications for stop without load

Stop without load is used for loads that place no special demands on the startup characteristic, e.g. fans.



5.2.2 Soft stop (3RW40 only)

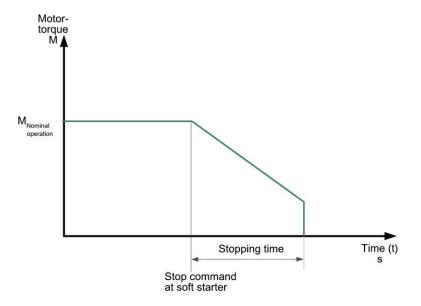
In "soft stop" mode, the natural stop process of the load is decelerated. The function is used when the load must be prevented from stopping abruptly. This is typically the case in applications with a low mass inertia or a high counter-torque.

Ramp-down time

The "Ramp-down time" potentiometer on the soft starter allows you to specify how long power should still be supplied to the motor after the ON command is removed. The torque generated in the motor is reduced by means of a voltage ramp function within this ramp-down time and the application stops smoothly.

If the motor is stopped abruptly in pump applications, as is normal with wye-delta or direct starting, for instance, water hammer can occur. Water hammer is caused by the sudden flow separation, leading to pressure fluctuations on the pump. It has the effect of producing noise and mechanical impacts on the pipelines as well as on any flaps and valves installed there.

Water hammer can be reduced compared to direct or wye-delta starting by using the SIRIUS 3RW40 soft starter. An optimum pump stop is achieved using a SIRIUS 3RW44 soft starter with an integrated pump stop function (refer to chapter Comparison of device functions (Page 26)).



Typical applications for soft stop

Use soft stop for

- Pumps to reduce water hammer.
- Conveyor belts to prevent the conveyed product from tilting.



5.3 Motor protection / intrinsic device protection (3RW40 only)

Note

If the soft starter is disconnected because the motor overload protection or the intrinsic device protection trips, you must wait a defined cooling time (recovery time) prior to acknowledging the fault or starting the motor again. (Motor overload tripping time: 5 minutes, temperature sensor: after cooling,

intrinsic device protection tripping time:

- 30 seconds upon overload of the thyristors,
- 60 seconds upon overload of the bypasses)

5.3.1 Motor protection function

The motor overload protection function is implemented on the basis of the winding temperature. This indicates whether the motor is overloaded or functioning in the normal operating range.

The winding temperature can either be calculated with the help of the integrated, electronic motor overload function or measured with a connected motor thermistor.

The two types of protection must be combined to achieve full motor protection. This combination is recommended to protect the motor optimally.

Note

Thermistor motor protection evaluation

The thermistor motor protection evaluation function is optionally available for the SIRIUS 3RW40 2 to 3RW40 4 soft starters in the 24 V AC/DC control voltage version.

Motor overload protection

The current flow during motor operation is measured by measuring the current with transformers integrated in the soft starter. The temperature rise in the winding is calculated based on the rated operational current set for the motor.

A trip is generated by the soft starter when the characteristic is reached, depending on the trip class (CLASS setting).



ATEX

"Increased safety" type of protection EEx e acc. to ATEX Directive 94/9/EC

The SIRIUS 3RW40 soft starter sizes S0 to S12 are suitable for starting explosion-proof motors with the "increased safety" type of protection EEx e (type of protection / marking: Ex II (2) GD).

Wire the fault output (95 96) to an upstream switching device in such a way that if a fault occurs, this device disconnects the feeder (refer to Fig. "3RW40 wiring fault with 3RV").

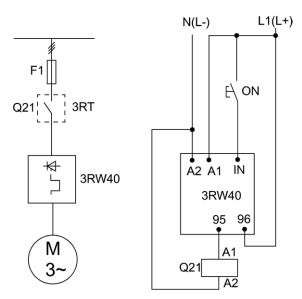


Figure 5-5 3RW40 wiring fault

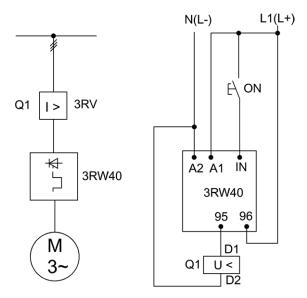


Figure 5-6 3RW40 wiring fault with 3RV



For further information, refer to the operating instructions, Order No. 3ZX1012-0RW40-1CA1 (http://support.automation.siemens.com/WW/view/de/22809303).



Danger of death or serious injury.

The 3RW40 is not suitable for installation in hazardous areas. The device is only allowed to be installed in a control cabinet with the IP4x degree of protection. Appropriate measures (e.g. encapsulation) must be taken if it is to be installed in a hazardous area.

Trip class (electronic overload protection)

The trip class (CLASS) specifies the maximum time within which a protective device must trip from a cold state at 7.2 x the rated operational current (motor protection to IEC 60947). The tripping characteristics represent this time as a function of the tripping current (refer to chapter Motor protection tripping characteristics for 3RW40 (with symmetry) (Page 176)). You can set different CLASS characteristics according to the startup class.

Note

The rated data of the soft starters refers to normal starting (CLASS 10). The starters may need to be calculated with a size allowance for heavy-duty starting (> CLASS 10). You can only set a rated motor current that is lower than the soft starter rated current (for the permissible settings, refer to chapter Technical data (Page 135)).

Recovery time (motor overload protection)

A recovery time of 5 minutes, during which the motor cools down and cannot be restarted, starts if the thermal motor model is tripped.

Protection against voltage failure in the event of a fault

If the control supply voltage fails during a trip, the current tripping state of the thermal motor model and the current recovery time are stored in the soft starter. When the control supply voltage is restored, the current tripping state of the thermal motor model and the intrinsic device protection prior to the power failure are likewise automatically restored. If the control voltage is disconnected during operation (without a preceding fault trip), the starter is not protected against voltage failure.



Temperature sensor

Note

Temperature sensor

The temperature sensor evaluation function is optionally available for the SIRIUS 3RW40 24 to 3RW40 47 soft starters in the 24 V AC/DC control voltage version.

This motor protection function measures the motor's stator winding temperature directly with the help of a sensor installed in the motor, in other words the motor must have a sensor wound into the stator winding.

You can choose between two different sensor types for the evaluation.

- 1. Type A PTC thermistors ("type A sensors") for connection to terminals T11/21 and T12
- 2. Thermoclick sensors for connection to terminals T11/21 and T22

The wiring and sensors are monitored for wire breakage and short-circuits.

Recovery time (thermistor motor protection)

If the thermistor motor protection is tripped, the soft starter cannot be restarted until the sensor installed in the motor has cooled down. The recovery time varies according to the temperature state of the sensor.

5.3.2 Intrinsic device protection (3RW40 only)

Thyristor protection (thermal)

SIRIUS 3RW40 soft starters are equipped with integrated intrinsic device protection to prevent thermal overloading of the thyristors.

This is achieved on the one hand by means of current measuring transformers in the three phases and on the other, by measuring the temperature with temperature sensors on the thyristor's heat sink.

If the fixed, internally set trip value is exceeded, the soft starter is automatically disconnected.

Recovery time (intrinsic device protection)

If the intrinsic device protection is tripped, the soft starter cannot be restarted until a recovery time of at least 30 seconds has elapsed upon overload of the thyristors and at least 60 seconds upon overload of the bypasses.



Thyristor protection (short-circuit)

SITOR semiconductor fuses must be connected upstream to protect the thyristors against short-circuits (e.g. in case of cable damage or an interturn fault in the motor; refer to chapter Soft starter assembly with type of coordination 2 (Page 71)). For the fuse selection tables, refer to chapter Technical data (Page 135).

Protection against voltage failure (in the event of a fault)

If the control supply voltage fails during a trip, the current tripping state of the thermal intrinsic device protection model and the current recovery time are stored in the soft starter. When the control supply voltage is restored, the current tripping state of the thermal intrinsic device protection prior to the power failure are likewise automatically restored.

Note

If the control voltage is disconnected during operation (e.g. in "automatic mode"), the starter is not protected against voltage failure. You must wait five minutes between two starts to ensure that the motor protection and the intrinsic device protection are working correctly.



5.4 Functions of the RESET buttons

5.4.1 SIRIUS 3RW40 2, 3RW40 3, and 3RW40 4 soft starters

5.4.1.1 RESET MODE button and LED

By pressing the RESET MODE button, you define the reset procedure in case of a fault. This is indicated by the RESET MODE LED.





Yellow = AUTO

Manual = off (factory setting)

Green = REMOTE

Note

On the SIRIUS 3RW40 2. soft starter, the RESET MODE button is located underneath the label (refer to chapter Operator controls, displays, and connections on the 3RW40 (Page 80))

5.4.1.2 Manual RESET

Manual RESET with the RESET / TEST button (RESET MODE LED = off)

You can reset a fault by pressing the RESET / TEST button.

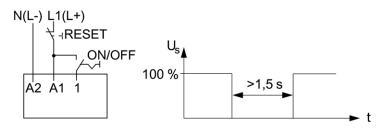




5.4.1.3 Remote RESET

Remote RESET (RESET MODE LED = green)

You can reset a fault signal by disconnecting the control supply voltage for >1.5 s.



5.4.1.4 AUTO RESET

AUTO RESET (RESET MODE LED = yellow)

If you set the RESET mode to AUTO, a fault is automatically reset as follows:

- If the motor overload protection function trips: after 5 minutes
- If the intrinsic device protection function trips:
 - after 30 seconds upon overload of the thyristors,
 - after 60 seconds upon overload of the bypasses
- If the thermistor evaluation function trips: after the temperature sensor in the motor has cooled down



Automatic restart

Danger of death, serious injury, or property damage.

The automatic RESET mode (AUTO RESET) must not be used in applications where there is a risk of serious injury to persons or substantial damage to property if the motor starts up again unexpectedly. The start command (e.g. issued by a contact or the PLC) must be reset prior to issuing a RESET command because the motor attempts to restart again automatically following this RESET command if a start command is still present. This particularly applies if the motor protection has tripped. For safety reasons, you are advised to integrate the group fault output (terminals 95 and 96) in the controller.

5.4.1.5 Acknowledging faults

For information about whether or not faults can be acknowledged as well as the corresponding LED and output contact states, refer to chapter Diagnostics and fault signals (Page 52).



5.4.2 SIRIUS 3RW40 5 and 3RW40 7 soft starters

5.4.2.1 RESET MODE button and AUTO LED

By pressing the RESET MODE button, you define the reset procedure in case of a fault. This is indicated by the AUTO LED.



Yellow = AUTO

Manual (remote) = off (factory setting)

5.4.2.2 Manual RESET

Manual RESET with the RESET / TEST button (AUTO LED = off)

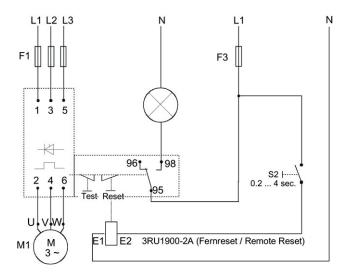
You can reset a fault by pressing the RESET / TEST button.



5.4.2.3 Remote RESET

Remote RESET (AUTO LED = green)

You can initiate a remote RESET by controlling the optional module for RESET (3RU1900-2A).





5.4.2.4 AUTO RESET

AUTO RESET (AUTO LED = yellow)

If you set the RESET mode to AUTO, a fault is automatically reset as follows:

- If the motor overload protection function trips: after 5 minutes
- If the intrinsic device protection function trips:
 - after 30 seconds upon overload of the thyristors,
 - after 60 seconds upon overload of the bypasses



Automatic restart

Can result in death, serious injury, or property damage.

The automatic RESET mode (AUTO RESET) must not be used in applications where there is a risk of serious injury to persons or substantial damage to property if the motor starts up again unexpectedly. The start command (e.g. issued by a contact or the PLC) must be reset prior to issuing a RESET command because the motor attempts to restart again automatically following this RESET command if a start command is still present. This particularly applies if the motor protection has tripped. For safety reasons, you are advised to integrate the group fault output (terminals 95 and 96) in the controller.

5.4.2.5 Acknowledging faults

For information about whether or not faults can be acknowledged as well as the corresponding LED and output contact states, refer to chapter Diagnostics and fault signals (Page 52).



5.4.3 Other functions of the RESET button

5.4.3.1 Motor protection trip test

You initiate a motor overload trip by pressing the RESET / TEST button for longer than five seconds. The SIRIUS 3RW40 soft starter is tripped by the fault signal at the OVERLOAD LED, the FAILURE / OVERLOAD contact 95-98 closes, and the motor that is connected and running is switched off.



RESET / TEST button on the 3RW40 2, 3RW40 3, and 3RW40 4



RESET / TEST button on the 3RW40 5 and 3RW40 7

5.4.3.2 Reparameterizing the ON / RUN output contact

For information about reparameterizing the output with the RESET / TEST button, refer to chapter Parameterizing the 3RW40 outputs (Page 122).

5.4.4 Reset options for fault acknowledgement

Fault	RESET MODE					
	Manual RESET	AUTO RESET	Remote reset:			
Line fault (missing line voltage, phase failure, missing load)	+	_	_			
le/class setting not permissible	+	_	_			
Asymmetry	+	_	_			
Self-protection thyristor	+	+	+			
Self-protection bypass	+	+	+			
Motor protection	+	+	+			
Thermistor motor protection	+	+	+			
Supply voltage not permissible	Automatic	Automatic	Automatic			



5.5 Functions of the inputs

5.5.1 Start input (terminal 1) on 3RW30 and 3RW40 2 to 3RW40 4

Rated control voltage is present at terminal A1 / A2: The startup process of the soft starter begins when a signal is present at terminal 1 (IN). The starter operates until the signal is removed again.

If a ramp-down time is parameterized (3RW40 only), a soft stop starts as soon as the signal is removed.

The potential of the signal at terminal 1 must correspond to the potential of the rated control voltage at terminal A1 / A2.



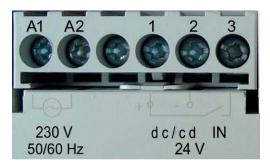
For recommended circuits, e.g. control by means of pushbuttons, contactor contacts, or a PLC, refer to chapter Typical circuit diagrams (Page 181).

5.5.2 Start input (terminal 3) on 3RW40 5 and 3RW40 7

Rated control voltage is present at terminal A1 / A2: The startup process of the soft starter begins when a signal is present at terminal 3 (IN). The starter operates until the signal is removed again. If a ramp-down time is parameterized, a soft stop starts as soon as the signal is removed.

The 24 V DC control voltage supplied by the soft starter must be taken from terminal 1 (+) as voltage for the signal at terminal 3.

If you select direct control by a PLC, the "M" of the PLC's reference potential must be connected to terminal 2 (-).



For recommended circuits, e.g. control by means of pushbuttons, contactor contacts, or a PLC, refer to chapter Typical circuit diagrams (Page 181).

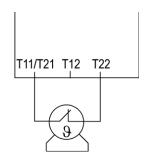


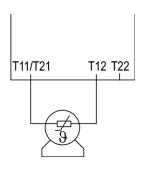
5.5.3 Thermistor input / connection on 3RW40 2 to 3RW40 4

24 V AC/DC rated control voltage

After removing the copper jumper between T11/21 and T22, you can connect and evaluate either a Klixon thermistor integrated in the motor winding (at terminal T11/T21-T22) or a type A PTC (at terminal T11/T21-T12).







Klixon

Type A PTC



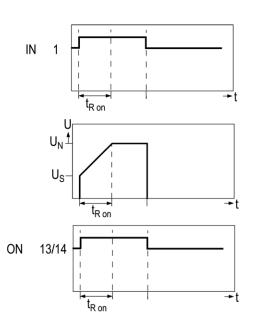
5.6 Functions of the outputs

5.6.1 3RW30: Output terminal 13 / 14 ON

The potential-free output contact at terminal 13/14 (ON) closes if a signal is present at terminal 1 (IN); it remains closed until the start command is removed.

The output can be used, for instance, to control a line contactor connected upstream or to implement latching if you selected pushbutton control. For recommended circuits, refer to chapter Typical circuit diagrams (Page 181).





For a state diagram of the contact in the various operating states, refer to chapter Diagnostics and fault signals (Page 52).



5.6.2 3RW40: Output terminals 13 / 14 ON / RUN and 23 / 24 BYPASSED

ON

The potential-free output contact at terminal 13/14 (ON) closes if a signal is present at terminal 1 (IN); it remains closed until the start command is removed (factory default). The ON function can be used, for instance, as a latching contact if you selected pushbutton control.

Reparameterizing from ON to RUN

You can reparameterize the function of the ON output on the 3RW40 to RUN by simultaneously pressing the RESET TEST and RESET MODE buttons (refer to chapter Commissioning the 3RW40 (Page 109)).

RUN

The RUN output remains closed as long as the motor is controlled by the soft starter, in other words during the startup phase, in bypass mode, and during the soft stop (if set). This output function can be used, for instance, if a line contactor connected upstream must be controlled by the soft starter, especially if the soft stop function is set.



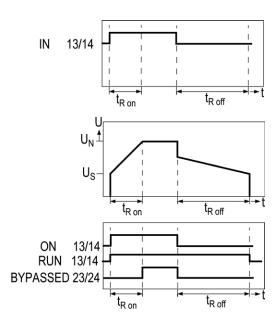
BYPASSED

The BYPASSED function can be used, for instance, to indicate that the motor has started up successfully.

The BYPASSED output at terminal 23 / 24 closes as soon as the SIRIUS 3RW40 soft starter detects that the motor has started up (refer to chapter Ramp-up detection (Page 117)).

The integral bypass contacts simultaneously close and the thyristors are bridged. The integral bypass contacts and output 23 / 24 open again as soon as the start input IN is removed.





For a state diagram of the contacts and the LEDs in the various operating and fault states, refer to chapter Diagnostics and fault signals (Page 52).

For recommended circuits, refer to chapter Typical circuit diagrams (Page 181).



5.6.3 3RW40: Group fault output at terminal 95 / 96 / 98 OVERLOAD / FAILURE

If there is no rated control voltage or if a failure occurs, the potential-free FAILURE / $\sf OVERLOAD$ output is switched.



For recommended circuits, refer to chapter Typical circuit diagrams (Page 181).

For a state diagram of the contacts in the various fault and operating states, refer to chapter Diagnostics and fault signals (Page 52).



5.7 Diagnostics and fault signals

5.7.1 3RW30: LEDs

					Os or	Auxiliary contact		
			5					
3RW30				DEVICE (rd/gn/ylw) STATE/BYPASSED FAILURE (gn/rd)		FAILURE	13 14/ (ON)	
U _s = 0)			
Opera	ating state		IN					
Off			0	\tau_	gn			_/_
Start			1	\ \	gn		gn	
Bypas	Bypassed		1	\ \	- ġ- gn - ġ- gn		-) - gn	
Fault								
Imper voltag	missible el e ¹⁾	ectronics sup	ply)		-\-rd	_/_
	ss overloa			\(\tau \)	ylw		-\-rd	
- Missing load voltage 1) - Phase failure, missing load 1)		\	- gn - rd		-\(\)- rd	_/_		
Devic	e fault 3)			\ \\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	rd		-\-rd	_/_
LE	Ds							
	\		gn =	rd =		lw =		
Off	ON	Flashing	Green	Red	Y	ellow		

1) The fault is automatically reset by an outgoing event. An automatic restart is initiated and the 3RW restarted if a start command is present at the input.



WARNING

Automatic restart

Danger of death, serious injury, or property damage.

If you do not want the motor to start automatically, you must integrate suitable additional components, e.g. phase failure or load monitoring devices, into the control and main circuits.

- 2) The fault can be acknowledged by removing the start command at the start input.
- 3) Switch off the control voltage, then switch it on again. If the fault is still present, contact your SIEMENS partner or Technical Assistance.



5.7.2 3RW30: Troubleshooting

Fault	Cause	Remedy
Impermissible electronics supply voltage	The control supply voltage does not correspond to the soft starter's rated voltage.	Check the control supply voltage; an incorrect control supply voltage could be caused by a power failure or a voltage dip.
Bypass overload	A current > 3.5 x I _e of the soft starter occurs for > 60 ms in bypass mode (e.g. because the motor is blocked).	Check the motor and load, and check the soft starter's dimensions.
Missing load voltage, phase failure / missing load	Cause 1: Phase L1 / L2 / L3 is missing at the start of soft starting or fails / collapses when the motor is operating. A trip occurs if a phase failure is detected by the 3RW30 at the start of soft starting: • at the beginning of starting: tripping time t > 0.5 s • in run-up or in bypass mode: phase failure not detected	Connect L1 / L2 / L3 or correct the voltage dip. Note: As soon as the motor is in run-up or bypass mode, these faults are no loner detected. The soft starter does not go to a fault state in these cases, and contact 13-14 remains closed. If the phase failure occurs in the uncontrolled phase, the response varies depending on whether the control voltage has a reference or connection to the AC network, or whether it is isolated: If the control voltage is isolated, the phase failure of the uncontrolled phase will also be detected when the motor is switched off. With an On command, the 3RW30 goes immediately to a fault state, and contact 13 / 14 does not close. If the control voltage has a reference to the AC network, the phase failure of the uncontrolled phase is not detected, and with an On command, the soft starter attempts to start the motor. This can cause the motor to hum.
	Cause 2: a motor that is not powerful enough is connected. A trip occurs if the current flowing through the 3RW30 soft starter at the start of soft starting is less than 10% of the rated operational current of the 3RW30, or less than 1 A. Cause 3: Motor phase T1 / T2 / T3 is not connected.	Connect a motor with a higher rated operational current, or select a different soft starter. Note: As soon as the motor is in run-up or bypass mode, these faults are no loner detected. The soft starter does not go to a fault state in these cases, and contact 13-14 remains closed. Connect the motor properly. (e.g. jumpers in the motor terminal box, repair switch closed etc.)
Device error	Soft starter defective.	Contact your SIEMENS partner or Technical Assistance.



5.7.3 3RW402 / 3RW403 / 3RW404: LEDs

		LED statuses 3RW40			Auxilia	Auxiliary contacts			
		Soft	Soft starter Motor protection		10 - 30 3 7 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5				
3RW402 / 3RW403 / 3RW404		DEVICE (rd/gn/ylw)	STATE / BYPASSED / FAILURE (gn/rd)	OVERLOAD (rd)	RESET MODE / AUTO (ylw/gn)	13 14 (ON)	13 14 (RUN)	24 23 (BYPASSED)	96 95 98 FAILURE / OVERLOAD
U _S = 0							_/_		لح ا
Operating state	IN								
Off	0	-\-\-\					_/_		7
Start	1	-\(\frac{1}{2}\)- gn	gn					_/_	7
Bypassed	1	-\(\) gn	- gn						7
Stop	0	- ` gn	gn			_/_		_/_	7
Warning	\.								
le/class-setting impermissible ²⁾		-\(\) gn	O/gr/cgn	•					7
Start inhibited, device too warm (may vary accord. to thyristor tem		ylw	0			_/_	_/_		7
Fault	1 800								
Impermissible electronics supply voltage ²⁾			- rd						لىح ا
Impermissible I _e / class setting and IN (0 -> 1) ²⁾		- \ gn	-\(\) rd	•		_/_	_/_		لنح ا
Motor protection tripping Overload relay cooling time 60 s / Thermistor cooling time may vary according to motor temperature 1)		-\(\frac{1}{2}\)- gn		\(\times\)		_/_	_/_	_/_	لے ا
Thermistor motor protection Wire break / short-circuit 1) 3)		-\(\)— gn		M			_/_	_/_	لح ا
Thermal overload on device ³⁾ (cooling time > 30 s)		- ylw	-\(\)-rd				_/_	_/_	لح ا
 No load voltage Phase failure, missing load ⁶⁾ 		-\(\frac{1}{2}\)- gn	-\-\-rd	0	0	_/_	_/_		لح ا
Device fault (cannot be acknowle	edged,	*	**						لہ ا
device defective) 5) Test function	624 - 92.50442	-\-\-rd	-\						
Press TEST t>5s 4)		- gn		-\(\)- rd		_/_	_/_		لح ا
RESET MODE (press to change	e)								
Manual reset									
Auto reset					-\to-ylw				
Remote Reset				- gn					
Display of	the LEDs	20	1) Opti	ional, only 3RW40	2. to 3RW40	4. with 24 V AC	C/DC		
		gn ylw = =	rd 2) Is reset automatically with the right setting or by an outgoing event. 3) Must be acknowledged according to set reset mode 4) Motor protection trip test 5) Device faults cannot be acknowledged. Please contact your Siemens partner or Technical						
off on flashing f	lickering gr	reen yellow red Assistance. 6) Can only be reset by manual or remote reset.						s scanni (1970-1994)	



AWARNING

Automatic restart

Can result in death, serious injury, or property damage.

The automatic RESET mode (AUTO RESET) must not be used in applications where there is a risk of serious injury to persons or substantial damage to property if the motor starts up again unexpectedly. The start command (e.g. issued by a contact or the PLC) must be reset prior to issuing a Reset command because the motor attempts to restart again automatically following this Reset command if a start command is still present. This particularly applies if the motor protection has tripped. For safety reasons, you are advised to integrate the group fault output on the 3RW40 (terminals 95 and 96), or the signaling contact of the motor or miniature circuit breaker on all devices, in the controller.



5.7.4 3RW405 / 3RW407: LEDs

		LED displays on 3RW40			Auxiliary contacts					
			Soft starter Motor protection							
3RW405 / 3RW407		DEVICE (rd/gn/ylw)	STATE / BYPASSED / RUN UP (gn)	FAILURE (rd)	OVERLOAD (rd)	RESET MODE (gn)	13 14 (ON)	13 14 (RUN)	24 23 (BYPASSED / RUN UP)	96 95 98 FAILURE / OVERLOAD
U _S = 0								_/_	_/_	لح ا
Operating state	IN_1				1907/89					
OFF	0	-) - gn					_/_	_/_	_/_	7
Start-up	1	-) - gn	•						_/_	7
Bypassed / RUN UP	1	- gn	\							7
Run-out	0	-) - gn					_/_			7
Warning	15									
I _e / class setting invalid		-) - gn								7
Start-up locked, thyristors too w	varm	J ylw					_/_	_/_	_/_	7
Error						T				
Supply voltage electronics inva $(U < 0.75 \times Us)$ or $(U > 1.15 \times Us)$				\ \			_/_	_/_	_/_	لح ا
Invalid I _e / class setting and IN (0 -> 1)		-) - gn		\rightarrow			_/_	_/_	_/_	لح ا
Motor protection switch-off		-\-\-\ gn			\Box		_/_	_/_	_/_	اح ا
Thermal overload thyristors		- ylw		\tau_			_/_	_/_	_/_	الح ا
- Missing load voltage - Phase failure, no load		-\-\		\ \			_/_	_/_	_/_	لح ا
Device fault		- rd		\\\\			_/_		_/_	لح ا
Test function										
1) Press TEST for t < 2 s		-) - gn	\	\tau_	\(\Delta\)					لح ا
2) Press TEST for 2 s < t < 5 s;	I _e > 0	1 rd	① /🌣							لح ا
2) Press TEST for 2 s < t < 5 s;	I _e = 0	∭ rd								لح ا
3) Press TEST for t > 5 s		-) - gn			\Rightarrow		_/_	_/_	_/_	لح ا
RESET MODE (press to change	e)									
Manual Reset										
Remote Reset						- gn				
LED display				14)	LEDI					
OFF ON flashing	flickering	gn = green	ylw = yellow	rd 2)	LED test Current mea Motor protect	- Marie 11				



AWARNING

Automatic restart

Can result in death, serious injury, or property damage.

The automatic RESET mode (AUTO RESET) must not be used in applications where there is a risk of serious injury to persons or substantial damage to property if the motor starts up again unexpectedly. The start command (e.g. issued by a contact or the PLC) must be reset prior to issuing a Reset command because the motor attempts to restart again automatically following this Reset command if a start command is still present. This particularly applies if the motor protection has tripped. For safety reasons, you are advised to integrate the group fault output on the 3RW40 (terminals 95 and 96), or the signaling contact of the motor or miniature circuit breaker on all devices, in the controller.

5.7.5 3RW40: Troubleshooting

Warning	Cause	Remedy
Impermissible I _e CLASS setting (control voltage present, no start command)	The rated operational current I_e set for the motor (control voltage present, no start command) exceeds the associated, maximum permissible setting current referred to the selected CLASS setting (chapter Motor current settings (Page 119)).	Check the rated operational current set for the motor, select a lower CLASS setting, or calculate the soft starter with a size allowance. As long as the 3RW40 is not controlled IN (0->1), this is only a status signal. However, it becomes a fault signal if the start command is applied.
Start inhibited, device too hot	The acknowledgment and the motor start are inhibited for a defined time by the inherent device protection following an overload trip, to allow the 3RW40 to cool down. Possible causes Too many starts, Motor starting time too long, Ambient temperature in switching device's environment too high, Minimum installation clearances not complied with.	The device cannot be started until the temperature of the thyristor or the heat sink has cooled down enough to guarantee sufficient reserve for a successful startup. The time until restarting is allowed can vary but is a minimum of 30 s. Rectify the causes and possibly retrofit the optional fan (3RW40 2. to 3RW40 4.).



Fault	Cause	Remedy		
Impermissible electronics supply voltage:				
Impermissible le/CLASS setting and IN (0->1) (control voltage present, IN start command changes from 0 to 1)	The rated operational current I_e set for the motor (control voltage present, start command present) exceeds the associated, maximum permissible setting current referred to the selected CLASS setting (chapter Motor current settings (Page 119)).	Check the rated operational current set for the motor, select a lower CLASS setting, or calculate the soft starter with a size allowance.		
	For the maximum permissible settings, refer to chapter "Technical data (Page 135)".			
Motor protection tripping Overload relay / thermistor:	The thermal motor model has tripped. After an overload trip, restarting is inhibited until the recovery time has elapsed.	- Check whether the motor's rated operational current $I_{\rm e}$ is set correctly, or - Change the CLASS setting, or		
	- Overload relay tripping time: 60 s	- Possibly reduce the switching		
	- Thermistor tripping time: When the	frequency, or		
	temperature sensor (thermistor) in the motor has cooled down.	- Deactivate the motor protection (CLASS OFF), or		
		- Check the motor and the application		
Thermistor protection: wire breakage / short-circuit (optional for 3RW40 2. to 3RW40 4. devices):	Temperature sensor at terminals T11/T12/T22 is short-circuited or defective, a cable is not connected, or no sensor is connected.	Check the temperature sensor and the wiring		
Thermal overload on the device:	Overload trip of the thermal model for the power unit of the 3RW40	Wait until the device has cooled down again, possibly increase the current		
	Possible causes	limiting value set for starting, or reduce		
	Too many starts,	the switching frequency (too many consecutive starts). Possibly retrofit the		
	Motor starting time too long,	optional fan (3RW40 2. to 3RW40 4.)		
	Ambient temperature in switching device's environment too high,	Check the load and the motor, check whether the ambient temperature in the		
	Minimum installation clearances not complied with.	soft starter's environment is too high (derating above 40 °C, refer to chapter Technical data (Page 135)), comply with the minimum clearances.		



Fault	Cause	Remedy
Missing load voltage, phase failure / missing load:	Cause 1: Phase L1 / L2 / L3 is missing or fails / collapses when the motor is operating.	Connect L1 / L2 / L3 or correct the voltage dip.
	A trip occurs if the current measured by the current transformers of the 3RW40 is less than 20% of the minimum rated motor current that can be set on the 3RW40 potentiometer:	
	At starting/coasting down: tripping time t > 1 s	
	• In bypass mode: tripping time t > 5 s	
	Cause 2: a motor that is not powerful enough is connected. A trip occurs if the current measured by the	Set the rated operational current for the connected motor correctly on the 3RW40 potentiometer, or set it to the minimum.
	current transformers of the 3RW40 is less than 20% of the minimum rated motor current that can be set on the 3RW40 potentiometer, or less than 2 A.	
	Cause 3: Motor phase T1 / T2 / T3 is not connected.	Connect the motor properly. (e.g. jumpers in the motor terminal box, repair switch closed etc.)
Device error	Soft starter defective.	Contact your SIEMENS partner or Technical Assistance.





Application planning

6.1 Application examples

6.1.1 Roller conveyor application

Using the 3RW30 with roller conveyors

Roller conveyors are employed, for example, in parcel distribution systems for transporting parcels to and from individual workstations. For this purpose, the direction of rotation of the 11 kW / 15 hp motor that is used has to be adjustable in order for the conveyor to work in both directions.

The following requirements must be met by the roller conveyor:

- The roller conveyor has to start smoothly, to prevent damage to the transported goods due to slipping or tilting.
- The machine's wear and maintenance intervals should be minimized, which is why slippage of the belt drive during startup must be prevented.
- The high current load upon motor startup must be reduced by means of a voltage ramp.
- The feeder assembly should be as small as possible so as not to exceed the control cabinet's space capacity.

The SIRIUS 3RW30 soft starter offers the following advantages:

- The roller conveyor is rapidly accelerated to the nominal speed without torque surges thanks to the optimum setting of the voltage ramp during startup.
- The motor's starting current is reduced.
- Reversing operation of the conveyor belt is realized through contactor interconnection with SIRIUS 3RA13 reversing contactor combinations.
- The feeder and the motor protection are implemented with SIRIUS 3RV motor starter protectors.
- The use of SIRIUS system components guarantees maximum wiring reductions and space savings.



6.1.2 Hydraulic pump application

Using the 3RW40 with hydraulic pumps

The SIRIUS 3RW40 is optimally suited for soft starting and stopping of hydraulic pumps. With a rating of 200 kW / 250 hp, this soft starter is used, for example, in the production of sheet parts to drive the presses.

The drives for hydraulic pumps must meet the following requirements:

- The motor's starting current has to be reduced to minimize the load on the higher-level mains transformer during startup.
- Integrated motor protection is called for to reduce wiring expenditure and space requirements in the control box.
- The hydraulic pump must be started and stopped in a soft manner to minimize the mechanical load on the drive and the pump caused by torque surges during starting and stopping.

The SIRIUS 3RW40 soft starter offers the following advantages:

- The settable current limiting of the SIRIUS 3RW40 limits the load on the mains transformer during the motor startup.
- Motor protection is ensured by the motor overload relay with settable tripping times integrated in the soft starter.
- The adjustable voltage ramp ensures that the hydraulic pump is started and stopped without torque surges.



Installation

7.1 Installing the soft starter

7.1.1 Unpacking

NOTICE

Do not lift the device by the cover in order to unpack it, especially sizes 3RW40 55 to 3RW40 76, because this could lead to damage.

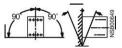
7.1.2 Permissible mounting position

3RW30

3RW40

10° 10° 10°

3RW40 2 to 3RW40 4 (with optional additional fan) 3RW40 5 to 3RW40 7



Vertical mounting

Horizontal mounting

Note

The permissible switching frequency values can vary according to the selected mounting position. For information about factors and how to determine the new switching frequency, refer to chapter Configuration (Page 83).

Note

An optional fan can be ordered for the 3RW40 24 to 3RW40 47 sizes; this fan is integrated in the device for 3RW40 55 to 3RW40 76. The 3RW30 cannot be equipped with a fan.



7.1.3 Mounting dimensions, clearances, and assembly type

The minimum clearances from other devices must be complied with to ensure unobstructed cooling as well as the free supply and discharge of air to and from the heat sink.

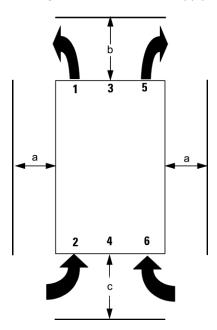


Figure 7-1 Clearances from other devices

MLFB	a (mm)	a (in)	b (mm)	b (in)	c (mm)	c (in)
3RW30 1./3RW30 2.	15	0.59	60	2.36	40	1.56
3RW30 3./3RW30 4	30	1.18	60	2.36	40	1.56
3RW40 2.	15	0.59	60	2.36	40	1.56
3RW40 3./3RW40 4.	30	1.18	60	2.36	40	1.56
3RW40 5./3RW40 7.	5	0.2	100	4	75	3

Note

Allow sufficient clearances for the cooling air to circulate freely. The device is ventilated from bottom to top.



7.1.4 Assembly type: Standalone assembly, side-by-side assembly, direct mounting

Standalone assembly



The term "standalone assembly" is used if the clearances a \prime b \prime c described in chapter Mounting dimensions, clearances, and assembly type (Page 64) are complied with.

Side-by-side assembly



The term "side-by-side assembly" is used if the lateral clearance a described in chapter Mounting dimensions, clearances, and assembly type (Page 64) are not complied with, e.g. if several switching devices are assembled side by side.



Direct mounting



The term "direct mounting" is used if the top clearance b described in chapter Mounting dimensions, clearances, and assembly type (Page 64) is not complied with, e.g. if the soft starter is mounted directly on a motor starter protector (e.g. 3RV2) using a link module (e.g. 3RV29).

Note

The permissible switching frequency values can vary according to the selected assembly type. For information about factors and how to determine the new switching frequency, refer to chapter Configuration (Page 83).

7.1.5 Installation requirements

Degree of protection IP00

The SIRIUS 3RW30 / 3RW40 soft starters conform to the IP00 degree of protection.

The devices must be installed in control cabinets with the IP54 degree of protection (pollution degree 2), taking account of the ambient conditions.

Make sure no liquids, dust, or conductive objects can get inside the soft starter. The soft starter produces waste heat (power loss) while it is operating (refer to chapter Technical data (Page 135)).

NOTICE

Provide adequate cooling at the place of installation to prevent the switching device from overheating.



Installation / mounting

8

8.1 General information

General information

A motor feeder comprises a **disconnector**, a **contact**, and a **motor** as a minimum.

Line protection against short-circuits must be implemented, together with overload protection for the line and motor.

Disconnector

The isolating function with line protection against overload and short-circuits can be achieved with a motor starter protector or a fuse disconnector, for instance. The motor overload protection function is integrated in the SIRIUS 3RW40 soft starter. The motor overload protection for the SIRIUS 3RW30 soft starter can be implemented with a motor circuit breaker, for instance, or using a motor overload relay in conjunction with a contactor (for the fuse and motor starter protector assignment, refer to Technical data (Page 135)).

Contact

The contact function is taken care of by the SIRIUS 3RW30 or 3RW40 soft starter.



Hazardous voltage

Danger of death or serious injury.

If mains voltage is present at the input terminals of the soft starter, hazardous voltage may still be present at the soft starter output even if a start command has not been issued. This voltage must be isolated by means of a disconnector (open isolating distance, e.g. with an open switch disconnector) whenever work is carried out on the feeder (refer to chapter Five safety rules for work in or on electrical systems (Page 68)).

Note

All elements of the main circuit (such as fuses, motor starter protectors, and switching devices) must be dimensioned for direct starting and according to the on-site short-circuit conditions, and ordered separately.

For recommended fuse and motor starter protector ratings for the feeder with soft starter, refer to chapter Technical data (Page 135).



8.2 Five safety rules for work in or on electrical systems

A set of rules, which are summarized in DIN VDE 0105 as the "five safety rules", are defined for work in or on electrical systems as a preventative measure against electrical accidents:

- Isolate
- 2. Secure against switching on again
- 3. Verify that the equipment is not live
- 4. Ground and short-circuit
- 5. Erect barriers around or cover adjacent live parts

These five safety rules must be applied in the above order prior to starting work on an electrical system. After completing the work, proceed in the reverse order.

It is assumed that every electrician is familiar with these rules.

Explanations

- 1. The isolating distances between live and deenergized parts of the system must vary according to the operating voltage that is applied.
 - "Isolate" refers to the all-pole disconnection of live parts.
 - All-pole disconnection can be achieved, e.g. by .:
 - Switching off the miniature circuit breaker
 - Switching off the motor circuit breaker
 - Unscrewing fusible links
 - Removing LV HRC fuses
- 2. The feeder must be secured against inadvertent restarting to ensure that it remains isolated for the duration of the work. This can be achieved, for instance, by securing the motor and miniature circuit breakers with lockable blocking elements in the disconnected state, either using a lock or by unscrewing the fuses.
- 3. The deenergized state of the equipment should be verified using suitable test equipment, e.g. a two-pole voltmeter. Single-pole test pins are not suitable for this purpose. The absence of power must be established for all poles, phase to phase, and phase to N/PE.
- 4. Grounding and short-circuiting are only mandatory if the system has a nominal voltage greater than 1 kV. In this case, the system should always be grounded first and then connected to the live parts to be short-circuited.
- 5. These parts should be covered, or barriers erected around them, to avoid accidental contact during the work with adjacent parts that are still live.



8.3 General feeder assembly (type of coordination 1)

The SIRIUS 3RW30 or 3RW40 soft starter is connected into the motor feeder between the motor starter protector and the motor.

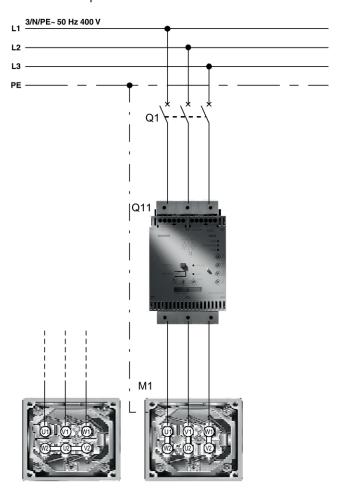


Figure 8-1 Block diagram of the SIRIUS 3RW40 soft starter

Note

For the component design, refer to chapter Technical data (Page 135).



8.4 Soft starter with line contactor (type of coordination 1)

If electrical isolation is specified, you can install a motor contactor between the soft starter and the motor starter protector.

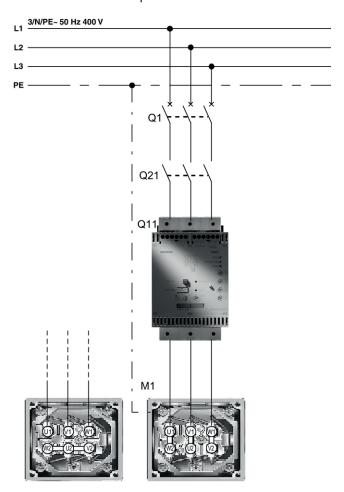


Figure 8-2 Block diagram of a feeder with an optional main / line contactor

Note

For the component design, refer to chapter Technical data (Page 135).

Note

If a main or line contactor is used, it should not be connected between the soft starter and the motor. The soft starter could otherwise indicate a "Missing load voltage" fault in case of a start command and delayed connection of the contactor.



8.5 Soft starter assembly with type of coordination 2

The SIRIUS 3RW40 soft starter has internal protection to prevent overloading of the thyristors. The SIRIUS 3RW30 soft starter has no internal protection to prevent overloading of the thyristors. The soft starter must always be dimensioned according to the duration of the startup process and the desired starting frequency. If the feeder of the SIRIUS 3RW30 or 3RW40 soft starter is assembled accordingly with the feeder components recommended in chapter Technical data (Page 135) (e.g. motor starter protector or LV HRC fuse), type of coordination 1 is achieved. In order to achieve type of coordination 2, all thyristors must be additionally protected against short-circuits by means of special semiconductor fuses (e.g. SIEMENS SITOR). A short-circuit can occur, for instance, as a result of a defect in the motor windings or in the motor's power supply cable.

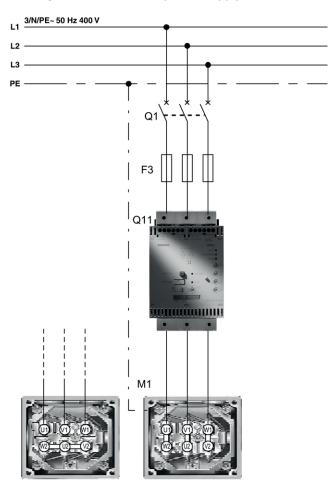


Figure 8-3 Block diagram of a feeder with semiconductor fuses

Note

For the component design, refer to chapter Technical data (Page 135).



Note

Minimum and maximum configuration of the semiconductor fuses

The fuses for the minimum and maximum configuration are specified in chapter Technical data (Page 135).

Minimum configuration: The fuse is optimized for the thyristor's I2t value.

If the thyristor is cold (ambient temperature) and the startup process lasts a maximum of 20 s at 3.5 times the rated current of the device, the fuse does not trip.

Maximum configuration: The maximum current permitted for the thyristor can flow without the fuse tripping.

The maximum configuration is recommended for heavy-duty starting.

NOTICE

Risk of property damage

Type of coordination 1 in accordance with IEC 60947-4-1:

The device is defective following a short-circuit failure and therefore unsuitable for further use (personnel and equipment must not be put at risk).

Type of coordination 2 in accordance with IEC 60947-4-1:

The device is suitable for further use following a short-circuit failure (personnel and equipment must not be put at risk).

The type of coordination only refers to soft starters in conjunction with the stipulated protective device (motor starter protector / fuse), not to additional components in the feeder.



8.6 Capacitors to improve the power factor



No capacitors must be connected to the output terminals of the soft starter. If so, the soft starter will be damaged.

Active filters, e.g. for power factor correction, must not be operated parallel to the motor control device.

If capacitors are to be used to correct the power factor, they must be connected on the device's line side. If an isolating or main contactor is used together with the electronic soft starter, the capacitors must be disconnected from the soft starter when the contactor is open.

8.7 Maximum cable length

The cable between the soft starter and the motor must not be more than 300 m long (3RW30 and 3RW40).

The voltage drop due to the length of the cable to the motor may need to be considered when dimensioning the cable.

Cable lengths up to 500 m are permitted for SIRIUS 3RW44 soft starters (refer to the 3RW44 System Manual (http://support.automation.siemens.com/WW/view/de/21772518)).





Connecting

9.1 Electrical connection

9.1.1 Control and auxiliary terminals

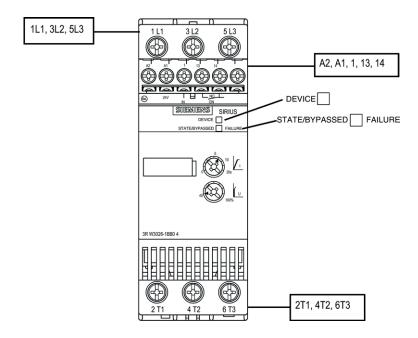
The SIRIUS 3RW30 and 3RW40 soft starters can be supplied with two different connection technologies:

- Screw-type technology
- Spring-loaded technology

9.1.2 Main circuit connection

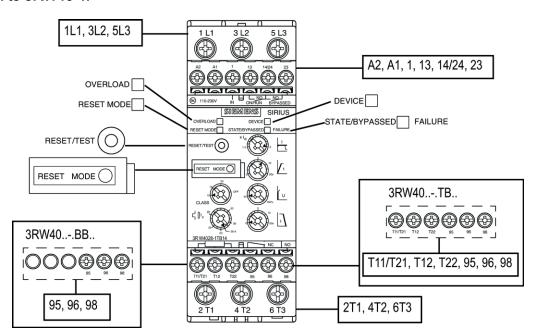
SIRIUS 3RW30 and 3RW40 soft starters up to the 55~kW / 75~hp size at 400~V / 480~V are designed with removable terminals at the main circuit connections.

Sizes 3RW30 1. to 3RW30 4.





Sizes 3RW40 2. to 3RW40 4.

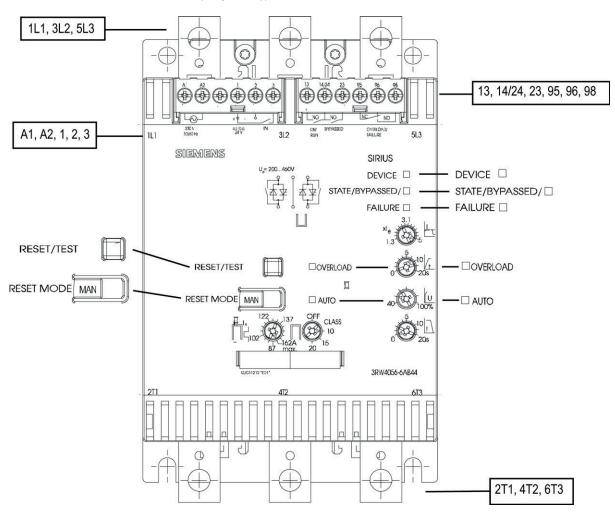




Sizes 3RW40 5. and 3RW40 7.

Sizes $3RW40\ 5$. and $3RW40\ 7$. have busbar connections for the main circuit connection.

Box terminals can be retrofitted on these devices as optional accessories (refer to chapter Accessories (Page 219)).

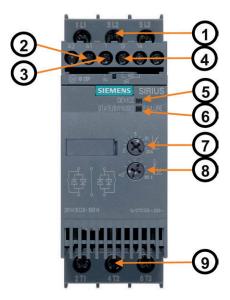






Operation 10

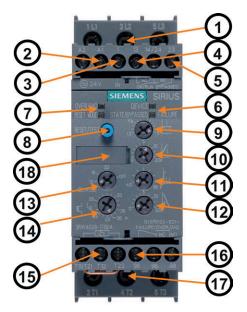
10.1 Operator controls, displays, and connections on the 3RW30



- 1 Operating voltage (three-phase mains voltage)
- 2 Control supply voltage
- 3 IN start input
- 4 ON output
- 5 DEVICE status LED
- 6 STATE / BYPASSED / FAILURE status LED
- 7 Ramp-up time
- 8 Starting voltage
- 9 Motor terminals



10.2 Operator controls, displays, and connections on the 3RW40



- 1 Operating voltage (three-phase mains voltage)
- 2 Control supply voltage
- 3 IN start input
- 4 ON / RUN output
- 5 BYPASSED output
- 6 DEVICE / STATE / BYPASSED / FAILURE status LEDs
- 7 OVERLOAD, RESET MODE status LEDs
- 8 TEST / RESET button
- 9 Current limiting
- 10 Ramp-up time
- 11 Starting voltage
- 12 Ramp-down time
- 13 Trip class
- 14 Motor current
- Thermistor input (can be optionally ordered with 24 V AC/DC control voltage for 3RW40 2. to 3RW40 4. devices)
- 16 Fault output
- 17 Motor terminals
- 18 RESET MODE button (behind the label on the 3RW40 2., refer to the diagram below)



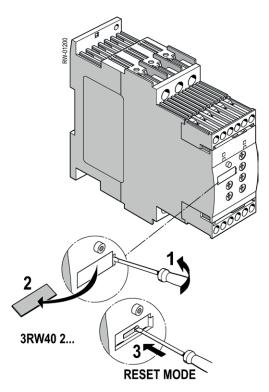


Figure 10-1 Button for setting RESET MODE behind the label





Configuration

11.1 Configuration in general

The SIRIUS 3RW30 and 3RW40 electronic soft starters are designed for normal starting. A larger size may need to be selected for longer ramp-up times or a higher starting frequency.

An appropriately dimensioned SIRIUS 3RW40 or 3RW44 soft starter should be chosen for startup processes with motor ramp-up times > 20 s.

The motor feeder between the soft starter and motor must not contain any capacitive elements (such as compensation systems). Active filters must not be operated in combination with soft starters.

All elements of the main circuit (such as fuses and switching devices) must be dimensioned for direct starting and according to the on-site short-circuit conditions, and ordered separately.

The harmonic component load of the starting current must be taken into consideration when selecting motor starter protectors (trip selection).

Note

Voltage dips generally occur in all start modes (direct starting, wye-delta starting, soft starting) when a three-phase motor is switched on. The infeed transformer must always be dimensioned so that the voltage dip at the motor startup remains within the permissible tolerance. If the infeed transformer is insufficiently dimensioned, the control voltage should be supplied from a separate circuit (independently of the main voltage) in order to prevent the voltage dip from disconnecting the 3RW.

Note

All elements of the main circuit (such as fuses, motor starter protectors, and switching devices) must be dimensioned for direct starting and according to the on-site short-circuit conditions, and ordered separately.

If wye-delta starters are exchanged for soft starters in an existing system, you should check the fuse ratings in the feeder in order to avoid false tripping. This is particularly important in connection with heavy-duty starting or if the fuse that is installed has already been operated close to the thermal tripping limit with the wye-delta assembly.

For recommended fuse and motor starter protector ratings for the feeder with soft starter, refer to chapter Technical data (Page 135).



11.1.1 Configuration procedure

1. Select the correct starter

What application must be started and what functionality must be provided by the soft starter? Chapter Selecting the optimum soft starter (Page 84)

2. Take account of the startup class and the switching frequency

Chapters Startup class (Page 86) and Calculating the permissible switching frequency (Page 92)

3. Take account of a possible reduction in the soft starter's rated data due to the ambient conditions and the type of assembly.

Chapter Reducing the rated data (Page 90)

11.1.2 Selecting the optimum soft starter

Selection aid

You can choose the optimum starter from the soft starter types available based on the intended application or the required functionality.

Normal starting (CLASS 10) applications	3RW30	3RW40	3RW44	
Pump	+	+	+	
Pump with special stop (against water hammer)	-	-	+	
Heat pump	+	+	+	
Hydraulic pump	х	+	+	
Press	х	+	+	
Conveyor belt	Х	+	+	
Roller conveyor	х	+	+	
Conveyor worm	Х	+	+	
Escalator	-	+	+	
Piston compressor	-	+	+	
Screw compressor	-	+	+	
Small fan 1)	-	+	+	
Centrifugal blower	-	+	+	
Bow thruster	-	+	+	

⁺ Recommended soft starter

x Possible soft starter

¹⁾ Small fan: Mass inertia (centrifugal mass) of fan < 10 x mass inertia of motor



Heavy-duty starting (CLASS 20) applications	3RW30	3RW40	3RW44
Agitator	-	Х	+
Extruder	-	х	+
Turning machine	-	Х	+
Milling machine	-	Х	+

⁺ Recommended soft starter

x Possible soft starter

Ultra-heavy-duty starting (CLASS 30) applications	3RW30	3RW40	3RW44
Large fan ²⁾	-	-	+
Circular saw / band saw	-	-	+
Centrifuge	-	-	+
Mill	-	-	+
Crusher	-	-	+

⁺ Recommended soft starter

²⁾ Large fan: Mass inertia (centrifugal mass) of fan ≥ 10 x mass inertia of motor

Soft starter functions	3RW30	3RW40	3RW44
Soft start function	+	+	+
Soft stop function	-	+	+
Integrated intrinsic device protection	-	+	+
Integrated electronic motor overload protection	-	+	+
Settable current limiting	-	+	+
Special pump stop function	-	-	+
Braking when coasting down	-	-	+
Settable breakaway torque	-	-	+
Communication via PROFIBUS (optional)	-	-	+
External operation and indication display (optional)	-	-	+
Soft Starter ES parameterization software	-	-	+
Special functions, e.g. measured values, display languages etc.	-	-	+
Motor overload protection acc. to ATEX	-	+	-

⁺ Recommended soft starter



Note

SIRIUS 3RW44 soft starter

For more information about the SIRIUS soft starter, refer to the 3RW44 System Manual. You can download (http://support.automation.siemens.com/WW/view/de/21772518) the manual free of charge.

11.2 Startup class

To achieve the optimum soft starter design, it is important to know and take into account the starting time (startup class) of the application. Long starting times mean a higher thermal load on the thyristors of the soft starter. An appropriately dimensioned SIRIUS 3RW40 or 3RW44 soft starter should be chosen for startup processes with a motor ramp-up time > 20 s. The maximum permissible starting time for SIRIUS 3RW30 soft starters is 20 seconds. SIRIUS soft starters are designed for continuous operation with normal starting (CLASS 10), an ambient temperature of 40 °C, and a defined switching frequency (refer to chapter Technical data (Page 135)). If other data applies, the starters may need to be calculated with a size allowance.

NOTICE

Risk of property damage

When using the 3RW30: Make sure the selected ramp time is longer than the actual motor run-up time. If not, the SIRIUS 3RW30 may be damaged because the internal bypass contacts close when the set ramp time elapses. If the motor has not finished starting up, an AC3 current that could damage the bypass contact system will flow.

When using the 3RW40: The 3RW40 has an integrated ramp-up detection function that prevents this operating state from occurring.

Selection criteria

Note

You must select the size of your SIRIUS soft starters according to the rated motor current (rated current_{soft starter} ≥ rated motor current).



11.2.1 Application examples for normal starting (CLASS 10) with 3RW30 and 3RW40

Recommended basic parameter settings

Assuming the conditions and constraints indicated below apply, the size of the soft starters can be equivalent to the motor rating for a normal starting characteristic (CLASS 10).

You can find a suitable soft starter for the required motor rating based on the required startup class in chapter Technical data (Page 135).

For typical applications where normal starting applies as well as recommended parameter settings for the soft starter, refer to the table below.

Normal starting (CLASS 10)

The soft starter rating can be equivalent to the motor rating.

Application		Conveyor belt	Roller conveyor	Compressor	Small fan ¹⁾	Pump	Heat / hydraulic pump
Start parameters							
 Voltage ramp and current limiting Starting voltage Ramp-up time Current limiting value (% s (3RW40)	70 10 off (max / 5 x I _M)	60 10 off (max / 5 x I _M)	50 10 4 x I _M	40 10 4 x I _M	40 10 4 x I _M	40 10 4 x I _M
Stop mode		Soft stop (3RW40 only)	Soft stop (3RW40 only)	Stop without load	Stop without load	Soft stop (3RW40 only)	Stop without load

1) Small fan: Mass inertia (centrifugal mass) of fan < 10 x mass inertia of motor

General conditions and constraints						
CLASS 10 (normal starting)						
3RW30: Maximum ramp-up time 3 s, 300 % starting current, 20 starts / hour						
3RW40: Maximum ramp-up time 10 s, 300 % current limiting, 5 starts / hour						
ON time	30 %					
Standalone assembly						
Installation altitude	Max. 1000 m / 3280 ft					
Ambient temperature kW	40 °C / 104 °F					



11.2.2 Application examples for heavy-duty starting (CLASS 20): 3RW40 only

Recommended basic parameter settings

Assuming the conditions and constraints indicated below apply, the soft starter size must be at least one power class higher than the motor rating for heavy-duty starting (CLASS 20).

You can find a suitable soft starter for the required motor rating based on the required startup class in chapter Technical data (Page 135).

For typical applications where heavy-duty starting can apply as well as recommended parameter settings for the soft starter, refer to the table below.

Heavy-duty starting (CLASS 20)
The soft starter must be at least one power class larger than the motor rating.

Application	Agitator	Extruder	Milling machine
Start parameters			
Voltage ramp and current limiting Starting voltage Ramp-up time S Current limiting value (3RW40)	40 20 4 × I _M	70 10 off (max / 5 x I _M)	40 20 4 × I _M
Stop mode	Stop without load	Stop without load	Stop without load

General conditions and constraints								
CLASS 20 (heavy-duty starting)								
3RW40 2. / 3RW40 3. / 3RW40 4.	Maximum starting time 20 s, 300% current limiting, max. 5 starts / hour							
3RW40 5. / 3RW40 7.	Maximum starting time 40 s, 350% current limiting, max. 1 start / hour							
ON time	30 %							
Standalone assembly								
Installation altitude	Max. 1000 m / 3280 ft							
Ambient temperature kW	40 °C / 104 °F							

Note

The settings and device dimensions indicated in these tables are examples only; they are merely provided for information purposes and are not binding. The actual settings depend on the application and must be optimized when the equipment is commissioned.

If other conditions and constraints apply, either refer to the chapter Technical data (Page 135) or check your requirements and selection with Technical Assistance (chapter Important notes (Page 11))



11.3 ON time and switching frequency

Based on the rated motor current and the startup class, the SIRIUS 3RW30 and 3RW40 soft starters are dimensioned for a maximum permissible switching frequency in combination with a relative ON time (refer to chapter Technical data (Page 135)). If these values are exceeded, a larger soft starter may have to be selected.

ON time

The relative ON time in % is the ratio between the load duration and the cycle duration for loads that are frequently switched on and off.

The ON time (OT) can be calculated using the following formula:

$$OT = \frac{t_s + t_b}{t_s + t_b + t_p}$$

where:

OT = ON time [%]

ts = ramp-up time [s]

t_b = operating time [s]

 $t_p = idle time [s]$

The following diagram illustrates this process.

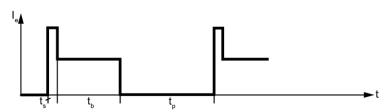


Figure 11-1 ON time

Switching frequency

The maximum permissible switching frequency must not be exceeded because the devices could be damaged due to thermal overloading.

Optional additional fan

The switching frequency of the 3RW40 2. to 3RW40 4. soft starters can be increased by installing an optional additional fan. For information about factors and how to determine the maximum switching frequency if an additional fan is installed, refer to chapter Calculating the permissible switching frequency (Page 92).



11.4 Reducing the rated data

You can reduce the rated data of the SIRIUS 3RW30 and 3RW40 soft starters if

- The installation altitude is higher than 1000 m.
- The ambient temperature in the switching device's environment exceeds 40 °C.
- The lateral clearances described earlier are not complied with, e.g. side-by-side assembly
 or direct mounting of other switching devices (assembly type).
- The vertical mounting position is not complied with.

11.5 Dimensioning of soft starters for motors with high starting current conditions

When using motors with high starting current conditions (typically $I/I_e \ge 8$), overdimensioning of the 3RW40 soft starter can be necessary. For this application case, we recommend 3RW40 soft starters with product version E07 or higher (for 3RW40 sizes S0, S2, S3) or with product version E11 or higher (for 3RW40 sizes S6 and S12). These 3RW40 devices make it possible to select the set value for current limiting sufficiently high for a successful motor start (refer to chapter Setting the current limiting value (Page 114)).

For dimensioning soft starters for motors with high starting current conditions (typically I/I_e > 8), we recommend our Siemens Technical Assistance (refer to chapter Technical Assistance (Page 97)).



11.6 Installation altitude and ambient temperature

Installation altitude

The permissible installation altitude must not be higher than 5000 m above sea level (higher than 5000 m on request).

If the installation altitude exceeds 1000 m, the rated operational current must be reduced for thermal reasons.

If the installation altitude exceeds 2000 m, the rated voltage must also be reduced owing to the restricted dielectric strength. A maximum permissible rated voltage of 460 V applies at installation altitudes between 2000 m and 5000 m above sea level.

The following diagram shows the reduction in the rated device current as a function of the installation altitude:

The rated operational current l_e must be reduced at altitudes higher than 1000 m above sea level.

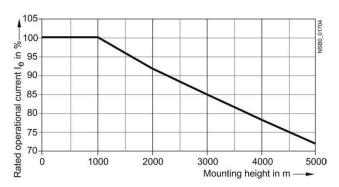


Figure 11-2 Reduction as a function of the installation altitude

Ambient temperature

The maximum permissible ambient temperature of the soft starter must not exceed 60 °C.

SIRIUS 3RW30 and 3RW40 soft starters are designed for operation with nominal current at an ambient temperature of 40 °C. If this temperature is exceeded, e.g. owing to an impermissible temperature rise in the control cabinet, other loads, or a general increase in the ambient temperature, the resulting deterioration in the soft starter's performance must be taken into account when the device is dimensioned (refer to chapter Technical data (Page 135)).

NOTICE

Risk of property damage.

The soft starter may be damaged if the maximum installation altitude (5000 m above sea level) or an ambient temperature of 60 °C is ignored.



Mounting position, assembly type

The mounting position and assembly type (refer to chapter Installing the soft starter (Page 63)) can influence the soft starter's permissible switching frequency. Refer to chapter Calculating the permissible switching frequency (Page 92) for the permissible mounting and assembly combinations as well as the resulting factors for the soft starter switching frequencies.

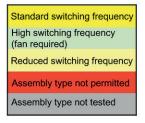
11.7 Calculating the permissible switching frequency

11.7.1 Table of permissible assembly combinations with switching frequency factors

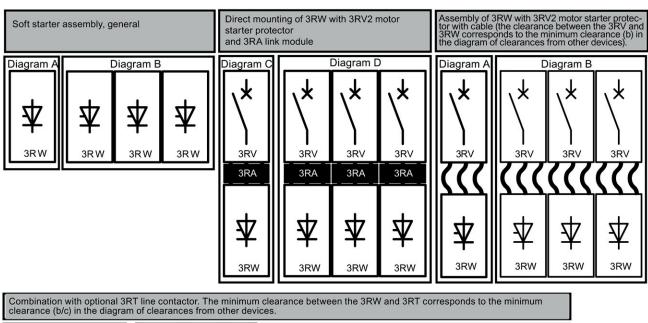
The factors indicated in the table refer to the switching frequency (starts / hour) as specified in chapter Technical data (Page 135).

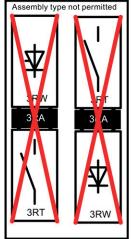
			Vertical mounting								
Graph	Assembly type		3RW3	10-0				optional fa	903.3		
		3RW301*	3RW302*	3RW303*3RW304*	3RW402*	3RW403*3RW404*	3RW402*	3RW403*	3RW404*		
Α	Standalone assembly	1.0				1.0	1.6	2.0	2.8		
В	Side-by-side assembly	0.7	0.1	0.3	0.1	0.3	1.6	2.0	2.8		
С	Standalone assembly	0.5			0.5		1.6				
D	Side-by-side assembly	0.3				-	1.6				

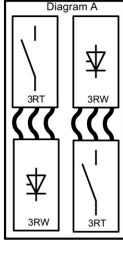
		Horizontal mounting							
Graph	Assembly type	3RW30/40 3RW40 + optional fan							
			3RW402*	3RW403*	3RW404*				
Α	Standalone assembly	<u>-</u>	1.6	2.0	2.8				
В	Side-by-side assembly	-	1.6	2.0	2.8				
С	Standalone assembly	ä	1.6						
D	Side-by-side assembly	-	1.4						

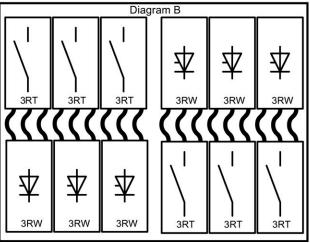






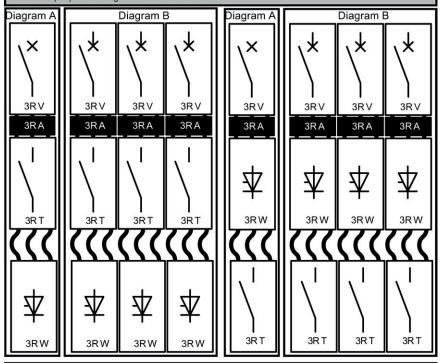




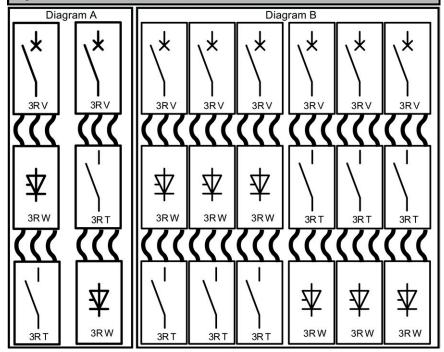




Assembly of 3RW with 3RV2 motor starter protector, 3RA link module, cable, and 3RT line contactor. The minimum clearance between the 3RW, 3RV, and 3RT corresponds to the minimum clearance (b/c) in the diagram of clearances from other devices.



Assembly of 3RW with 3RV2 motor starter protector and 3RT line contactor with cable. The minimum clearance between the 3RV and 3RT corresponds to the minimum clearance (b/c) in the diagram of clearances from other devices.





	MLFB	a (mm)	a (in)	b (mm)	b (in)	c (mm)	c (in)
· •	3RW30 1./3RW30 2.	15	0.59	60	2.36	40	1.56
	3RW30 3./3RW30 4	30	1.18	60	2.36	40	1.56
	3RW40 2.	15	0.59	60	2.36	40	1.56
*	3RW40 3./3RW40 4.	30	1.18	60	2.36	40	1.56
2 4 6 Clearances from other devices	3RW40 5./3RW40 7.	5	0.2	100	4	75	3

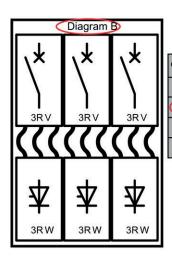


11.7.2 Calculating the switching frequency (example)

Problem

The maximum permissible switching frequency of a 5.5 kW (12.5 A) 3RW4024 soft starter must be determined. The requirements are side-by-side assembly and vertical mounting. A run-up time of approx. 3 s at an ambient temperature of 40 $^{\circ}$ C is specified as a supplementary condition (e.g. a pump motor with CLASS 10 starting). The soft starter must be connected to a 3RV2021 motor starter protector by means of cables. (Clearance between 3RV and 3RW \geq 40 mm)

Calculating the number of starts / hour of a 3RW40 for side-by-side assembly and vertical mounting



			Vertical mounting									
Graph	Assembly type	00140044	3RW30 3RW301* 3RW302* 3RW303* 3RW304*/							3RW40 + optional fan		
		3RW301*	3RW302*	3RW303*	3RW304*	3RW402*	3RW403*	3RW404*	3RW402*	3RW403*	3RW404*	
Α	Standalone assembly		1.0			1.0			1.6	2.0	2.8	
(E)	Side-by-side assembly	0.7	0.1	0.3	3	0.1	0	.3	1.6	2.0	2.8	
С	Standalone assembly	0.5				0.5			1.6			
D	Side-by-side assembly	0.3	2				-		1.6			

Туре		3RW4024
Power electronics		
Load rating with rated operational current I _e • According to IEC and UL/CSA ¹⁾ , for standalone assembly, AC-53a - At 40°C - At 50°C - At 60°C	A A A	12.5 11 10
Minimum settable rated motor current $I_{\rm M}$ for the motor overload protection	А	5
Power loss • During operation after successful startup with uninterrupted rated operational current (40°C) approx.	W	2
• During starting with current limit set to 300% I_M (40°C)	W	68
Permissible rated motor current and starts per hour		
 For normal starting (CLASS 10) Rated motor currentl_M², ramp-up time 3 s Starts per hour³ 	A 1/h	12.5 50

Assembly of a 3RV2021 motor starter protector and connection of a 3RW40 24 soft starter with cables and vertical mounting for CLASS 10 starting:

Switching frequency of 3RW40 with standalone assembly: 50 1/h Switching frequency factor for diagram B without a fan: 0,1
Switching frequency factor for diagram B with a fan 1): 1,6

Maximum permissible switching frequency:

Without fan 50 1/h x 0.1 = 5 1/hWith fan 1): 50 1/h x 1.6 = 80 1/h

1) Optional fan: 3RW49 28-8VB00



Result

The pump could be started five times an hour providing the above assembly conditions are complied with (side-by-side assembly, vertical mounting). A switching frequency of up to 80 starts per hour can be achieved by equipping the 3RW4026 with the optional 3RW4928-8VB00 fan.

11.8 Configuration aids

11.8.1 Online configurator

Using the online configurator, you can select soft starters based on the rated motor data and the specified device functionality. The selection of the soft starter is subject to fixed conditions and constraints, such as switching frequency, startup class etc. These conditions cannot be changed. You can find the online configurator at www.siemens.de/sanftstarter (http://www.siemens.com/softstarter).

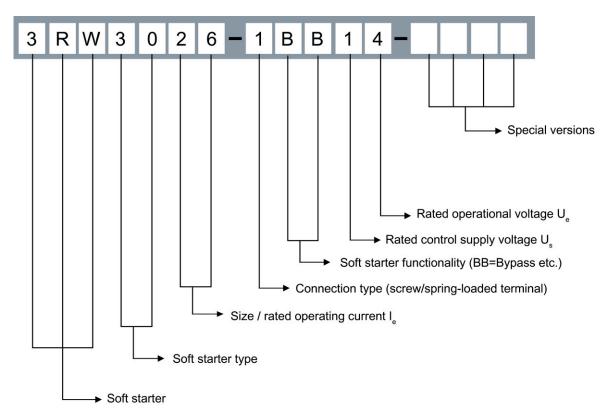
11.8.2 Technical Assistance

SIEMENS Technical Assistance offers personal support to help you find the optimum device and provides assistance with technical queries relating to low-voltage switchgear and controlgear

Technical Assistance:	Phone: +49 (0) 911-895-5900 (8°° - 17°° CET) Fax: +49 (0) 911-895-5907			
	e-mail: (mailto:technical-assistance@siemens.com)			
	Internet: (http://www.siemens.com/industrial-controls/technical-assistance)			



11.9 Order number system for the 3RW30



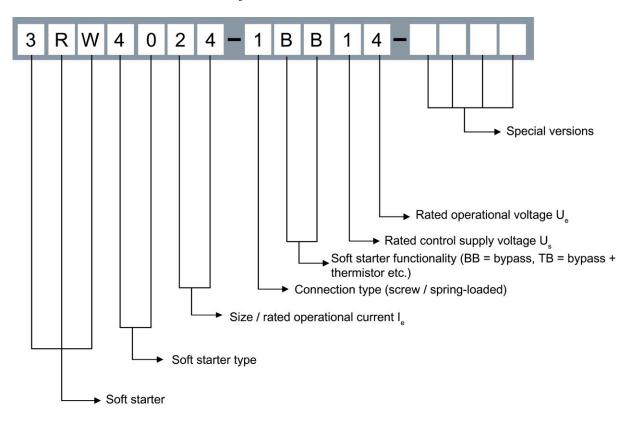
Rated current and rated power at U_e = 400 V / 460 V and T_{amb} = 40 °C / 50 °C

13	le = 3.6 A / 3 A	Pe = 1.5 kW / 1.5 hp	Size S00
14	le = 6.5 A / 4.8 A	Pe = 3 kW / 3 hp	
16	le = 9.0 A / 7.8 A	Pe = 4 kW / 5 hp	
17	le = 12.5 A / 11 A	Pe = 5.5 kW / 7.5 hp	
18	le = 17.6 A / 17 A	Pe = 7.5 kW / 10 hp	
26	le = 25 A / 23 A	Pe = 11 kW / 15 hp	Size S0
27	le = 32 A / 29 A	Pe = 15 kW / 20 hp	
28	le = 38 A / 34 A	Pe = 18.5 kW / 25 hp	
36	le = 45 A / 42 A	Pe = 22 kW / 30 hp	Size S2
37	le = 63 A / 58 A	Pe = 30 kW / 40 hp	
38	le = 72 A / 62 A	Pe = 37 kW / 40 hp	
46	le = 80 A / 73 A	Pe = 45 kW / 50 hp	Size S3
47	le = 106 A / 398 A	Pe = 55 kW / 75 hp	

For more information, refer to chapter Technical data (Page 135).



11.10 Order number system for the 3RW40



Rated current and rated power at U_e = 400 V / 460 V and T_{amb} = 40 °C / 50 °C

24	le = 12.5 A / 11 A	Pe = 5.5 kW / 7.5 hp	Size S0
26	le = 25 A / 23 A	Pe = 11 kW / 15 hp	
27	le = 32 A / 29 A	Pe = 15 kW / 20 hp	
28	le = 38 A / 34 A	Pe = 18.5 kW / 25 hp	
36	le = 45 A / 42 A	Pe = 22 kW / 30 hp	Size S2
37	le = 63 A / 58 A	Pe = 30 kW / 40 hp	
38	le = 72 A / 62 A	Pe = 37 kW / 40 hp	
46	le = 80 A / 73 A	Pe = 45 kW / 50 hp	Size S3
47	le = 106 A / 98 A	Pe = 55 kW / 75 hp	
55	le = 132 A / 117 A	Pe = 75 kW / 75 hp	Size S6
56	le = 160 A / 145 A	Pe = 90 kW / 100 hp	
73	le = 230 A / 205 A	Pe = 132 kW / 150 hp	Size S12
74	le = 280 A / 248 A	Pe = 160 kW / 200 hp	
75	le = 350 A / 315 A	Pe = 200 kW / 250 hp	
76	le = 432 A / 385 A	Pe = 250 kW / 300 hp	

For more information, refer to chapter Technical data (Page 135).





Commissioning

12.1 Before commencing work: Isolating the equipment from the supply system and ensuring that it cannot be reconnected.

DANGER

Hazardous voltage Will cause death or serious injury.

- Disconnect the system and all devices from the power supply before starting work.
- · Secure against switching on again.
- Verify that the equipment is not live.
- · Ground and short-circuit.
- Erect barriers around or cover adjacent live parts.

DANGER

Hazardous voltage Will cause death or serious injury. Qualified Personnel.

The equipment / system may only be commissioned and operated by qualified personnel. For the purpose of the safety information in these Operating Instructions, a "qualified person" is someone who is authorized to energize, ground, and tag equipment, systems, and circuits in accordance with established safety procedures.



12.2 Commissioning the 3RW30

Commissioning, description of the start and output parameters

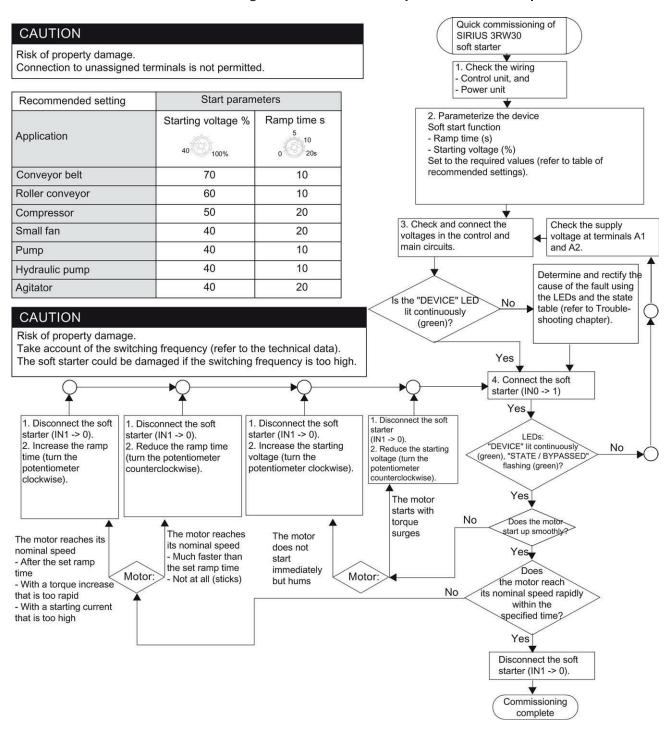


12.2.1 Commissioning procedure

- 1. Check the voltages and wiring.
- 2. Set the start parameters (for recommended parameters, refer to the quick commissioning table).
- 3. Start up the motor and if necessary optimize the parameters (refer to the quick commissioning table).
- 4. Document the parameter settings if required (refer to chapter Table of parameters used (Page 227)).



12.2.2 Quick commissioning of the 3RW30 and optimization of the parameters

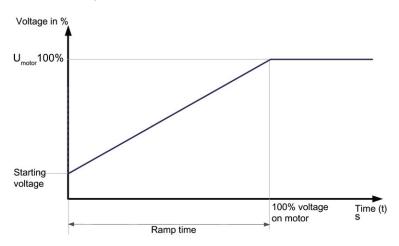


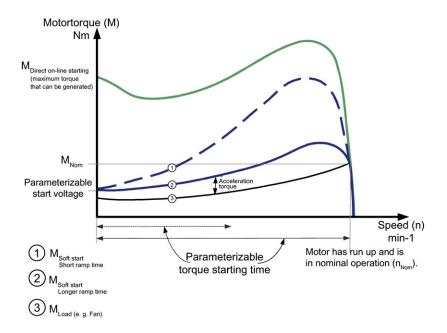


12.2.3 Setting the soft start function

Voltage ramp

The SIRIUS 3RW30 achieves soft starting by means of a voltage ramp. The motor terminal voltage is increased from a parameterizable starting voltage to the mains voltage within a definable ramp time.







12.2.4 Setting the starting voltage

U potentiometer



The starting voltage value is set with the U potentiometer. This value determines the starting torque of the motor. A lower starting voltage results in a lower starting torque (softer start) and a lower starting current.

The starting voltage selected must be sufficiently high to ensure that motor starts up smoothly as soon as the start command is received by the soft starter.

12.2.5 Setting the ramp time

t potentiometer



You define the length of the required ramp time with the t potentiometer. The ramp time determines the time taken to increase the motor voltage from the parameterized starting voltage to the mains voltage. This time merely influences the motor's acceleration torque, which drives the load during the ramp-up process. The actual motor starting times are load-dependent and can differ from the 3RW soft starter settings.

A longer ramp time results in a lower starting current and a reduced acceleration torque as the motor starts up. The startup is slower and smoother as a result. The ramp time must be long enough for the motor to reach its nominal speed. If the time selected is too short, in other words if the ramp time ends before the motor has started up successfully, a very high starting current that can even equal the direct starting current at the same speed occurs at this instant.

The SIRIUS 3RW30 soft starter can be damaged in this application (set ramp time shorter than the actual motor ramp-up time). A maximum ramp-up time of 20 s is possible for the 3RW30. An appropriately dimensioned SIRIUS 3RW40 or 3RW44 soft starter should be chosen for startup processes with a motor ramp-up time > 20 s.



NOTICE

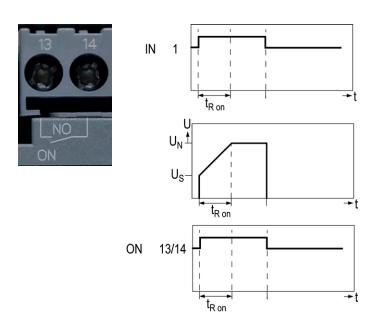
Risk of property damage

Make sure the selected ramp time is longer than the actual motor ramp-up time. If not, the SIRIUS 3RW30 may be damaged because the internal bypass contacts close when the set ramp time elapses. If the motor has not finished starting up, an AC3 current that could damage the bypass contact system will flow.

When using the 3RW40: The 3RW40 has an integrated ramp-up detection function that prevents this operating state from occurring.

12.2.6 ON output

ON output contact



State diagram of the ON output contact

The output contact at terminal 13/14 (ON) closes if a signal is present at terminal 1 (IN); it remains closed until the start command is removed.

The output can be used, for instance, to control a line contactor connected upstream or to implement latching if you selected pushbutton control. For recommended circuits, refer to chapter Typical circuit diagrams (Page 181).

For the state diagram of the contacts in the various operating states, refer to chapter 3RW30: LEDs (Page 52).



12.3 3RW30: LEDs

1			LEDs on 3RW30			Auxiliary contact			
İ				Soft starter					
3RW30			DEVI (rd/gn/			E/BYPASSED/ FAILURE (gn/rd)	13 14/ (ON)		
U _s = 0)							_/_	
Opera	ating state		IN						
Off			0		\(\frac{1}{2}\)	gn			_/_
Start			1		\	gn		gn	
Вура	ssed		1		\	gn		-) - gn	
Fault									
Imper voltag	missible ele je ¹⁾	ectronics sup	pply)		-\(\)- rd	_/_
Bypass overload ²⁾			\	ylw		-\-\-\			
- Missing load voltage ¹⁾ - Phase failure, missing load ¹⁾			\(\frac{1}{2}\)	gn		-\-\-\	_/_		
Device fault 3)				\	rd		-\(\)- rd	_/_	
LE	Ds								
	\		gn =		rd =	-	lw =		
Off	ON	Flashing	Green		Red	Y	ellow		

1) The fault is automatically reset by an outgoing event. An automatic restart is initiated and the 3RW restarted if a start command is present at the input.



Automatic restart

Danger of death, serious injury, or property damage.

If you do not want the motor to start automatically, you must integrate suitable additional components, e.g. phase failure or load monitoring devices, into the control and main circuits.

- 2) The fault can be acknowledged by removing the start command at the start input.
- 3) Switch off the control voltage, then switch it on again. If the fault is still present, contact your SIEMENS partner or Technical Assistance.



12.4 3RW30: Troubleshooting

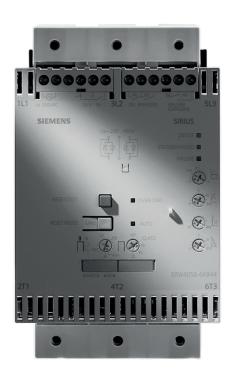
Fault	Cause	Remedy
Impermissible electronics supply voltage	The control supply voltage does not correspond to the soft starter's rated voltage.	Check the control supply voltage; an incorrect control supply voltage could be caused by a power failure or a voltage dip.
Bypass overload	A current > $3.5 \times I_e$ of the soft starter occurs for > 60 ms in bypass mode (e.g. because the motor is blocked).	Check the motor and load, and check the soft starter's dimensions.
Missing load voltage, phase failure / missing load	Cause 1: Phase L1 / L2 / L3 is missing at the start of soft starting or fails / collapses when the motor is operating. A trip occurs if a phase failure is detected by the 3RW30 at the start of soft starting: • at the beginning of starting: tripping time t > 0.5 s • in run-up or in bypass mode: phase failure not detected	Connect L1 / L2 / L3 or correct the voltage dip. Note: As soon as the motor is in run-up or bypass mode, these faults are no loner detected. The soft starter does not go to a fault state in these cases, and contact 13-14 remains closed. If the phase failure occurs in the uncontrolled phase, the response varies depending on whether the control voltage has a reference or connection to the AC network, or whether it is isolated: If the control voltage is isolated, the phase failure of the uncontrolled phase will also be detected when the motor is switched off. With an On command, the 3RW30 goes immediately to a fault state, and contact 13 / 14 does not close. If the control voltage has a reference to the AC network, the phase failure of the uncontrolled phase is not detected, and with an On command, the soft starter attempts to start the motor. This can cause the motor to hum.
er A th st op th	Cause 2: a motor that is not powerful enough is connected. A trip occurs if the current flowing through the 3RW30 soft starter at the start of soft starting is less than 10% of the rated operational current of the 3RW30, or less than 1 A.	Connect a motor with a higher rated operational current, or select a different soft starter. Note: As soon as the motor is in run-up or bypass mode, these faults are no loner detected. The soft starter does not go to a fault state in these cases, and contact 13-14 remains closed.
	Cause 3: Motor phase T1 / T2 / T3 is not connected.	Connect the motor properly. (e.g. jumpers in the motor terminal box, repair switch closed etc.)
Device error	Soft starter defective.	Contact your SIEMENS partner or Technical Assistance.



12.5 Commissioning the 3RW40

Commissioning, description of the start, stop, motor protection, and output parameters



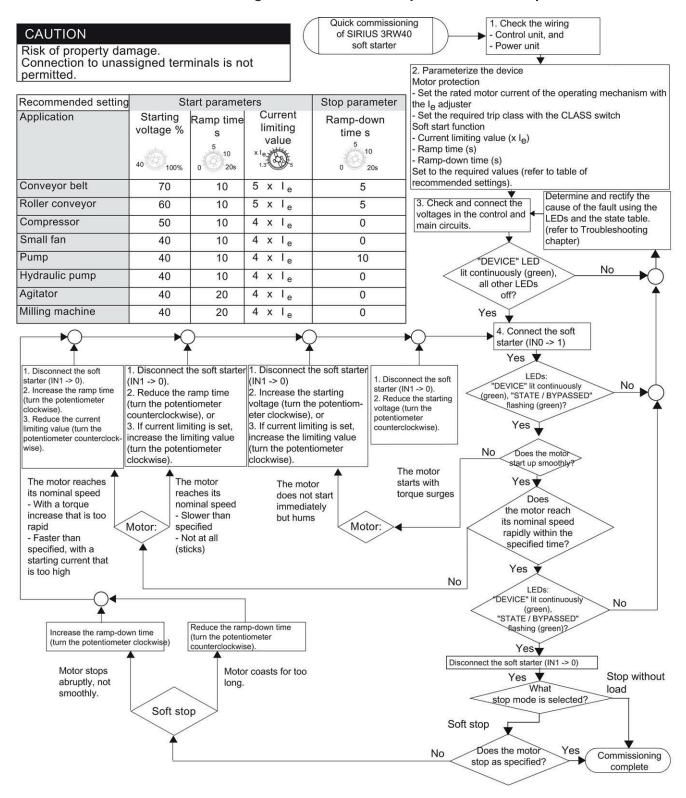


12.5.1 Commissioning procedure

- 1. Check the voltages and wiring.
- 2. Set the start and stop parameters (for recommended parameters, refer to the quick commissioning table).
- 3. Set the motor overload function (if required)
- 4. Define the RESET mode if a failure occurs.
- 5. Start up the motor and if necessary optimize the parameters (refer to the quick commissioning table).
- 6. Document the parameter settings if required.



12.5.2 Quick commissioning of the 3RW40 and optimization of the parameters

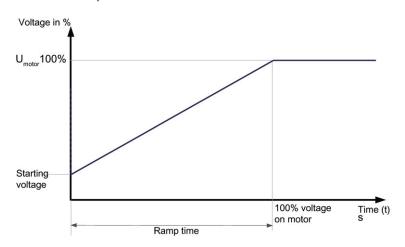


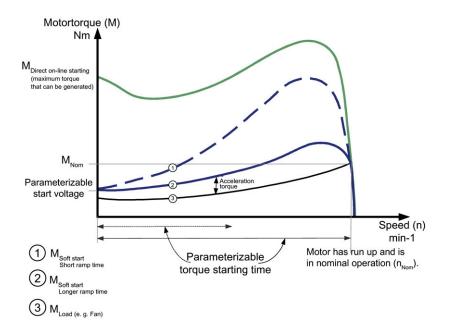


12.5.3 Setting the soft start function

Voltage ramp

The SIRIUS 3RW40 achieves soft starting by means of a voltage ramp. The motor terminal voltage is increased from a parameterizable starting voltage to the mains voltage within a definable ramp time.







12.5.4 Setting the starting voltage

U potentiometer



The starting voltage value is set with the U potentiometer. This value determines the starting torque of the motor. A lower starting voltage results in a lower starting torque (softer start) and a lower starting current.

The starting voltage selected must be sufficiently high to ensure that motor starts up smoothly as soon as the start command is received by the soft starter.

12.5.5 Setting the ramp time

t potentiometer



You define the length of the required ramp time with the t potentiometer. The ramp time determines the time taken to increase the motor voltage from the parameterized starting voltage to the mains voltage. This time merely influences the motor's acceleration torque, which drives the load during the ramp-up process. The actual motor starting times are load-dependent and can differ from the 3RW soft starter settings.

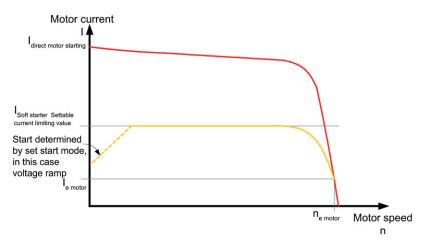
A longer ramp time results in a lower starting current and a reduced acceleration torque as the motor starts up. The startup is slower and smoother as a result. The ramp time must be long enough for the motor to reach its nominal speed. If the time selected is too short, in other words if the ramp time ends before the motor has started up successfully, a very high starting current that can even equal the direct starting current at the same speed occurs at this instant.

The SIRIUS 3RW40 soft starter additionally limits the current to the value set with the current limiting potentiometer. As soon as the current limiting value is reached, the voltage ramp or the ramp time is interrupted and the motor is started with the current limiting value until it has started up successfully. In this case, the motor ramp-up times may be longer than the maximum parameterizable 20 seconds ramp time or the ramp time that is actually set on the soft starter (for further information about the maximum ramp-up times and switching frequencies, refer to the Technical data chapter > 3RW30 13, 14, 16, 17, 18-.BB.. power electronics (Page 139)) ff. and 3RW40 24, 26, 27, 28 power electronics (Page 164) ff.).



12.5.6 Current limiting in conjunction with a starting voltage ramp and ramp-up detection

Current limiting



The SIRIUS 3RW40 soft starter measures the phase current (motor current) continuously with the help of integrated current transformers.

The motor current that flows during the startup process can be actively limited by means of the soft starter. The current limiting function takes priority over the voltage ramp function.

As soon as a parameterizable current limit is reached, in other words, the voltage ramp is interrupted and the motor is started with the current limiting value until it has started up successfully. The current limiting function is always active with SIRIUS 3RW40 soft starters.

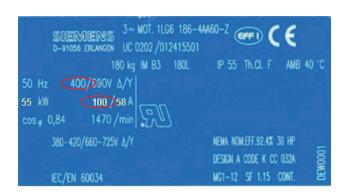
If the current limiting potentiometer is set to clockwise stop, the starting current is limited to the maximum possible current (refer to chapter Setting the current limiting value (Page 114)).



12.5.7 Setting the motor current

I_e potentiometer





The rated operational current of the motor must be set with the I_e potentiometer according to the mains voltage and the motor connection (wye-delta). The electronic motor overload protection also refers to this set value if it is active. For the permissible settings referred to the required motor overload trip class, refer to chapter Motor current settings (Page 119).

12.5.8 Setting the current limiting value

xl_e potentiometer



Representation valid for 3RW40 S0, S2, S3 up to product version E06, and 3RW40 S6 and S12 up to product version E10.



Representation valid for 3RW40 S0, S2, S3 for product version E07 and higher, and 3RW40 S6 and S12 for product version E11 and higher.

The current limiting value is set with the xl_e potentiometer to the maximum required starting current as a factor of the set rated motor current (I_e).



Example

- I_e potentiometer set to 100 A
- xle potentiometer set to 5 ⇒ current limiting 500 A.

As soon as the selected current limiting value is reached, the motor voltage is reduced or controlled by the soft starter to prevent the current from exceeding the limit. Since the starting current is asymmetrical, the set current corresponds to the arithmetic mean value for the three phases.

If the current limiting value is set to the equivalent of 100 A, the starting currents might be approx. 80 A in L1, 120 A in L2, and 100 A in L3 (refer to chapter Starting current asymmetry (Page 24)).

The set current limiting value must be high enough to ensure that the torque generated in the motor is sufficient to accelerate the motor to nominal speed. Three to four times the value of the motor's rated operational current (I_e) can be assumed as typical here.

The current limiting function is always active because it is required by the intrinsic device protection. If the current limiting potentiometer is set to clockwise stop, the starting current is limited to the maximum possible current. We must differentiate between two cases here:

Scenario A:

3RW40 devices up to product version E06 (for 3RW40 size S0, S2, S3) or up to product version E10 (for 3RW40 size S6 and S12)

⇒ The maximum possible limiting current is 5 times the value of the rated motor current set on the 3RW40 soft starter (refer to chapter Setting the motor current (Page 114)).

Scenario B:

3RW40 devices from product version E07 (for 3RW40 size S0, S2, S3) or from product version E11 (for 3RW40 size S6 and S12)

 \Rightarrow On these 3RW40 devices, the maximum possible limiting current ("max" setting) is 5 times the value of the maximum rated operational current set on the soft starter (see the rating plate of the soft starter). This value depends on the rated motor current actually set on the 3RW40 soft starter (potentiometer I_e). This value is identical with 5 times the maximum value that can be set on the potentiometer I_e .

Overdimensioning, due to motors with high starting current conditions, for example

For dimensioning soft starters for motors with high starting current conditions (typically I/I_e ≥ 8), please observe the configuring information in the chapter Dimensioning of soft starters for motors with high starting current conditions (Page 90).



12.5.9 Optimized setting ranges for current limiting

Example of optimized current limiting setting ranges for the 3RW40 soft starters

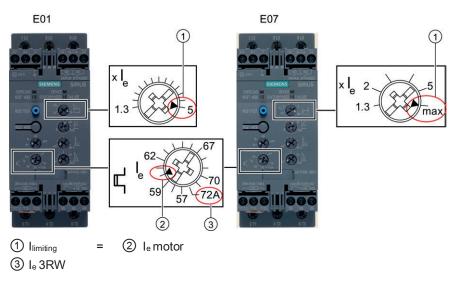
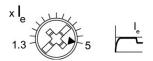


Figure 12-1 Optimized current limiting setting ranges

Example of calculating the current limiting

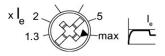
Up to product version E06 (for 3RW40 size S0, S2, S3) or up to product version E10 (for 3RW40 size S6 and S12)



I_{e motor} = 60 A

 $I_{e 3RW} = 72 A$

 $I_{limiting}$ = 1 ... 5 x $I_{e motor}$ I_{max} = 5 x $I_{e motor}$ = 300 A Product version E07 and higher (for 3RW40 size S0, S2, S3) or product version E11 and higher (for 3RW40 size S6 and S12)



 $I_{e motor} = 60 A$

 $I_{e 3RW} = 72 A$

 $I_{\text{limiting}} = 1 \dots 5 \times I_{\text{e motor}}$

 $I_{max} = 5 \times I_{e 3RW} = 360 \text{ A}$

For setting values, see Figure 12-1 Optimized current limiting setting ranges (Page 116).

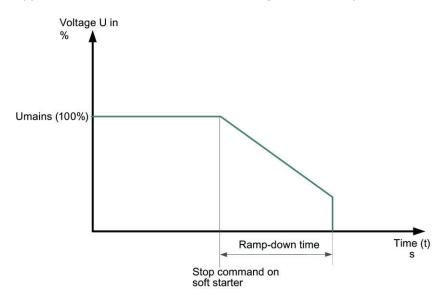


12.5.10 Ramp-up detection

The SIRIUS soft starter has a motor ramp-up detection function that is always active regardless of the start mode. If it detects a motor startup, the motor voltage is immediately increased to 100 % of the mains voltage. The thyristors of the soft starter are bridged by the bypass contacts integrated in the device and the successful startup is indicated by means of the BYPASS output and the STATE / BYPASSED LED.

12.6 Setting the soft stop function

In "soft stop" mode, the natural stop process of the load is decelerated. The function is used when the load must be prevented from stopping abruptly. This is typically the case in applications with a low mass inertia or a high counter-torque.



12.6.1 Setting the ramp-down time

t potentiometer



You can set a ramp-down time with the t potentiometer. This determines how long power should still be supplied to the motor after the ON command is removed. The torque generated in the motor is reduced by means of a voltage ramp function within this ramp-down time and the application stops smoothly.

If the potentiometer is set to 0, there is no voltage ramp during stopping (stop without load).



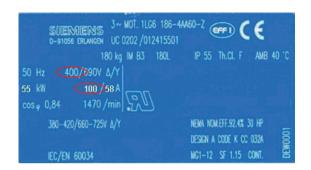
12.7 Setting the motor protection function

The motor overload protection function is implemented on the basis of the winding temperature. This indicates whether the motor is overloaded or functioning in the normal operating range.

The winding temperature can either be calculated with the help of the integrated, electronic motor overload function or measured with a connected motor thermistor.

12.7.1 Setting the electronic motor overload protection





le potentiometer

The rated operational current of the motor must be set with the I_e potentiometer according to the mains voltage and the motor connection (wye-delta).

The current flow during motor operation is measured by measuring the current with transformers integrated in the soft starter. This value is also used for the current limiting function. The temperature rise in the winding is calculated based on the rated operational current set for the motor.

CLASS potentiometer

You can set the required trip class (10, 15, or 20) with the CLASS potentiometer. A trip is generated by the soft starter when the standardized characteristic is reached, depending on the trip class (CLASS setting).

The trip class specifies the maximum time within which a protective device must trip from a cold state at 7.2 x the rated operational current (motor protection to IEC 60947). The tripping characteristics represent this time as a function of the tripping current (refer to chapter Motor protection tripping characteristics for 3RW40 (with symmetry) (Page 176)).

You can set different CLASS characteristics according to the startup class. If the potentiometer is set to OFF, the "electronic motor overload protection" function is deactivated.



Note

The rated data of the soft starters refers to normal starting (CLASS 10). The starters may need to be calculated with a size allowance for heavy-duty starting (> CLASS 10). You can only set a rated motor current that is lower than the soft starter rated current (refer to chapter Motor current settings (Page 119)); if not, a fault will be indicated by the OVERLOAD LED (red flashing) and it will not be possible to start the SIRIUS 3RW soft starter.

12.7.2 Motor current settings

	I _e [A]	I _{min} [A]	I _{max} [A] CLASS 10	I _{max} [A] CLASS 15	I _{max} [A] CLASS 20
3RW40 24	12.5	5	12.5	11	10
3RW40 26	25.3	10.3	25.3	23	21
3RW40 27	32.2	17.2	32.2	30	27
3RW40 28	38	23	38	34	31
3RW40 36	45	22.5	45	42	38
3RW40 37	63	25.5	63	50	46
3RW40 38	72	34.5	72	56	50
3RW40 46	80	42.5	80	70	64
3RW40 47	106	46	106	84	77
3RW40 55	134	59	134	134	124
3RW40 56	162	87	162	152	142
3RW40 73	230	80	230	210	200
3RW40 74	280	130	280	250	230
3RW40 75	356	131	356	341	311
3RW40 76	432	207	432	402	372

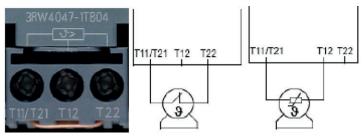
12.7.3 Motor protection acc. to ATEX

Refer to the information in chapter Motor protection / intrinsic device protection (3RW40 only) (Page 36).



12.8 Thermistor motor protection

(Optional for 3RW40 2. to 3RW40 4. with 24 V AC/DC rated control voltage)



Klixon thermistor Type A PTC thermistor

Thermistor motor protection

After removing the copper jumper between T11/21 and T22, you can connect and evaluate either a Klixon thermistor integrated in the motor winding (at terminal T11/T21-T22) or a type A PTC (at terminal T11/T21-T12).

12.9 Motor protection trip test





TEST / RESET button

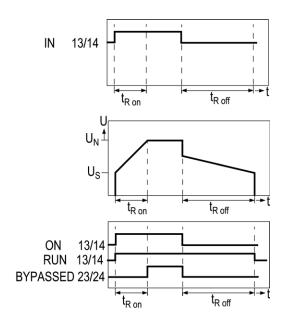
You initiate a motor overload trip by pressing the RESET / TEST button for longer than five seconds. The SIRIUS 3RW40 soft starter is tripped by the fault signal at the OVERLOAD LED, the FAILURE / OVERLOAD contact 95-98 closes, and the motor that is connected and running is switched off.



12.10 Functions of the outputs

12.10.1 Functions of the BYPASSED and ON / RUN outputs





BYPASSED output contact

The BYPASSED output at terminal 23 / 24 closes as soon as the SIRIUS 3RW40 soft starter detects that the motor has started up (refer to chapter Ramp-up detection (Page 117)). The integral bypass contacts simultaneously close and the thyristors are bridged. The integral bypass contacts and output 23 / 24 open again as soon as the start input IN is removed.

ON / RUN output contact

ON function set: The potential-free output contact at terminal 13/14 (ON) closes if a signal is present at terminal 1 (IN); it remains closed until the start command is removed (factory default). The ON function can be used, for instance, as a latching contact if you selected pushbutton control (refer to chapter Control by pushbutton (Page 182)).



Reparameterizing the output of the ON function (factory default) to RUN

You can reparameterize the output function from ON to RUN by simultaneously pressing two buttons (refer to chapter Parameterizing the 3RW40 outputs (Page 122)).

RUN function set: The potential-free output contact at terminal 13/14 closes if a signal is present at terminal 1 (IN); it remains closed until the start command is removed and after that until the set ramp-down time has elapsed.

If the RUN function is set, you can control a line contactor during the startup process, operation, or the set soft stop (refer to chapter Control with an optional main / line contactor (Page 194))

For recommended circuits, refer to chapter Typical circuit diagrams (Page 181).

12.10.2 Parameterizing the 3RW40 outputs

Programming the ON / RUN output 13/14 on the SIRIUS 3RW40 soft starter

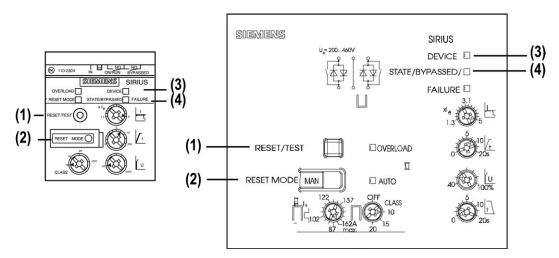
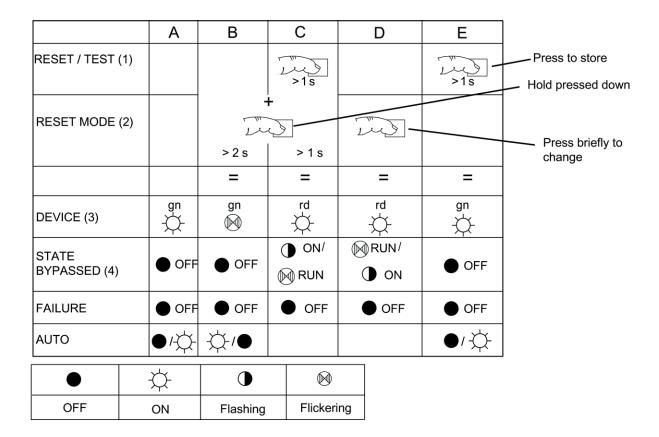


Figure 12-2 Overview of buttons / LEDs on the 3RW40 2 to 3RW40 4 and 3RW40 5 to 3RW40 7





Reparameterizing the ON / RUN output

A: Control voltage is present and the soft starter is in the normal, fault-free position: The DEVICE LED is continuously lit (green) while the STATE / BYPASSED and FAILURE LEDs are off.

The AUTO LED indicates the color of the set RESET mode.

B: Start programming:

(On the 3RW40 2 device, remove the RESET MODE cover as shown in chapter Setting the RESET MODE (Page 125).) Press the RESET MODE button (2) for longer than 2 s until the DEVICE LED (3) flickers (green). Hold the RESET MODE button (2) pressed down.

C: Simultaneously press the RESET / TEST button (1) for longer than 1 s until the DEVICE LED (3) lights up (red). The active mode set at the ON / RUN output is indicated by the STATE / BYPASSED / FAILURE LED (4):

STATE / BYPASSED / FAILURE LED (4) flashes (green): ON mode (factory setting). STATE / BYPASSED / FAILURE LED (4) flickers (green): RUN mode.

D: Change the mode:

Press the RESET MODE button (2) briefly. By pressing this button, you change the mode at the output, and the new mode is indicated by the STATE / BYPASSED / FAILURE LED (4): STATE / BYPASSED / FAILURE LED (4) flickers (green): RUN mode is set. STATE / BYPASSED / FAILURE LED (4) flashes (green): ON mode is set.



E: Exit programming and save the settings:

Press the RESET / TEST MODE button (1) for longer than 1 s until the DEVICE LED (3) lights up (green).

The LEDs indicate the following states again if the output was successfully parameterized: DEVICE LED: Continuously lit (green).

STATE / BYPASSED and FAILURE LEDs: Off.

The AUTO LED indicates the color of the set RESET mode.

12.10.3 Function of the FAILURE / OVERLOAD output



FAILURE / OVERLOAD output contact

If there is no rated control voltage or if a failure occurs, the potential-free FAILURE / OVERLOAD output is switched.

Note

For information about whether or not faults can be acknowledged, as well as the recovery time and the corresponding LED and output contact states, refer to chapter Diagnostics and fault signals (Page 52).

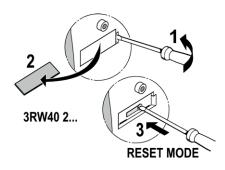


12.11 RESET MODE and functions of the RESET / TEST button

12.11.1 SIRIUS 3RW40 2. to 3RW40 4. soft starters

12.11.1.1 Setting the RESET MODE

Position of the RESET button behind the label on the 3RW40 2.





RESET MODE

AUTO RESET Manual RESET Remote RESET Yellow off (factory setting) Green

RESET MODE button

By pressing the RESET MODE button, you define the reset procedure in case of a fault. This is indicated by the RESET MODE LED.

12.11.1.2 Manual RESET

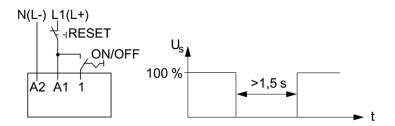


RESET / TEST button (RESET MODE LED off)

You can reset a fault by pressing the RESET / TEST button.



12.11.1.3 Remote RESET



Remote RESET (RESET MODE LED = green)

You can reset a fault signal by disconnecting the control supply voltage for >1.5 s.

12.11.1.4 AUTO RESET

AUTO RESET (RESET MODE LED = yellow)

If you set the RESET mode to AUTO, a fault is automatically reset.

Note

For information about whether or not faults can be acknowledged, as well as the recovery time and the corresponding LED and output contact states, refer to chapter Diagnostics and fault signals (Page 52).



WARNING

Automatic restart

Can result in death, serious injury, or property damage.

The automatic RESET mode (AUTO RESET) must not be used in applications where there is a risk of serious injury to persons or substantial damage to property if the motor starts up again unexpectedly. The start command (e.g. issued by a contact or the PLC) must be reset prior to issuing a RESET command because the motor attempts to restart again automatically following this RESET command if a start command is still present. This particularly applies if the motor protection has tripped. For safety reasons, you are advised to integrate the group fault output on the 3RW40 (terminals 95 and 96), or the signaling contact of the motor or miniature circuit breaker on all devices, in the controller.



12.11.2 SIRIUS 3RW40 5. to 3RW40 7. soft starters

12.11.2.1 Setting the RESET MODE



RESET MODE button

By pressing the RESET MODE button, you define the reset procedure in case of a fault. This is indicated by the AUTO LED.

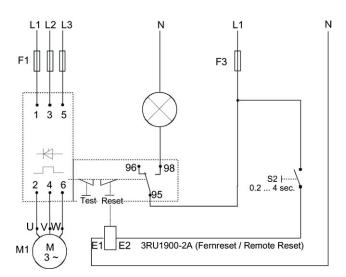
12.11.2.2 Manual RESET



RESET / TEST button (AUTO LED off)

You can reset a fault by pressing the RESET / TEST button.

12.11.2.3 Remote RESET





Remote RESET with module for RESET (AUTO LED = off)

You can perform a remote RESET (the RESET MODE set on the starter is MANUAL RESET) by controlling the optional module for RESET (3RU1900-2A).

12.11.2.4 AUTO RESET

AUTO RESET (AUTO LED = yellow)

If you set the RESET mode to AUTO, a fault is automatically reset.

Note

For information about whether or not faults can be acknowledged, as well as the recovery time and the corresponding LED and output contact states, refer to chapter Diagnostics and fault signals (Page 52).



Automatic restart

Can result in death, serious injury, or property damage.

The automatic RESET mode (AUTO RESET) must not be used in applications where there is a risk of serious injury to persons or substantial damage to property if the motor starts up again unexpectedly. The start command (e.g. issued by a contact or the PLC) must be reset prior to issuing a RESET command because the motor attempts to restart again automatically following this RESET command if a start command is still present. This particularly applies if the motor protection has tripped. For safety reasons, you are advised to integrate the group fault output on the 3RW40 (terminals 95 and 96), or the signaling contact of the motor or miniature circuit breaker on all devices, in the controller.



12.12 3RW402 / 3RW403 / 3RW404: LEDs

				LED statuses 3RW40				Auxiliary contacts				
			Sof	t starter		Motor pro	tection		•			
3RW402 / 3RW403 / 3	RW404		DEVICE (rd/gn/ylw)	STATE BYPAS FAILUF (gn/rd)	SED/	OVERLOAD (rd)	RESET MODE / AUTO (ylw/gn)	13 14 (ON)	13 14 (RUN)	24 23 (BYPASSED)	96 95 98 FAILURE / OVERLOAD	
U _S = 0								_/_	_/_	_/_	لے ا	
Operating state		IN										
Off		0	- gn						_/_	_/_	7	
Start		1	- gn		gn			1		_/_	7	
Bypassed		1	- gn	\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	gn						4	
Stop		0	- gn		gn			_/_		_/_	5	
Warning		L						,				
le/class-setting imperm	nissible 2)		-\(\frac{1}{2}\)- gn		A G	•					7	
Start inhibited, device to may vary accord. to thy)			_/_	_/_	_/_	7	
Fault												
Impermissible electronics supply voltage ²⁾				\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	rd				_/_		لح ا	
Impermissible I _e / class setting and IN (0 -> 1) ²⁾			- gn	X	rd	•		_/_	_/_	_/_	لح ا	
Motor protection tripping Overload relay cooling time 60 s / Thermistor cooling time may vary according to motor temperature 1)			- gn)	\(\tilde{\pi}\)		_/_	_/_	_/_	لىح ا	
Thermistor motor prote Wire break / short-circu	ection		- gn			M		_/_	_/_	_/_	لح ا	
Thermal overload on de (cooling time > 30 s)	evice 3)		- ylw	\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	rd				_/_		لح ا	
- No load voltage - Phase failure, missing	g load ⁶⁾		- gn	n - rd				_/_	_/_	_/_	لح ا	
Davids for the former than						· ·			· · · · · · · · · · · · · · · · · · ·			
Device fault (cannot be device defective) 5)	acknowle	eagea,	-\rac{1}{rd}		rd				_/_		171	
Test function			\ _ 4			147					Lat	
Press TEST t>5s 4)		- \	- Q - gn)	-\-\-\\-rd				_/_	17	
RESET MODE (press	to change	e)										
Manual reset)		0					
Auto reset						-\times-ylw						
Remote Reset							-X- gn					
	Display of	the LEDs			1) Opti	onal, only 3RW40	2. to 3RW40	4. with 24 V AC	C/DC			
			gn ylw rd 2) Is reset automatically with the right setting or by an outgoing event. 3) Must be acknowledged according to set reset mode 4) Motor prot							t. 4) Motor protectio	n trin test	
- X			= =	=	5) Devi	ice faults cannot b				ens partner or Tec		
off on fla	shing f	flickering	green yellow		Assista	A019853K	100 C		and the same of th	reconnected Biological School		
	6) Can only be reset by manual or remote reset.											



AWARNING

Automatic restart

Can result in death, serious injury, or property damage.

The automatic RESET mode (AUTO RESET) must not be used in applications where there is a risk of serious injury to persons or substantial damage to property if the motor starts up again unexpectedly. The start command (e.g. issued by a contact or the PLC) must be reset prior to issuing a Reset command because the motor attempts to restart again automatically following this Reset command if a start command is still present. This particularly applies if the motor protection has tripped. For safety reasons, you are advised to integrate the group fault output on the 3RW40 (terminals 95 and 96), or the signaling contact of the motor or miniature circuit breaker on all devices, in the controller.



12.13 3RW405 / 3RW407: LEDs

			LED displays on 3RW40				Auxiliary contacts				
				Soft starter Motor protection							
3RW405 / 3RW407		DEVICE (rd/gn/ylw)	STATE / BYPASSED / RUN UP (gn)	FAILURE (rd)	OVERLOAD (rd)	RESET MODE (gn)	13 14 (ON)	13 14 (RUN)	24 23 (BYPASSED / RUN UP)	96 95 98 FAILURE / OVERLOAD	
U _S = 0									_/_	_/_	لح ا
Operating state		IN_1									
OFF		0	- gn					_/_	_/_		4
Start-up		1	- gn	•							4
Bypassed / RUN UP		1	- gn	\(\tau \)							4
Run-out		0	- gn					_/_			4
Warning									HE.		7
I _e / class setting inva	lid		- \ gn			1					4
Start-up locked, thyri	stors too warn	n	ylw					_/_	_/_	_/_	5
Error				T	T			Tý	1	1	Tr
Supply voltage electr (U < 0,75 x Us) or (U				0	\tau_	0		_/_	_/_		17
Invalid I _e / class setting and IN (0 -> 1)		-\()- gn		\(\Delta\)	•		_/_	_/_	_/_	17	
Motor protection switch-off		-\(\)— gn			\rightarrow		_/_	_/_	_/_	17	
Thermal overload thy			- ylw		\			_/_	_/_	_/_	17
 Missing load voltage Phase failure, no lo 			- gn		\\dagger		0	_/_			171
Device fault			-\(\)- rd		\ \\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\			_/_		_/_	1 7
Test function			, , ,		, , ,				1		-
1) Press TEST for t <	: 2 s		-\-\-\	\(\Delta\)	\(\tau\)	\(\Delta\)					الح ا
2) Press TEST for 2 s	s < t < 5 s; l _e ?	> 0	1 rd	① /\$							لح ا
2) Press TEST for 2	s < t < 5 s; l _e =	= 0	∭ rd								لح ا
3) Press TEST for t >			- gn			\rightarrow		_/_	_/_		اح ا
RESET MODE (press	s to change)									1	ř
Manual Reset											
Remote Reset						- gn					
LED	display				1)) LED test					
• *			gn =	ylw =	rd 2, = 3,	2) Current measuring test 3) Motor protection shutdown test					
OFF ON	flashing fli	ickering	green	yellow	red	Transcription Inc. and the Contract of the C					

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WARNING

Automatic restart

Can result in death, serious injury, or property damage.

The automatic RESET mode (AUTO RESET) must not be used in applications where there is a risk of serious injury to persons or substantial damage to property if the motor starts up again unexpectedly. The start command (e.g. issued by a contact or the PLC) must be reset prior to issuing a Reset command because the motor attempts to restart again automatically following this Reset command if a start command is still present. This particularly applies if the motor protection has tripped. For safety reasons, you are advised to integrate the group fault output on the 3RW40 (terminals 95 and 96), or the signaling contact of the motor or miniature circuit breaker on all devices, in the controller.

12.14 3RW40: Troubleshooting

Warning	Cause	Remedy
Impermissible I _e CLASS setting (control voltage present, no start command)	The rated operational current I _e set for the motor (control voltage present, no start command) exceeds the associated, maximum permissible setting current referred to the selected CLASS setting (chapter Motor current settings (Page 119)).	Check the rated operational current set for the motor, select a lower CLASS setting, or calculate the soft starter with a size allowance. As long as the 3RW40 is not controlled IN (0->1), this is only a status signal. However, it becomes a fault signal if the start command is applied.
Start inhibited, device too hot	The acknowledgment and the motor start are inhibited for a defined time by the inherent device protection following an overload trip, to allow the 3RW40 to cool down. Possible causes Too many starts, Motor starting time too long, Ambient temperature in switching device's environment too high, Minimum installation clearances not complied with.	The device cannot be started until the temperature of the thyristor or the heat sink has cooled down enough to guarantee sufficient reserve for a successful startup. The time until restarting is allowed can vary but is a minimum of 30 s. Rectify the causes and possibly retrofit the optional fan (3RW40 2. to 3RW40 4.).



Fault	Cause	Remedy		
Impermissible electronics supply voltage:	The control supply voltage does not correspond to the soft starter's rated voltage.	Check the control supply voltage; could be caused by a power failure, voltage dip, or incorrect control supply voltage. Use a stabilized power supply unit if due to mains fluctuations.		
Impermissible Ie/CLASS setting and IN (0->1) (control voltage present, IN start command changes from 0 to 1)	The rated operational current l _e set for the motor (control voltage present, start command present) exceeds the associated, maximum permissible setting current referred to the selected CLASS setting (chapter Motor current settings (Page 119)).	Check the rated operational current set for the motor, select a lower CLASS setting, or calculate the soft starter with a size allowance.		
	For the maximum permissible settings, refer to chapter "Technical data (Page 135)".			
Motor protection tripping Overload relay / thermistor:	The thermal motor model has tripped. After an overload trip, restarting is inhibited until the recovery time has elapsed Overload relay tripping time: 60 s	- Check whether the motor's rated operational current I _e is set correctly, or - Change the CLASS setting, or - Possibly reduce the switching frequency, or - Deactivate the motor protection (CLASS OFF), or - Check the motor and the application		
	- Thermistor tripping time: When the temperature sensor (thermistor) in the motor has cooled down.			
Thermistor protection: wire breakage / short-circuit (optional for 3RW40 2. to 3RW40 4. devices):	Temperature sensor at terminals T11/T12/T22 is short-circuited or defective, a cable is not connected, or no sensor is connected.	Check the temperature sensor and the wiring		
Thermal overload on the device:	Overload trip of the thermal model for the power unit of the 3RW40 Possible causes Too many starts, Motor starting time too long, Ambient temperature in switching device's environment too high, Minimum installation clearances not complied with.	Wait until the device has cooled down again, possibly increase the current limiting value set for starting, or reduce the switching frequency (too many consecutive starts). Possibly retrofit the optional fan (3RW40 2. to 3RW40 4.) Check the load and the motor, check whether the ambient temperature in the soft starter's environment is too high (derating above 40 °C, refer to chapter Technical data (Page 135)), comply with the minimum clearances.		



Fault	Cause	Remedy		
Missing load voltage, phase failure / missing load:	Cause 1: Phase L1 / L2 / L3 is missing or fails / collapses when the motor is operating.	Connect L1 / L2 / L3 or correct the voltage dip.		
	A trip occurs if the current measured by the current transformers of the 3RW40 is less than 20% of the minimum rated motor current that can be set on the 3RW40 potentiometer:			
	At starting/coasting down: tripping time t > 1 s			
	• In bypass mode: tripping time t > 5 s			
	Cause 2: a motor that is not powerful enough is connected.	Set the rated operational current for the connected motor correctly on the 3RW40		
	A trip occurs if the current measured by the current transformers of the 3RW40 is less than 20% of the minimum rated motor current that can be set on the 3RW40 potentiometer, or less than 2 A.	potentiometer, or set it to the minimum.		
	Cause 3: Motor phase T1 / T2 / T3 is not connected.	Connect the motor properly. (e.g. jumpers in the motor terminal box, repair switch closed etc.)		
Device error	Soft starter defective.	Contact your SIEMENS partner or Technical Assistance.		



Technical data

13.1 3RW30

13.1.1 Overview

SIRIUS 3RW30 soft starters reduce the motor voltage through variable phase angle control and increase it from a selectable starting voltage up to the mains voltage within the ramp time. They limit the starting current and torque, so that the shocks that occur during direct starts or wye-delta starting are avoided. Mechanical loads and mains voltage dips can be effectively prevented in this way.

Soft starting reduces the stress on the connected equipment, resulting in lower wear and therefore longer periods of trouble-free production. The selectable starting voltage means the soft starters can be individually adjusted to the requirements of the application in question and – unlike wye-delta starters – are not restricted to two-stage starting with fixed voltage ratios.

SIRIUS 3RW30 soft starters are characterized above all by their small space requirements. Integral bypass contacts mean that no power loss has to be taken into account at the power semiconductors (thyristors) after the motor has started up. This cuts down on heat losses, enabling a more compact design and making external bypass circuits superfluous.

Soft starters rated up to 55 kW (at 400 V) can be supplied for standard applications in three-phase systems. Extremely small sizes, low power losses and simple startup are just three of the many advantages of this soft starter.



13.1.2 Selection and ordering data for standard applications and normal starting



¹⁾ Stand-alone assembly without additional fan.

²⁾ Soft starter with screw terminals.

³⁾ Main connection: Screw terminals.



Note

The rated motor current is extremely important when selecting a soft starter.

Refer to the information about selecting soft starters in chapter Configuration (Page 83).

Conditions for normal starting:

Max. ramp time 3 s, starting current 300%, 20 starts / hour, ON time 30%, standalone assembly, max. installation altitude 1000 m / 3280 ft, ambient temperature kW 40 $^{\circ}$ C / 104 $^{\circ}$ F. A larger model may need to be selected if other conditions and constraints apply or for a higher starting frequency. For information about the rated currents for ambient temperatures >40 $^{\circ}$ C, refer to chapter 3RW30..-.BB.. power electronics (Page 139).



13.1.3 3RW30..-.BB.. control electronics

Туре				3RW301., 3RW3	302.	3RW303., 3RW304.		
Control electronics								
Rated values Rated control supply voltage • Tolerance		Terminal A1 / A2	V %	24 ±20	110230 -15/+10	24 ±20	110230 -15/+10	
Rated control supply current • STANDBY • During pickup • ON			mA mA mA	<50 <100 <100	6 15 15	20 <4000 20	<50 <500 <50	
Rated frequency • Tolerance			Hz %	50/60 ±10				
Control input IN Power consumption with version • 24 V DC • 110/230 V AC			mA mA	ON / OFF approx. 12 AC: 3/6; DC: 1.5	5/3			
Relay outputs Output 1	ON	13/14		Operating indica	ation (NO)			
Rated operational current			A A	3AC-15/AC-14 a 1DC-13 at 24 V	at 230 V,			
Protection against overvoltages Short-circuit protection				4 A gL/gG opera	eans of varistor throug ational class; is not included in scop			
Operating indications			LED	DEVICE	STATE/BYPASSED/ FAILURE	DEVICE	STATE/BYPASSED/ FAILURE	
Off Start Bypass				Green Green Green	Off Green flashing Green	Green Green Green	Off Green flashing Green	
Fault signals • 24 V DC: U < 0.75 x Us or U > 1.25 x Us • AC 110230 V: U < 0.75 x Us or U > 1.15 x Us				Off Off	Red Red	Off Off	Red Red	
Electrical overloading of bypass (reset by removing IN command)				Yellow	Red	Yellow	Red	
Missing mains voltage, phase failure / missing load Device fault				Green Red	Red Red	Green Red	Red Red	

13.1.4 3RW30..-.BB.. control times and parameters

Туре			3RW3013RW304.	
				Factory default
Control times and parameters				
Control times Closing delay (with connected control voltage) Closing delay (automatic / line contactor mode)		ms ms	<50 <300	
Mains failure bridging time Control supply voltage		ms	50	
Mains failure response time ¹⁾ Load current circuit		ms	500	
Start parameters Ramp-up time Starting voltage		s %	020 40100	7.5 40
Ramp-up detection			No	
Operating mode output 13/14 Rising edge at Falling edge at	Start command Off command		ON	

¹⁾ Mains failure detection only in standby state, not during operation.



13.1.5 3RW30..-.BB.. power electronics

Туре		3RW301BB.43RW304BB.4
Power electronics		
Rated operational voltage Tolerance	V AC %	200480 -15/+10
Rated frequency Tolerance	Hz %	50/60 ±10
Continuous duty at 40°C (% of I _e)	%	115
Minimum load (% of I _e)	%	10 (at least 2 A)
Maximum cable length between soft starter and motor	m	300
Permissible installation altitude	m	5000 (Derating from 1000, see characteristic curves); higher on request
Permissible mounting position (auxiliary fan not available)		10° 10° 10° 10° 10° 10° 10° 10° 10° 10°
Permissible ambient temperature Operation Storage	°C °C	-25+60; (derating from +40) -40+80
Degree of protection		IP20 for 3RW30 1. and 3RW30 2.; IP00 for 3RW30 3. and 3RW30 4.

13.1.6 3RW30 13, 14, 16, 17, 18-.BB.. power electronics

Туре		3RW3013	3RW3014	3RW3016	3RW3017	3RW3018
Power electronics						
Current carrying capacity rated operating current I _e •Acc. to IEC and UL/CSA ¹⁾ , for standalone assembly, AC-53a -At 40°C -At 50°C -At 60°C	A A A	3.6 3.3 3	6.5 6 5.5	9 8 7	12.5 12 11	17.6 17 14
Power loss •During operation after startup of the motor at uninterrupted rated operat. curr. (40°C) approx. •During starting at 300% I _M (40 °C)	W W	0,25	0,5 52	1	2	4 116
Permissible rated motor current and starts per hour for normal starting (class 10): -Rated motor curr. $I_{\rm M}^{2}$,ramp-up time 3s -Starts per hour ³ -Rated motor curr. $I_{\rm M}^{2}$,ramp-up time 4s -Starts per hour ³	A 1/h A 1/h	3.6 / 3.3 200 / 150 3.6 / 3.3 150 / 100	6,5 / 6,0 87 / 60 6,5 / 6,0 64 / 46	9 / 8 50 / 50 9 / 8 35 / 35	12.5 / 12.0 85 / 70 12.5 / 12.0 62 / 47	17.6 / 17.0 62 / 46 17.6 / 17.0 45 / 32

¹⁾ Measurement at 60°C in accordance with UL/CSA not required.

²⁾ At 300% I_{M} . Tamb = 40 °C / 50 °C

³⁾ For intermittent duty S4 with ON time 30%, T_{amb} =40°C / 50 °C, vertical standalone assembly. The specified switching frequencies do not apply to automatic mode.



13.1.7 3RW30 26, 27, 28-.BB.. power electronics

Туре		3RW3026	3RW3027	3RW3028
Power electronics				
Current carrying capacity rated operating current I _e •Acc. to IEC and UL/CSA ¹⁾ , for standalone assembly, AC-53a -At 40°C -At 50°C -At 60°C	A A A	25.3 23 21	32.2 29 26	38 34 31
Power loss •During operation after startup of the motor at uninterrupted rated operat. curr.(40°C) approx. •During starting at 300% _M (40°C)	w	8	13 220	19 256
Permissible rated motor current and starts per hour at normal starting (class 10) -Rated motor curr. I_M^{2} ,ramp-up time 3s -Starts per hour ³⁾ -Rated motor curr. I_M^{2} ,ramp-up time 4s -Starts per hour ³⁾	A 1/h A 1/h	25 / 23 23 / 23 25 / 23 15 / 15	32 / 29 23 / 23 32 / 29 16 / 16	38 / 34 19 / 19 38 / 34 12 / 12

¹⁾ Measurement at 60°C in accordance with UL/CSA not required.

13.1.8 3RW30 36, 37, 38, 46, 47-.BB.. power electronics

		3RW3037	3RW3038	3RW3046	3RW3047
A	45	65	72	80	106
A	42	58	62.1	73	98
A	39	53	60	66	90
W	6	12	15	12	21
W	316	444	500	576	768
A	45 / 42	63 / 58	72 / 62	80 / 73	106 / 108
1/h	38 / 38	23 / 23	22 / 22	22 / 22	15 / 15
A	45 / 42	63 / 58	72 / 62	80 / 73	106 / 98
_	A W W	A 42 A 39 W 6 W 316 A 45/42 1/h 38/38 A 45/42	A 42 58 A 39 53 W 6 12 W 316 444 A 45 / 42 63 / 58 1/h 38 / 38 23 / 23 A 45 / 42 63 / 58	A 42 58 62.1 A 39 53 60 W 6 12 15 W 316 444 500 A 45/42 63/58 72/62 1/h 38/38 23/23 22/22 A 45/42 63/58 72/62	A 42 58 62.1 73 A 39 53 60 66 W 6 12 15 12 W 316 444 500 576 A 45/42 63/58 72/62 80/73 1/h 38/38 23/23 22/22 22/22 A 45/42 63/58 72/62 80/73

¹⁾ Measurement at 60°C in accordance with UL/CSA not required.

²⁾ At 300% I_M. Tamb = 40 °C / 50 °C

³⁾ For intermittent duty S4 with ON time 30%, T_{amb}=40°C / 50 °C, vertical standalone assembly. The specified switching frequencies do not apply to automatic mode. Factors for permissible switching frequency with different mounting position, direct assembly, side-by-side assembly, see Configuration chapter.

²⁾ At 300% I_M. Tamb = 40 °C / 50 °C

³⁾ For intermittent duty S4 with ON time 70%, T_{amb} =40°C / 50 °C, vertical standalone assembly. The specified switching frequencies do not apply to automatic mode.



13.1.9 3RW30 main conductor cross-sections

Soft starter	Туре		3RW301.	3RW302.	3RW303.	3RW304.
Conductor cross-section	ons					
Screw terminals	Main conductors					
Front clamping point connected	• Solid	mm ²	2 x (12.5); 2 x (2.56) acc. to IEC 60947	2 x (12.5); 2 x (2.56) acc. to IEC 60947; max. 1 x 10	2 x (1.516)	2 x (2.516)
NSB00479	Finely stranded with end sleeve	mm^2	2 x (1.52.5); 2 x (2.56)	2 x (12.5); 2 x (2.56)	1 x (0.7525)	1 x (2.535)
	Stranded	mm^2	-	_	1 x (0.7535)	1 x (470)
	AWG cables Solid	AWG	2 x (16 12)	2 x (16 12)		
	Solid or strandedStranded	AWG AWG	2 x (1410) 1 x 8	2 x (1410) 1 x 8	1 x (182) -	1 x (102/0) -
Rear clamping point	Solid	mm^2	-	=	2 x (1.516)	2 x (2.516)
connected	 Finely stranded with end sleeve 	mm^2	_	-	1 x (1.525)	1 x (2.550)
Ħ.	 Stranded 	mm^2	-	-	1 x (1.535)	1 x (1070)
NSB00480	AWG cables Solid or stranded	AWG	_	_	1 x (162)	1 x (102/0)
Both clamping points	• Solid	mm^2	_	_	2 x (1.516)	2 x (2.516)
connected	Stranded	mm^2	_	_	2 x (1.525)	2 x (1050)
	 Finely stranded with end sleeve 	mm^2	-	<u>~</u>	2 x (1.516)	2 x (2.535)
NSB00481	AWG cables Solid or stranded	AWG	_	-	2 x (162)	2 x (101/0)
	Tightening torque	Nm lb.in	22.5 1822	22.5 1822	4.5 40	6.5 58
	Tools		PZ2	PZ2	PZ2	Allen screw 4 mm
	Degree of protection		IP20	IP20	IP20 (terminal compartment IP00)	IP20 t (terminal compartme IP00)
Spring-loaded terminals	Main conductors					
	• Solid	mm^2	14	110	_	_
	Finely stranded with end sleeve	mm ²	12.5	16; end sleeves, without plastic collar	_	_
	 AWG cables Solid or stranded (finely stranded) Stranded 	AWG AWG	1614 1612	1610 1 x 8	<u> </u>	Ξ
	Tools		DIN ISO 2380- 1A0; 5 x 3	DIN ISO 2380- 1A0; 5 x 3		-
	Degree of protection		IP20	IP20	-	_
Busbar connections	Main conductors					
	With cable lug according to DIN 46234 or max. 20 mm wide	2				2 (10 70)
	StrandedFinely-stranded	mm ²		_	_	2 x (1070) 2 x (1050)
	AWG cables, solid or stranded	AWG	_	_	_	2 x (71/0)
	ATTO Gables, solid of straffded	, ,,,,				Z x (1 1/0)



13.1.10 3RW30 auxiliary conductor cross-sections

Soft starters	Туре		3RW3013RW304.
Conductor cross-	-sections		
Auxiliary conductors	s (1 or 2 conductors can be connected):		
	Screw terminals		
	SolidFinely stranded with end sleeve	$\frac{\text{mm}^2}{\text{mm}^2}$	2 x (0.52.5) 2 x (0.51.5)
	 AWG cables Solid or stranded Finely stranded with end sleeve 	AWG AWG	2 x (2014) 2 x (2016)
	Terminal screws Tightening torque	Nm lb.in	0.81.2 710.3
	Spring-loaded terminals	20.0	
	SolidFinely stranded with end sleeveAWG cables, solid or stranded	mm ² mm ² AWG	2 x (0.252.5) 2 x (0.251.25) 2 x (2414)

13.1.11 Electromagnetic compatibility according to EN 60947-4-2

	Standard	Parameters	
Electromagnetic compatibility according to EN 60947-4-2			
EMC interference immunity	-		
Electrostatic discharge (ESD)	EN 61000-4-2	±4 kV contact discharge, ±8 kV air discharge	
Electromagnetic RF fields	EN 61000-4-3	Frequency range: 80 to 2000 MHz with 80% at 1 kHz Degree of severity 3: 10 V/m	
Conducted RF interference	EN 61000-4-6	Frequency range: 150 kHz80 MHz with 80% at 1 kHz Interference 10 V	
RF voltages and RF currents on cables			
Burst	EN 61000-4-4	±2 kV / 5 kHz	
• Surge	EN 61000-4-5	±1 kV line to line ±2 kV line to ground	
EMC interference emission			
EMC interference field strength	EN 55011	Limit value of Class A at 301000 MHz, Limit value of Class B for 3RW302.; 24 V AC/DC	
Radio interference voltage	EN 55011	Limit value of Class A at 0.1530 MHz, Limit value of Class B for 3RW302.; 24 V AC/DC	
Radio interference suppression filters			
Degree of noise suppression A (industrial applications)	Not required		
Degree of noise suppression B (applications for residential areas) Control voltage • 230 V AC/DC • 24 V AC/DC	Not available ¹⁾ Not required for 3RW301. and 3RW302; Required for 3RW303. and 3RW304. (see table)		

Degree of noise suppression B cannot be obtained through the use of filters as the strength of the electromagnetic field is not attenuated by the filter.



13.1.12 Recommended filters

Soft starter types	Nominal current	Recommended filters ¹⁾				
	Soft starter	Voltage range 200 to 480 V				
		Filter types	Filter types Nominal current filters Termina			
	Α		Α	mm ²		
3RW30 36	45	4EF1512-1AA10	50	16		
3RW30 37	63	4EF1512-2AA10	66	25		
3RW30 38	72	4EF1512-3AA10	90	25		
3RW30 46	80	4EF1512-3AA10	90	25		
3RW30 47	106	4EF1512-4AA10	120	50		

The radio interference suppression filter is used to remove the conducted interference from the main circuit. The field-related emissions comply with degree of noise suppression B. The filter should be selected under standard conditions: 10 starts per hour, ramp-up time 4 s at 300% I_e

13.1.13 Types of coordination

feeder.

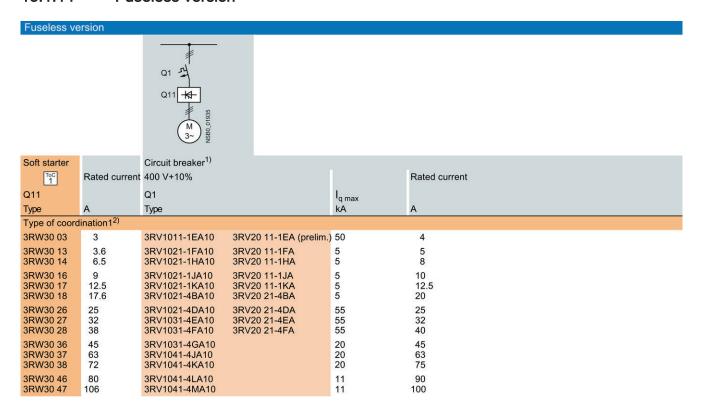
The type of coordination according to which the motor feeder with soft starter is mounted depends on the application-specific requirements. Normally, fuseless mounting (combination of motor starter protector and soft starter) is sufficient.

If type of coordination 2 needs to be fulfilled, semiconductor fuses must be fitted in the motor feeder.

- Type of coordination 1 in accordance with IEC 60947-4-1:
 The device is defective following a short-circuit failure and therefore unsuitable for further use. (Personnel and equipment must not be put at risk).
- Type of coordination 2 in accordance with IEC 60947-4-1:
 The device is suitable for further use following a short-circuit failure. (Personnel and equipment must not be put at risk).
 The type of coordination only refers to soft starters in conjunction with the stipulated protective device (motor starter protector / fuse), not to additional components in the



13.1.14 Fuseless version



¹⁾ The rated motor current must be considered when selecting the devices.

²⁾ The types of coordination are described in chapter Types of coordination (Page 143).



13.1.15 Fused version (line protection only)

Fused versi	on (line prote	ection only)						
		F1 96610 708SN						
Soft starters ToC 1 Q11 Type	Nominal current	Line protection, m F1 Type	naximum ⁴⁾ Rated current	Size	Line contacto (optional) Q21	rs		
		65 kA at 480 V +		the state of the s				
3RW30 03 ²⁾	3	3NA3805 ³⁾	20	000	3RT10 15	3RT20 15		
3RW30 13 3RW30 14	3.6 6.5	3NA3803-6 3NA3805-6	10 16	000	3RT10 15 3RT10 15	3RT20 15 3RT20 15		
3RW30 16 3RW30 17 3RW30 18	9 12.5 17.6	3NA3807-6 3NA3810-6 3NA3814-6	20 25 35	000 000 000	3RT10 16 3RT10 24 3RT10 26	3RT20 16 3RT20 18 3RT20 26		
3RW30 26 3RW30 27 3RW30 28	25 32 38	3NA3822-6 3NA3824-6 3NA3824-6	63 80 80	00 00 00	3RT10 26 3RT10 34 3RT10 35	3RT20 26 3RT20 27 3RT20 28		
3RW30 36 3RW30 37 3RW30 38	45 63 72	3NA3130-6 3NA3132-6 3NA3132-6	100 125 125	1 1 1	3RT10 36 3RT10 44 3RT10 45			
3RW30 46 3RW30 47	80 106	3NA3136-6 3NA3136-6	160 160	1	3RT10 45 3RT10 46			

- 1) The types of coordination are described in chapter Types of coordination (Page 143). Type of coordination 1 only refers to soft starters in conjunction with the stipulated protective device (motor starter protector / fuse), not to any additional components in the feeder.
- ⁴⁾ Note: The soft starter protection function of the installed fuse is only guaranteed if the rated current of the fuse is not less than "minimum" and not greater than "maximum".
- $^{2)}$ I_q = 50 kA at 400 V.
- ³⁾ 3NA3 805-1 (NH00), 5SB2 61 (DIAZED), 5SE2 201-6 (NEOZED).



13.1.16 Fused version with SITOR 3NE1 fuses

Assembly as for type of coordination 2, with SITOR all-range fuses (F´1) for combined thyristor and line protection.

Fused version	on with SIT	OR 3NE1 fuses (sen	niconducto <u>r ar</u>	nd line p	protection)		
For suitable fuse bases, refer to "SENTRON switching and protecting devices for power distrib "Switch disconnectors" in the LV1 Catalog and to "BETA protecting" -> "SITOR semiconor fuses" the ET B1 Catalog or consult www.siemens.de/sitor							
Soft starters	Nominal current	All-range fuses	Rated current	Size	Line contactor (optional)	s	
Q11 Type	A	F'1 Type	A		Q21		
Type of coordi	nation 2 ¹⁾ : I _q	= 65 kA at 480 V + 10%	6				
3RW30 03 ²⁾	3	3NE1813-0 ³⁾	16	000	3RT10 15	3RT20 15	
3RW30 13 3RW30 14	3.6 6.5	3NE1813-0 3NE1813-0	16 16	000	3RT10 15 3RT10 15	3RT20 15 3RT20 15	
3RW30 16 3RW30 17 3RW30 18	9 12.5 17.6	3NE1813-0 3NE1813-0 3NE1814-0	16 16 20	000 000 000	3RT10 16 3RT10 24 3RT10 26	3RT20 16 3RT20 18 3RT20 26	
3RW30 26 3RW30 27 3RW30 28	25 32 38	3NE1803-0 3NE1020-2 3NE1020-2	35 80 80	000 00 00	3RT10 26 3RT10 34 3RT10 35	3RT20 26 3RT20 27 3RT20 28	
3RW30 36 3RW30 37 3RW30 38	45 63 72	3NE1020-2 3NE1820-0 3NE1820-0	80 80 80	00 000 000	3RT10 36 3RT10 44 3RT10 45		
3RW30 46 3RW30 47	80 106	3NE1021-0 3NE1022-0	100 125	00 00	3RT10 45 3RT10 46		

¹⁾ The types of coordination are described in chapter Types of coordination (Page 143). Type of coordination 2 only refers to soft starters in conjunction with the stipulated protective device (motor starter protector / fuse), not to additional components in the feeder.

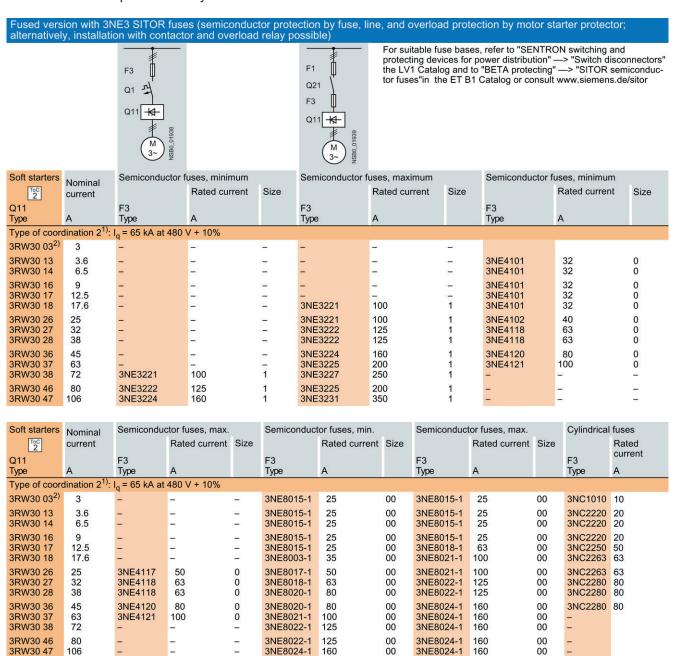
 $^{^{2)}}$ I_q = 50 kA at 400 V.

³⁾ No SITOR fuse required! Alternatively: 3NA3 803 (NH00), 5SB2 21 (DIAZED), 5SE2 206 (NEOZED)



13.1.17 Fused version with SITOR 3NE3/4/8 fuses

Assembly as for type of coordination 2, with additional SITOR fuses (F3) for thyristor protection only.





Soft starters	Nominal	Line contact	tors	Motor starter prote	ectors	cs.	Line protection, maximum			
ToC 2	current	(optional)		400 V +10%	400 V +10%		Rated current		Size	
Q11 Type	А	Q21		Q1 Type			F1 Type	Α		
Type of coor	dination 2 ¹⁾ :	$I_q = 65 \text{ kA at}$	480 V + 10%							
3RW30 03 ²⁾	3	3RT10 15	3RT20 15	3RV1011-1EA10	3RV20 11-1EA (provis.)	4	3NA3805 ³⁾	20	000	
3RW30 13 3RW30 14	3.6 6.5	3RT10 15 3RT10 15	3RT20 15 3RT20 15	3RV1021-1FA10 3RV1021-1HA10	3RV20 11-1FA 3RV20 11-1HA	5 8	3NA3803-6 3NA3805-6	10 16	000 000	
3RW30 16 3RW30 17 3RW30 18	9 12.5 17.6	3RT10 16 3RT10 24 3RT10 26	3RT20 16 3RT20 18 3RT20 26	3RV1021-1JA10 3RV1021-1KA10 3RV1021-4BA10	3RV20 11-1JA 3RV20 11-1KA 3RV20 21-4BA	10 12.5 20	3NA3807-6 3NA3810-6 3NA3814-6	20 25 35	000 000 000	
3RW30 26 3RW30 27 3RW30 28	25 32 38	3RT10 26 3RT10 34 3RT10 35	3RT10 26 3RT20 27 3RT20 28	3RV1031-4DA10 3RV1031-4EA10 3RV1031-4EA10	3RV20 21-4DA 3RV20 21-4EA 3RV20 21-4FA	25 32 40	3NA3822-6 3NA3824-6 3NA3824-6	63 80 80	00 00 00	
3RW30 36 3RW30 37 3RW30 38	45 63 72	3RT10 36 3RT10 44 3RT10 45		3RV1031-4GA10 3RV1041-4JA10 3RV1041-4KA10		45 63 75	3NA3130-6 3NA3132-6 3NA3132-6	100 125 125	1 1 1	
3RW30 46 3RW30 47	80 106	3RT10 45 3RT10 46		3RV1041-4LA10 3RV1041-4MA10		90 100	3NA3136-6 3NA3136-6	160 160	1	

 $^{1)}$ The types of coordination are described in $^{2)}$ I_{q} = 50 kA at 400 V. chapter Types of coordination (Page 143). Type of coordination 2 only refers to soft starters in conjunction with the stipulated protective device (motor starter protector / fuse), not to additional components in the feeder.



13.2 3RW40

13.2.1 Overview

SIRIUS 3RW40 soft starters have all the same advantages as the 3RW30 soft starters.

SIRIUS 3RW40 soft starters are characterized above all by their small space requirements. Integral bypass contacts mean that no power loss has to be taken into account at the power semiconductors (thyristors) after the motor has started up. This cuts down on heat losses, enabling a more compact design and making external bypass circuits superfluous.

At the same time, this soft starter comes with additional integrated functions such as settable current limiting, motor overload and intrinsic device protection, and optional thermistor motor protection. The higher the motor rating, the more important these functions become because they make it unnecessary to purchase and install protection equipment (such as overload relays).

Internal intrinsic device protection prevents thermal overloading of the thyristors and the power unit defects this can cause. As an option, the thyristors can also be protected against short-circuiting with semiconductor fuses.

Thanks to integrated status and fault monitoring, this compact soft starter offers many different diagnostics options. Up to four LEDs and relay outputs permit differentiated monitoring and diagnostics of the operating mechanism by indicating the operating state as well as, for example, mains or phase failures, missing load, impermissible tripping times / CLASS settings, thermal overloading, or device faults.

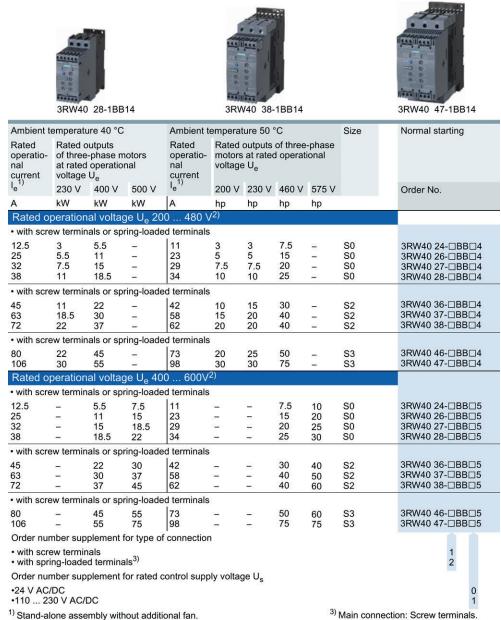
Soft starters rated up to 250 kW (at 400 V) can be supplied for standard applications in three-phase systems. Extremely small sizes, low power losses, and simple commissioning are just three of the many advantages of the SIRIUS 3RW40 soft starters.

"Increased safety" type of protection EEx e according to ATEX Directive 94/9/EC

The SIRIUS 3RW40 soft starter sizes S0 to S12 are suitable for starting explosion-proof motors with the "increased safety" type of protection EEx e.



13.2.2 Selection and ordering data for standard applications and normal starting (CLASS 10)



¹⁾ Stand-alone assembly without additional fan.

²⁾ Soft starter with screw terminals.



Note

The rated motor current is extremely important when selecting a soft starter.

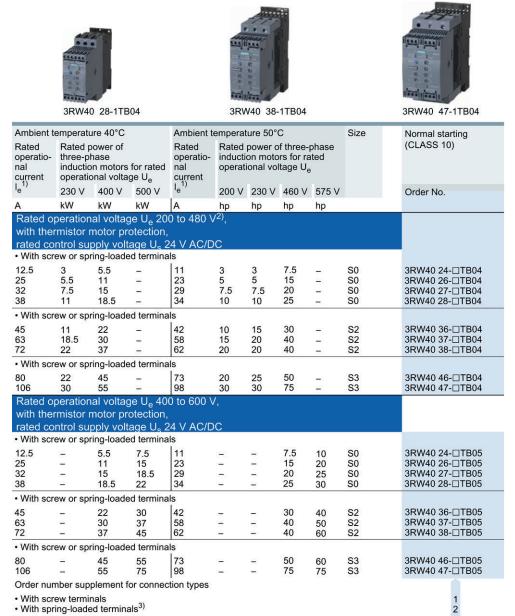
Refer to the information about selecting soft starters in chapter Configuration (Page 83).

Conditions for normal starting (CLASS 10):

Max. starting time 10 s, current limiting 300%, 5 starts / hour, ON time 30%, standalone assembly, max. installation altitude 1000 m / 3280 ft, ambient temperature kW 40 °C / 104 °F. A larger model may need to be selected if other conditions and constraints apply or for a higher starting frequency. For information about the rated currents for ambient temperatures >40 °C, refer to chapter 3RW40 2. to 7. power electronics (Page 163).



13.2.3 Selection and ordering data for standard applications and normal starting (CLASS 10) (with thermistor motor protection evaluation)



Standalone assembly without additional fan.
 Soft starter with screw terminals.

³⁾ Main circuit connection: screw terminals.



Note

The rated motor current is extremely important when selecting a soft starter.

Refer to the information about selecting soft starters in chapter Configuration (Page 83).

Conditions for normal starting (CLASS 10):

Max. starting time 10 s, current limiting 300%, 5 starts / hour, ON time 30%, standalone assembly, max. installation altitude 1000 m / 3280 ft, ambient temperature kW 40 $^{\circ}$ C / 104 $^{\circ}$ F. A larger model may need to be selected if other conditions and constraints apply or for a higher starting frequency. For information about the rated currents for ambient temperatures >40 $^{\circ}$ C, refer to chapter 3RW40 2. to 7. power electronics (Page 163).



Selection and ordering data for standard applications and normal starting 13.2.4 (CLASS 10)





3RW40 56-6BB44

3RW40	56-6BB	3RW40 76-6BB44										
Rated operational	operatio- nal three-phase induction motors for rated			Rated operational	operatio- nal induction motors for rated operational voltage U _e					Normal starting (CLASS 10)		
current I _e 1)	230 V	400 V	500 V	current I _e ¹⁾	200 V	230 V	460 V	575 V		Order No.		
Α	kW	kW	kW	Α	hp	hp	hp	hp				
Rated of	peration	al voltaç	je U _e 20	00 to 460 \	√ 2)							
 With screen 	ew or spr	ing-loade	d termina	ls								
134 162	37 45	75 30	_	117 145	30 40	40 50	75 100	_	S6	3RW40 55-□BB□4 3RW40 56-□BB□4		
 With screen 	ew or spr	ring-loade	d termina	ls								
230 280	75 90	132 160	_	205 248	60 75	75 100	150 200	-	S12	3RW40 73-□BB□4 3RW40 74-□BB□4		
356 432	110 132	200 250	_	315 385	100 125	125 150	250 300	_		3RW40 75-□BB□4 3RW40 76-□BB□4		
Rated of	peration	al voltaç	je U _e 40	00 to 600 \	/ 2)							
 With screen 	ew or spr	ring-loade	d termina	ls								
134 162	_	75 90	90 110	117 145	_	=	75 100	100 150	S6	3RW40 55-□BB□5 3RW40 56-□BB□5		
 With screen 	ew or spr	ring-loade	d termina	ls								
230 280	_	132 160	160 200	205 248	_	=	150 200	200 250	S12	3RW40 73-□BB□5 3RW40 74-□BB□5		
356 432	-	200 250	250 315	315 385	_	_	250 300	300 400		3RW40 75-□BB□5 3RW40 76-□BB□5		
Order nun	nber sup	plement f	or connec	tion types ³)							
With sprWith scr	ing-loade	ed termina								2		
Order nun	nber sup	plement fo	or rated co	ontrol supp	ly voltag	ge U _s ⁴⁾						
• 115 V A	С									3		

^{• 230} V AC

¹⁾ Standalone assembly.

²⁾ Soft starter with screw terminals.

 $^{^{\}rm 3)}\,{\rm Main}$ circuit connection: busbar connection.

⁴⁾ Control by way of the internal 24 V DC supply or direct control by means of PLC possible



Note

The rated motor current is extremely important when selecting a soft starter.

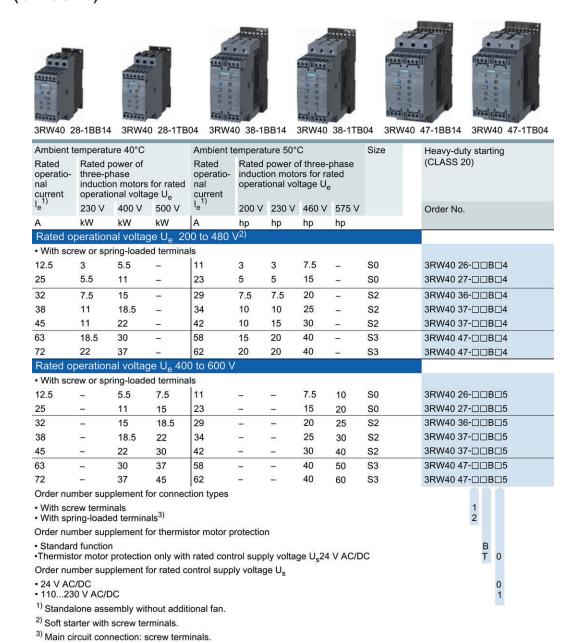
Refer to the information about selecting soft starters in chapter Configuration (Page 83).

Conditions for normal starting (CLASS 10):

Max. starting time 10 s, current limiting 300%, 5 starts / hour, ON time 30%, standalone assembly, max. installation altitude 1000 m / 3280 ft, ambient temperature kW 40 $^{\circ}$ C / 104 $^{\circ}$ F. A larger model may need to be selected if other conditions and constraints apply or for a higher starting frequency. For information about the rated currents for ambient temperatures >40 $^{\circ}$ C, refer to chapter 3RW40 2. to 7. power electronics (Page 163).



13.2.5 Selection and ordering data for standard applications and heavy-duty starting (CLASS 20)





Note

The rated motor current is extremely important when selecting a soft starter.

Refer to the information about selecting soft starters in chapter Configuration (Page 83).

Conditions for normal starting (CLASS 10):

Max. starting time 20 s, current limiting 300%, 5 starts / hour, ON time 30%, standalone assembly, max. installation altitude 1000 m / 3280 ft, ambient temperature kW 40 °C / 104°. A larger model may need to be selected if other conditions and constraints apply or for a higher starting frequency. For information about the rated currents for ambient temperatures >40 °C, refer to chapter 3RW40 24, 26, 27, 28 power electronics (Page 164).



Selection and ordering data for standard applications and heavy-duty starting 13.2.6 (CLASS 20)







3RW40 76-6BB44

Ambient to	emperati	ure 40°C		Ambient t	emperat	ure 50°0	2		Size	Heavy-duty starting
Rated operatio- nal current	induction motors for rated nal operational voltage $\mathbf{U_e}$ current							(CLASS 20)		
l _e ¹⁾	230 V	400 V	500 V	le''	200 V	230 V	460 V	575 V		Order No.
A	kW	kW	kW	Α	hp	hp	hp	hp		
Rated or	peration	าal volta	ge U _e 20	0 to 460 '	y 2)					
 With screen 	ew or spi	ring-loade	ed termina	ls						
80	22	45	-	73	20	25	50	-	S6	3RW40 55-□BB□4
106	30	55		98	25	30	60	-	S6	3RW40 55-□BB□4
134	37	75	_	117	30	40	75	-	S6	3RW40 56-□BB□4
162	45	90	202	145	40	50	100	_	S12	3RW40 73-□BB□4
230	75	132		205	60	75	150	_	S12	3RW40 74-□BB□4
280	90	160	-	248	75	100	200	-	S12	3RW40 75-□BB□4
356	110	200	_	315	100	125	250	_	S12	3RW40 76-□BB□4
Rated or	peration	ıal voltaç	ge U _e 400	0 to 600 V	(2)					
 With screen 	ew or sp	ring-loade	ed termina	ls						
80	_	45	55	73	-	_	50	60	S6	3RW40 55-□BB□5
106	-	55	75	98	: 	-	60	75	S6	3RW40 55-□BB□5
134	li a e	75	90	117	a-a	-	75	100	S6	3RW40 56-□BB□5
162	-	90	110	145	-	-	100	150	S12	3RW40 73-□BB□5
230	-	132	160	205	-	-	150	200	S12	3RW40 74-□BB□5
280	-	160	200	248	_	-	200	250	S12	3RW40 75-□BB□5
356	-	200	250	315	-	-	250	300	S12	3RW40 76-□BB□5
Order nun	nber sup	plement f	for connec	tion types ³)					
With sprWith scr			als							2
Order nun	nber sup	plement f	or rated co	ontrol supp	lv voltac	ie U ₂ 4)				

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^{• 115} V AC • 230 V AC

¹⁾ Standalone assembly.

²⁾ Soft starter with screw terminals.

³⁾ Main circuit connection: busbar connection.

⁴⁾ Control by way of the internal 24 V DC supply or direct control by means of PLC possible



Note

The rated motor current is extremely important when selecting a soft starter.

Refer to the information about selecting soft starters in chapter Configuration (Page 83).

Conditions for normal starting (CLASS 10):

Max. starting time 40 s, current limiting 350%, 1 start / hour, ON time 30%, standalone assembly, max. installation altitude 1000 m / 3280 ft, ambient temperature kW 40 $^{\circ}$ C / 104 $^{\circ}$ F. A larger model may need to be selected if other conditions and constraints apply or for a higher starting frequency. For information about the rated currents for ambient temperatures >40 $^{\circ}$ C, refer to chapter 3RW40 55, 56, 73, 74, 75, 76 power electronics (Page 166).

13.2.7 3RW40 2., 3., 4. control electronics

Туре				3RW402.		3RW403., 3RV	V404.
Control electronics							
Rated values Rated control supply voltage • Tolerance		Terminal A1/A2	V %	24 ±20	110230 -15/+10	24 ±20	110230 -15/+10
Rated control supply current STANDBY During pickup ON without fan ON with fan			mA mA mA	< 150 < 200 < 250 < 300	< 50 < 100 < 50 < 70	< 200 < 5000 < 200 < 250	< 50 < 1500 < 50 < 70
Rated frequency • Tolerance			Hz %	50/60 ±20			
Control inputs IN				ON/OFF			
Rated operational current A C D C			mA mA	approx. 12 approx. 12	3/6 1,5/3	approx. 12 approx. 12	3/6 1,5/3
Relay outputs Output 1 Output 2 Output 3	ON / RUN mode ¹⁾ BYPASSED OVERLOAD/FAILURE	13/14 23/24 95/96/98		Operating indicati Bypass indication Overload / fault in			
Thermistor motor protection (PTC bir Total cold resistance Response value Return value Cable lengths, cable cross sections	nary)		kOhm kOhm kOhm	≤ 1,5 3,4 3,8 1,5 1,65 2 x 250 m: 2.5 mi 2 x 150 m: 1.5 mi 2 x 50 m: 0.5 mm	m ² 1 ²		
Rated operational current			A A	3 AC-15/AC-14 a 1 DC-13 at 24V	t 230V,		
Protection against overvoltages				Protection by mea	ans of varistor throu	ugh contact	
Short-circuit protection				4 A operational 6 A quick (fuse i	class gL/gG; not included in scop	pe of supply)	

¹⁾ Factory setting: ON Mode.



13.2.8 3RW40 5., 7. control electronics

Туре				3RW405.		3RW407.				
Control electronics										
Rated values Rated control supply voltage Tolerance		Terminal A1/A2	V AC %	115 -15/+10	230	115 -15/+10	230			
Rated control supply current STANDBY During pickup ON ¹⁾ Rated frequency Tolerance			mA mA mA Hz %	15 < 1 7 0 0 440 50/60 ±10	< 8 5 0 200	15 < 4 0 0 0 660 50/60 ±10	< 2 0 0 0 360			
Control inputs IN Rated operational current Rated operational voltage	perational current				ON/OFF Approx. 10 in accordance with DIN19240 24 from internal supply dc+ or external DC voltage (in accordance with DIN19240) via terminals - and IN					
Relay outputs Output 1 Output 2 Output 3	ON / RUN mode ²⁾ BYPASSED OVERLOAD/FAILURE	13/14 23/24 95/96/98		Operating indication						
Thermistor motor protection (PTC bin Total cold resistance Response value Return value Cable lengths, cable cross sections	ary)		kOhm	≤ 1,5 3,4 3,8 1,5 1,65 2 x 250 m: 2.5 mn 2 x 150 m: 1.5 mm 2 x 50 m: 0.5 mm	12					
Rated operational current Protection against overvoltages Short-circuit protection				2 x 50 m: 0.5 mm ⁻ 3 AC-15/AC-14 at 230V, 1 DC-13 at 24V Protection by means of varistor through contact 4 A operational class gL/gG; 6 A quick (fuse not included in scope of s u p p l y)						
1) Values for the coil current consump	otion at +10% U _n , 50Hz.			2) Factory setting:	ON Mode.					

13.2.9 3RW40 2., 3., 4. control electronics

Туре		3RW402., 3RW403., 3RW404.				
Control electronics						
Operating indications Off Start Bypass Stop	LED	DEVICE Green Green Green Green	STATE/BYPASSED/FAILURE Off Green flashing Green Green flashing	OVERLOAD Off Off Off Off		
Alarm signals Impermissible $I_{\rm e}$ / CLASS setting Start inhibited / thyristors too hot		Green Yellow flashing	Not relevant Not relevant	Red flashing Off		
Fault signals • 24 V: $U < 0.75 \times U_s$ or $U > 1.25 \times U_s$ • 110230 V: $U < 0.75 \times U_s$ or $U > 1.15 \times U_s$ Impermissible $I_{e'}$ CLASS setting for edge 0->1 on input IN Motor protection tripping (overload thermistor) Thermistor defective (wire breakage, short-circuit)		Off Off Green Green Green	Red Red Off Off	Off Off Red flashing Red Red flickering		
Thermal overload of the thyristors Missing mains voltage, phase failure / missing load Device fault		Yellow Green Red	Red Red Red	Off Off Off		



13.2.10 3RW40 5., 7. control electronics

Туре	3RW405. and 3R\	N407.		
Control electronics				
Operating indications Off Start Bypass Stop	DEVICE	STATE/BYPASSED	FAILURE	OVERLOAD
	Green	Off	Off	Off
	Green	Green flashing	Off	Off
	Green	Green	Off	Off
	Green	Green flashing	Off	Off
Alarm signals Impermissible I _e / CLASS setting Start inhibited / thyristors too hot	Green	Not relevant	Not relevant	Red flashing
	Yellow flashing	Not relevant	Not relevant	Off
Fault signals $U < 0.75 \times U_s$ or $U > 1.15 \times U_s$ Impermissible $I_{e'}$ CLASS setting for edge $0->1$ on input IN Motor protection tripping	Off Green Green	Off Off Off	Red Red Off	Off Red flashing Red
Thermal overload of the thyristors	Yellow	Off	Red	Off
Missing mains voltage, phase failure / missing load	Green	Off	Red	Off
Device fault	Red	Off	Red	Off

13.2.11 3RW40 protection functions

Туре		3RW40	
W2			Factory default
Protection functions			
Motor protection functions Trips in the event of Trip class to IEC 60947-4-1 Phase failure sensitivity	Class %	Thermal overloading of the motor 10/15/20 >40	10
Overload warning Thermistor protection according to IEC 60947-8, type A / IEC 60947-5-1 Reset option after tripping		No Yes ¹⁾ Manual / automatic / remote reset ²⁾ (MAN / AUTO / REMOTE ²⁾)	
Recovery time	min	5	
Device protection functions Trips in the event of Reset option after tripping		Thermal overloading of the thyristors or bypass ³⁾ Manual / automatic / remote reset ²⁾ (MAN / AUTO / REMOTE ²⁾)	
Recovery time • During overloading of the thyristors • During overloading of the bypass	s s	30 60	

¹⁾ Optional up to size S3 (device version).

²⁾ Integrated remote reset (REMOTE) available only for 3RW40 2. to 3RW40 4.; remote reset with accessory module 3RU19 available for 3RW405. and 3RW407.

³⁾ Bypass protection up to size S3.



13.2.12 3RW40 control times and parameters

Туре			3RW40	
				Factory default
Control times and parameters				
Control times Closing delay (with connected control voltage) Closing delay (automatic / line contactor mode) Recovery time (closing command during active sto	p)	ms ms ms	< 5 0 <300 100	
Mains failure bridging time Control supply voltage		ms	50	
Mains / phase failure response time Load circuit During starting and stopping During bypass		s s	1 5	
Reclosing lockout after overload trip Motor protection trip Device protection trip • During overloading of the thyristors		min s	5	
During overloading of the tryfistors During overloading of the bypass		s	60	
Start parameters Starting time Start voltage Starting current limiting		s %	0 2 0 40100 1.35x l _e /max ¹⁾	7,5 40 5 x l _e
Stop parameters Stopping time		s	020	0
Reset mode parameters (for motor / device protection Manual reset Automatic reset Remote reset (REMOTE) ²⁾	trip) LED LED LED		Off Yellow Green	Off
Ramp-up detection			Yes	
Operating mode output 13/14 Rising edge at Falling edge at	Start command Off command End of stopping		ON RUN	ON

¹⁾ Product version E07 and higher (for 3RW40 size S0 to S3) or product version E11 and higher (for 3RW40 S6 to S12)

Integrated remote reset (REMOTE) available only for 3RW40 2. to 3RW40 4.; available for 3RW405. and 3RW407. Remote reset with accessory module 3RU19.



13.2.13 3RW40 2. to 7. power electronics

Туре		3RW402B.4, 3RW403B.4, 3RW404B.4	3RW402B.5, 3RW403B.5, 3RW404B.5	3RW405BB.4, 3RW407BB.4	3RW405BB.5, 3RW407BB.5
Power electronics					
Rated operational voltage Tolerance	V AC %	200480 -15/+10	400600 -15/+10	200460 -15/+10	400600 -15/+10
Maximum thyristor blocking voltage	V AC	1600		1400	1800
Rated frequency Tolerance	Hz %	50/60 ±10			
Continuous duty at 40°C (% of I _e)		115			
Minimum load (% of minimum selectable rated motor current I _M)	%	20 (at least 2 A)			
Maximum cable length between soft starter and motor	m	300			
Permissible installation altitude	m	5000 (Derating from 10	00, see characterist	tic curves); higher on	request
Permissible mounting position					
With auxiliary fan (for 3RW402 3RW404.)		900 2	2,5° 22,5° 65900 088N		
Without auxiliary fan (for 3RW402 3RW404.)		10° 10° 1	0° 10° 10° 10° 10° 10° 10° 10° 10° 10° 1	– (fan integrated i	n the soft starter)
Permissible ambient temperature Operation Storage	°C °C	-25+60; (deratir	ng from +40)		
Degree of protection		IP20 for 3RW40 2		IP00	



3RW40 24, 26, 27, 28 power electronics 13.2.14

Туре		3RW4024	3RW4026	3RW4027	3RW4028
Power electronics					
Current carrying capacity rated operational current I _e • According to IEC and UL/CSA ¹ , for single assembly, AC-53a - at 40°C - at 50 °C - at 60 °C	A	12,5	25,3	32,2	38
	A	11	23	29	34
	A	10	21	26	31
Minimum settable rated motor current I _M for motor overload protection	Α	5	10	17	23
Power loss During operation after run-up at uninterrupted rated operational current (40°C) approx. During start-up with set current limitation to 300% I _M (40°C)	w w	2 68	8 188	13 220	19 256
Permissible rated motor current and starts per hour					
 For normal starting (class 10) Rated motor current I_M², run-up time 3 s Starts per hour³) 	A	12,5 / 11	25 / 23	32 / 29	38 / 34
	1/h	50 / 50	23 / 23	23 / 23	19 / 19
- Rated motor current $I_M^{\ 2}$, run-up time 4 s - Starts per hour 3	A	12,5 / 11	25 / 23	32 / 29	38 / 34
	1/h	36 / 36	15 / 15	16 / 16	12 / 12
 For heavy-duty starting (class 15) Rated motor current I_M²⁾, run-up time 4.5 s Starts per hour³⁾ 	A	11 / 10	23 / 21	30 / 27	34 / 31
	1/h	49 / 49	21 / 21	18 / 18	18 / 18
- Rated motor current $I_M^{\ 2}$, run-up time 6 s - Starts per hour $^{3)}$	A	11 / 10	23 / 21	30 / 27	34 / 31
	1/h	36 / 36	14 / 14	13 / 13	13 / 13
 For heavy-duty starting (class 20) Rated motor current I_M²⁾, run-up time 6 s Starts per hour³⁾ 	A	10 / 9	21 / 19	27 / 24	31 / 28
	1/h	47 / 47	21 / 21	20 / 20	18 / 18
- Rated motor current $I_M^{\ 2}$, run-up time 8 s - Starts per hour $^{3)}$	A	10 / 9	21 / 19	27 / 24	31 / 28
	1/h	34 / 34	15 / 15	14 / 14	13 / 13

¹⁾ Measurement at 60°C acc. to UL/CSA not required.

Current limitation or soft starter set to 300% I_M. Ta = 40 °C / 50 °C.
 Maximum settable rated motor current I_M, depending on the CLASS setting.

 For intermittent duty S4 with ON time OT =30%, T_a=40°C / 50 °C, stand-alone assembly vertical. The specified switching frequencies do not apply to automatic mode. Factors for permissible switching frequency for different mounting position, direct, side-by-side mounting, and use of an optional additional fan, see chapter Configuration.



13.2.15 3RW40 36, 37, 38, 46, 47 power electronics

Туре		3RW4036	3RW4037	3RW4038	3RW4046	3RW4047
Power electronics						
Current carrying capacity rated operational current I _e • According to IEC and UL/CSA ¹ , for single assembly, AC-53a - at 40°C - at 50 °C - at 60 °C	A	45	63	72	80	106
	A	42	58	62,1	73	98
	A	39	53	60	66	90
Minimum settable rated motor current \boldsymbol{I}_{M} for motor overload protection	Α	23	26	35	43	46
Power loss • During operation after run-up at uninterrupted rated operational current (40°C) approx. • During start-up with set current limitation to	w	6	12	15	12	21
	w	316	444	500	576	768
300% I _M (40 °C) Permissible rated motor current and starts per hour						
 For normal starting (class 10) Rated motor current I_M²⁾, run-up time 3 s Starts per hour³⁾ 	A	45 / 42	63 / 58	72 / 62	80 / 73	106 / 98
	1/h	38 / 38	23 / 23	22 / 22	22 / 22	15 / 15
- Rated motor current $I_{\rm M}^{\ 2)}$, run-up time 4 s - Starts per hour $^3)$	A	45 / 42	63 / 58	72 / 62	80 / 73	106 / 98
	1/h	26 / 26	15 / 15	15 / 15	15 / 15	10 / 10
 For heavy-duty starting (class 15) Rated motor current I_M²⁾, run-up time 4.5 s Starts per hour³⁾ 	A	42 / 38	50 / 46	56 / 52	70 / 64	84 / 77
	1/h	30 / 30	34 / 34	34 / 34	24 / 24	23 / 23
- Rated motor current $I_M^{(2)}$, run-up time 6 s - Starts per hour $^{(3)}$	A	42 / 38	50 / 46	56 / 52	70 / 64	84 / 77
	1/h	21 / 21	24 / 24	24 / 24	16 / 16	17 / 17
 For heavy-duty starting (class 20) Rated motor current I_M²⁾, run-up time 6 s Starts per hour³⁾ 	A	38 / 34	46 / 42	50 / 46	64 / 58	77 / 70
	1/h	30 / 30	31 / 31	34 / 34	23 / 23	23 / 23
- Rated motor current ${\rm I_M}^{2)}$, run-up time 8 s - Starts per hour $^{3)}$	A	38 / 34	46 / 42	50 / 46	64 / 58	77 / 70
	1/h	21 / 21	22 / 22	24 / 24	16 / 16	16 / 16

¹⁾ Measurement at 60°C acc. to UL/CSA not required.

²⁾ Current limitation on soft starter set to 300% I_M . Ta = 40 °C / 50 °C Maximum settable rated motor current I_M , depending on the CLASS-setting.

³⁾ For intermittent duty S4 with ON time OT =30%, T_a=40°C / 50 °C, stand-alone assembly vertical. The specified switching frequencies do not apply to automatic mode. Factors for permissible switching frequency for different mounting position, direct, side-by-side mounting, and use of an optional additional fan, see chapter Configuration.



3RW40 55, 56, 73, 74, 75, 76 power electronics 13.2.16

Туре		3RW4055	3RW4056	3RW4073	3RW4074	3RW4075	3RW4076
Power electronics							
Current carrying capacity rated operational current I _e • According to IEC and UL/CSA ¹), for single assembly, AC-53a - at 40°C - at 50 °C - at 60 °C	A	134	162	230	280	356	432
	A	117	145	205	248	315	385
	A	100	125	180	215	280	335
Minimum settable rated motor current \mathbf{I}_{M} for motor overload protection	Α	59	87	80	130	131	207
Power loss During operation after run-up at uninterrupted rated operational current (40°C) approx. During start-up with set current limitation to 350% ²⁾ I _M (40°C)	w	60	75	75	90	125	165
	w	1043	1355	2448	3257	3277	3600
Permissible rated motor current and starts per hour							
 For normal starting (class 10) Rated motor current I_M², run-up time 10 s Starts per hour³ 	A	134 / 117	162 / 145	230 / 205	280 / 248	356 / 315	432 / 385
	1/h	20 / 20	8 / 8	14 / 14	20 / 20	16 / 16	17 / 17
- Rated motor current ${\sf I_M}^2$, run-up time 20 s - Starts per hour $^{3)}$	A	134 / 117	162 / 145	230 / 205	280 / 248	356 / 315	432 / 385
	1/h	7 / 7	1,4 / 1,4	3 / 3	8 / 8	5 / 5	5 / 5
 For heavy-duty starting (class 15) Rated motor current I_M², run-up time 15 s Starts per hour³) 	A 1/h	134 / 117	152 / 140 8 / 8	210 / 200 11 / 11	250 / 220 13 / 13	341 / 315 11 / 11	402 / 385 12 / 12
- Rated motor current ${\sf I_M}^2$, run-up time 30 s - Starts per hour $^{3)}$	A	134 / 117	152 / 140	210 / 200	250 / 220	341 / 315	402 / 385
	1/h	1,2 / 1,2	1,7 / 1,7	1 / 1	6 / 6	2 / 2	2 / 2
 For heavy-duty starting (class 20) Rated motor current I_M²⁾, run-up time 20 s Starts per hour³⁾ 	A	124 / 112	142 / 132	200 / 185	230 / 205	311 / 280	372 / 340
	1/h	12 / 12	9 / 9	10 / 10	10 / 10	10 / 10	10 / 10
- Rated motor current $I_M^{\ 2}$, run-up time 40 s - Starts per hour 3	A	124 / 112	142 / 132	200 / 185	230 / 205	311 / 280	372 / 340
	1/h	2 / 2	2 / 2	1 / 1	5 / 5	1 / 1	1 / 1

¹⁾ Measurement at 60°C acc. to UL/CSA not required.

²⁾ Current limitation on soft starter set to 350% $\rm I_{M}.\ Ta$ = 40 °C / 50 °C

Maximum settable rated motor current I_M, depending on the CLASS-setting.

3) For intermittent duty S4 with ON time OT =70%, T_a=40°C / 50 °C, stand-alone assembly vertical. The specified switching frequencies do not apply to automatic mode.



13.2.17 3RW40 2., 3., 4. main conductor cross-sections

Soft starters	Туре		3RW402.	3RW403.	3RW404.
Conductor cross-secti	ons				
Screw terminals	Main conductors				
Front clamping point connected	• Solid	mm ²	2 x (1.52.5); 2 x (2.56) according to IEC 60947; max. 1 x 10	2 x (1.516)	2 x (2.516)
NSB00479	With end sleeve	mm^2	2 x (1.52.5); 2 x (2.56)	1 x (0.7525)	1 x (2.535)
	Stranded	mm^2	_	1 x (0.7535)	1 x (470)
	AWG cables				
	- Solid	AWG	2 x (16 12)		
	- Solid or stranded	AWG	2 x (1410)	1 x (182)	2 x (101/0)
	- Stranded	AWG	1 x 8	_ ` ′	_
Rear clamping point	Solid	mm^2	-	2 x (1.516)	2 x (2.516)
connected	With end sleeve	mm^2	_	1 x (1.525)	1 x (2.550)
	Stranded	mm^2	_	1 x (1.535)	1 x (1070)
NSB004800	AWG cables			(227 mag) (1 € (277 ma) (100 m) (217 m) (1 €)	100 million (10
S S S S S S S S S S S S S S S S S S S	- Solid or stranded	AWG	-	1 x (162)	2 x (101/0)
Both clamping points	Solid	mm^2	_	2 x (1.516)	2 x (2.516)
connected	With end sleeve	mm^2	_	2 x (1.516)	2 x (2.535)
	Stranded	mm^2	_	2 x (1.525)	2 x (1050)
	AWG cables			,	,
NSB00481	- Solid or stranded	AWG	_	2 x (162)	1 x (102/0)
	Tightening torque	Nm lb.in	22.5 1822	4.5 40	6.5 58
	Tools		PZ2	PZ2	Allen screw 4 mm
	Degree of protection		IP20	IP20	IP20
	Dograd or protestion		11 20	(terminal compartment IP00)	
Spring-loaded terminals	Main conductors				
	• Solid	mm^2	110	_	
	Finely stranded with end sleeve	mm^2	16 end sleeves without plastic collar	·-	
	AWG cables				
	- Solid or stranded (finely stranded)	AWG	1610	s - s	
	- Stranded	AWG	1 x 8	_	
	Tools		DIN ISO 2380-1A0; 5 x 3	-	
	Degree of protection		IP20	-	
Busbar connections	Main conductors				
	 With cable lug according to DIN 46234 or 20 mm wide 				
	- Stranded	mm^2	-		2 x (1070)
	- Finely-stranded	mm^2	_		2 x (1050)
	AWG cables, solid or stranded	AWG	_		2 x (71/0)



13.2.18 3RW40 5., 7. main conductor cross-sections

Soft starters	Туре		3RW405.	3RW407.
Conductor cross-sections				
Screw terminals	Main conductors:			
With box terminal			3RT19 55-4G (55 kW)	3RT19 66-4G
Front clamping point	Finely stranded with end sleeve	mm^2	1670	70240
connected	Stranded	mm^2	1670	95300
479	Ribbon cable conductors (number x width x thickness)	mm	Min. 3 x 9 x 0.8,	Min. 6 x 9 x 0.8
NSB00	AWG cables, solid or stranded	AWG	Max. 6 x 15.5 x 0.8 62/0	Max. 20 x 24 x 0.5 3/0600 kcmil
Rear clamping point connected	Finely stranded with end sleeve	mm^2	1670	120185
En .	Stranded	mm ²	1670	120240
08480	Ribbon cable conductors (number x width x thickness)	mm	Min. 3 x 9 x 0.8,	Min. 6 x 9 x 0.8
O o o o o o o o o o o o o o o o o o o o	AWG cables, solid or stranded	AWG	Max. 6 x 15.5 x 0.8 62/0	Max. 20 x 24 x 0.5 250500 kcmil
Both clamping points connected	Finely stranded with end sleeve	mm^2	Max. 1 x 50, 1 x 70	Min. 2 x 50; max. 2 x 185
	Stranded	mm^2	Max. 2 x 70	Max. 2 x 70; max. 2 x 240
184	 Ribbon cable conductors (number x width x thickness) AWG cables, solid or stranded 	mm AWG	Max. 2 x (6 x 15.5 x 0.8) Max. 2 x 1/0	Max. 2 x (20 x 24 x 0.5) Min. 2 x 2/0; max. 2 x 500 kcmil
NSBOO	Terminal screws Tightening torque	Nm	M10 (hexagon socket, A/F4) 1012	M12 (hexagon socket, A/F5) 2022
	COOP SHOOT SHOOT OF COOP A SHOOT OF COOP AS A SHOTT OF COOP AS A SHOOT OF COOP AS A SHOTT OF COOP AS A SHOOT OF COOP AS A SHOOT	lb.in	90110	180195
Screw terminals	Main conductors:			
With box terminal			3RT19 56-4G	
Front or rear clamping point connected	Finely stranded with end sleeve	mm ²	16120	
	Stranded	mm^2	16120	
SB00479	Ribbon cable conductors (number x width x thickness)	mm	Min. 3 x 9 x 0.8 Max. 6 x 15.5 x 0.8	
	AWG cables, solid or stranded	AWG	6250 kcmil	
Both clamping points connected	Finely stranded with end sleeve	mm^2	Max. 1 x 95, 1 x 120	
	Stranded	mm^2	Max. 2 x 120	
NSBOOd81	Ribbon cable conductors (number x width x thickness) AWG cables, solid or stranded	mm AWG	Max. 2 x (10 x 15.5 x 0.8) Max. 2 x 3/0	
Screw terminals	Main conductors:			
	Without box terminal / busbar connection			
	 Finely stranded with cable lug Stranded with cable lug AWG cables, solid or stranded 	mm ² mm ² AWG	1695 ¹⁾ 25120 ¹⁾ 4250 kcmil	50240 ²⁾ 70240 ²⁾ 2/0500 kcmil
	Connecting bar (max. width) Terminal screws Tightening torque	mm Nm lb.in	17 M8x25 (A/F13) 1014 89124	25 M10x30 (A/F17) 1424 124210

When connecting cable lugs to DIN 46235, use 3RT19 56-4EA1 terminal cover for conductor cross-sections from 95 mm² to ensure the required clearance between phases.

²⁾ When connecting cable lugs to DIN 46234 or DIN 46235, use 3RT19 66-4EA1 terminal cover for conductor cross-sections from 240 mm² or 185 mm² respectively to ensure the required clearance between phases.



13.2.19 3RW40 .. auxiliary conductor cross-sections

Soft starters	Туре		3RW40
Conductor cross-se	ections		
Auxiliary conductors (1 or 2 conductors can be connected)		
	Screw terminals		
	SolidFinely stranded with end sleeve	$\frac{\text{mm}^2}{\text{mm}^2}$	2 x (0.52.5) 2 x (0.51.5)
	 AWG cables Solid or stranded Finely stranded with end sleeve 	AWG AWG	2 x (2014) 2 x (2016)
	Terminal screws Tightening torque	Nm lb.in	0.81.2 710.3
	Spring-loaded terminals		
	 Solid 3RW40 2. to 3RW40 4. 3RW40 5., 3RW40 7. 	$\frac{\text{mm}^2}{\text{mm}^2}$	2 x (0.252.5) 2 x (0.251.5)
	Finely stranded with end sleeveAWG cables, solid or stranded	mm ² AWG	2 x (0.251.5) 2 x (2414) for 3RW4023RW404.; 2 x (2416) for 3RW405, and 3RW407.

13.2.20 Electromagnetic compatibility according to EN 60947-4-2

	Standard	Parameters
Electromagnetic compatibility according to EN 60947-4-2	Starraura	1 diameters
EMC interference immunity		
Electrostatic discharge (ESD)	EN 61000-4-2	± 4 kV contact discharge, ± 8 kV air discharge
Electromagnetic RF fields	EN 61000-4-3	Frequency range: 80 to 1000 MHz with 80% at 1 kHz Degree of severity 3: 10 V/m
Conducted RF interference	EN 61000-4-6	Frequency range: 150 kHz80 MHz with 80% at 1 kHz Interference 10 V
RF voltages and RF currents on cables		
Burst	EN 61000-4-4	± 2 kV / 5 kHz
• Surge	EN 61000-4-5	±1 kV line to line ±2 kV line to ground
EMC interference emission		
EMC interference field strength	EN 55011	Limit value of Class A at 301000 MHz, Limit value of Class B for 3RW402.; 24 V AC/DC
Radio interference voltage	EN 55011	Limit value of Class A at 0.1530 MHz, Limit value of Class B for 3RW402.; 24 V AC/DC
Radio interference suppression filters		
Degree of noise suppression A (industrial applications)	Not required	
Degree of noise suppression B (applications for residential areas) Control voltage • 110230 V AC/DC • 115/230 V AC • 24 V AC/DC	Not available ¹⁾ Not available ¹⁾ Not required for 3F Required for 3RW	RW402.; 403. and 3RW404. (see table)

Degree of noise suppression B cannot be obtained through the use of filters as the strength of the electromagnetic field is not attenuated by the filter.



13.2.21 Recommended filters

Soft starter type	Rated	Recommended filter ¹⁾		
	current	Voltage range 200 480 V		
	of soft starter	Filter type	Rated current of filter	Connecting terminals
	Α		Α	mm ²
3RW40 36	45	4EF1512-1AA10 ((<u>http://www.epcos.com</u>) ⇒ B84143B0050R110)	50	16
3RW40 37	63	4EF1512-2AA10 ((<u>http://www.epcos.com</u>) ⇒ B84143B0066R110)	66	25
3RW40 38	72	4EF1512-3AA10 ((http://www.epcos.com) ⇒ B84143B0090R110)	90	25
3RW40 46	80	4EF1512-3AA10 ((http://www.epcos.com) ⇒ B84143B0090R110)	90	25
3RW40 47	106	4EF1512-4AA10 ((http://www.epcos.com) ⇒ B84143B0120R110)	120	50

¹⁾ The interference suppression filter is used to remove conducted interference in the main circuit. The field-conducted emissions meet radio suppression level B. The filter selection applies under standard conditions: 10 starts per hour, start time 4 s at $300\% \text{ l}_{\text{e}}$.

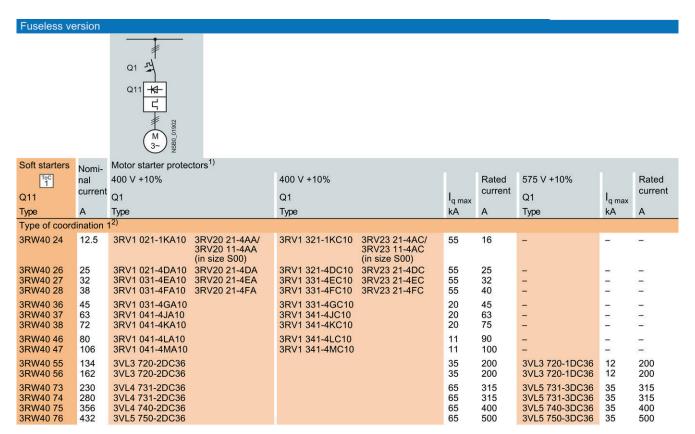
13.2.22 Types of coordination

The type of coordination according to which the motor feeder with soft starter is mounted depends on the application-specific requirements. Normally, fuseless mounting (combination of motor starter protector and soft starter) is sufficient. If type of coordination 2 needs to be fulfilled, semiconductor fuses must be fitted in the motor feeder.

- Type of coordination 1 in accordance with IEC 60947-4-1:
 The device is defective following a short-circuit failure and therefore unsuitable for further use (personnel and equipment must not be put at risk).
- Type of coordination 2 in accordance with IEC 60947-4-1:
 The device is suitable for further use following a short-circuit failure (personnel and equipment must not be put at risk).
 The type of coordination only refers to soft starters in conjunction with the stipulated protective device (motor starter protector / fuse), not to additional components in the feeder.



13.2.23 Fuseless version

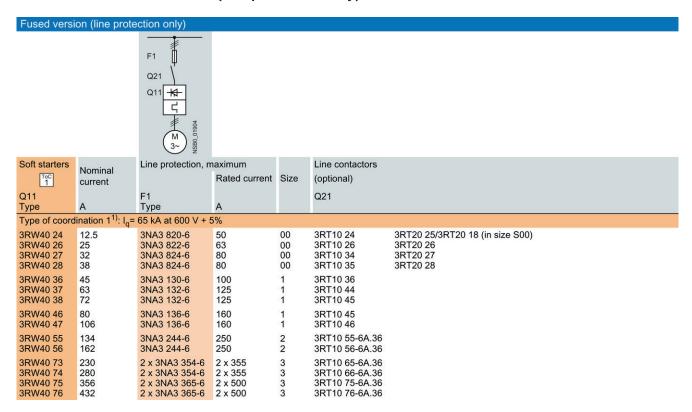


¹⁾ The rated motor current must be considered when selecting the devices. The 3RV13 and 3RV23 motor starter protectors are used for starter combinations (without motor protection). In this case, motor protection is provided by the 3RW40 soft starter.

²⁾ The types of coordination are described in chapter Types of coordination (Page 170).



13.2.24 Fused version (line protection only)

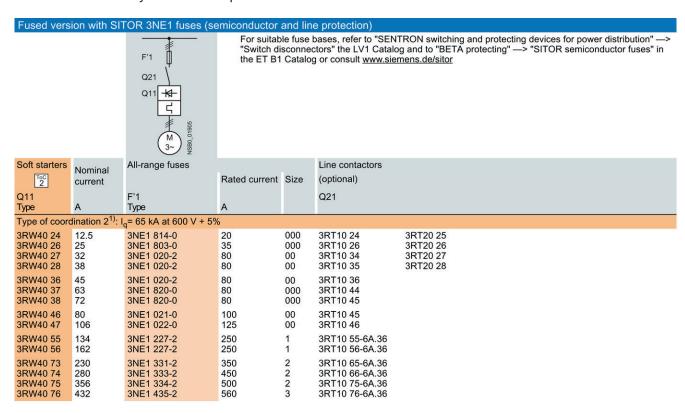


¹⁾ The types of coordination are described in chapter Types of coordination (Page 170). Type of coordination 1 only refers to soft starters in conjunction with the stipulated protective device (motor starter protector / fuse), not to additional components in the feeder.



13.2.25 Fused version with SITOR 3NE1 fuses

Assembly as for type of coordination 2, with SITOR all-range fuses (F´1) for combined thyristor and line protection.



¹⁾ The types of coordination are described in chapter Types of coordination (Page 170). Type of coordination 2 only refers to soft starters in conjunction with the stipulated protective device (motor starter protector / fuse), not to additional components in the feeder.



13.2.26 Fused version with SITOR 3NE3/4/8 fuses

Assembly as for type of coordination 2, with additional SITOR fuses (F3) for thyristor protection only.

Fused version with 3NE3 SITOR fuses (semiconductor protection by fuse, line, and overload protection by motor starter protector; alternatively, installation with contactor and overload relay possible)

F1 Q21 Q21 F3 Q11 K1 C7 0888 A Q11 K1 C7

For suitable fuse bases, refer to under "SENTRON switching and protecting devices for power distribution" —> "Switch disconnectors" in the LV1 Catalog and to "BETA protecting" —> "SITOR semiconductor fuses" in the ET B1 Catalog or consult www.siemens.de/sitor

		U ž			ž					
Soft starters		Semiconductor f	uses, minimum		Semiconductor f	uses, maximum		Semiconductor f	uses, minimum	
ToC 2	Nominal current		Rated current	Size		Rated current	Size		Rated current	Size
Q11		F3			F3			F3		
Type	Α	Туре	Α		Туре	Α		Туре	Α	
Type of coord	dination 2 ¹⁾ : I	_q = 65 kA at 600 \	/ + 5%							
3RW40 24	12.5	-	-	-	_	-	-	3NE4101	32	0
3RW40 26	25	-		_	3NE3 221	100	1	3NE4102	40	0
3RW40 27	32	-	-	_	3NE3 224	160	1	3NE4118	63	0
3RW40 28	38		-	-	3NE3 224	160	1	3NE4118	63	0
3RW40 36	45	_	7 <u>22</u>	_	3NE3 224	160	1	3NE4120	80	0
3RW40 37	63	-	-	-	3NE3 225	200	1	3NE4121	100	0
3RW40 38	72	3NE3 221	100	1	3NE3 227	250	1	-	=	1000)
3RW40 46	80	3NE3 222	125	1	3NE3 225	200	1	_	_	<u> </u>
3RW40 47	106	3NE3 224	160	1	3NE3 231	350	1	-	-	-
3RW40 55	134	3NE3 227	250	1	3NE3 335	560	2	_	_	
3RW40 56	162	3NE3 227	250	1	3NE3 335	560	2	-	_	-
3RW40 73	230	3NE3 232-0B	400	1	3NE3 333	450	2	_	_	_
3RW40 74	280	3NE3 233	450	1	3NE3 336	630	2	-	-	-
3RW40 75	356	3NE3 335	560	2	3NE3 336	630	2	_	_	
3RW40 76	432	3NE3 337-8	710	2	3NE3 340-8	900	2	-	-	-

Soft starters	Nominal	Semicondu	ctor fuses, max.		Semiconduct	tor fuses, min.		Semiconduc	tor fuses, max.		Cylindrica	fuses
ToC 2	current		Rated current	Size		Rated current	Size		Rated current	Size		Rated current
Q11		F3			F3			F3			F3	00
Type	Α	Type	Α		Type	Α		Type	Α		Type	Α
Type of coord	dination 2 ¹⁾ :	I _q = 65 kA at	600 V + 5%									
3RW40 24 3RW40 26 3RW40 27 3RW40 28	12.5 25 32 38	3NE4117 3NE4117 3NE4118 3NE4118	50 50 63 63	0 0 0 0	3NE8015-1 3NE8017-1 3NE8018-1 3NE8020-1	25 50 63 80	00 00 00 00	3NE8017-1 3NE8021-1 3NE8022-1 3NE8024-1	50 100 125 160	00 00 00 00	3NC2240 3NC2263 3NC2280 3NC2280	63 80
3RW40 36 3RW40 37 3RW40 38	45 63 72	3NE4120 3NE4121	80 100 -	0 0 -	3NE8020-1 3NE8021-1 3NE8022-1	80 100 125	00 00 00	3NE8024-1 3NE8024-1 3NE8024-1	160 160 160	00 00 00	3NC2280 - -	80
3RW40 46 3RW40 47	80 106	<u>-</u>	_	_	3NE8 022-1 3NE8 024-1	125 160	00 00	3NE8024-1 3NE8024-1	160 160	00 00	_ _	
3RW40 55 3RW40 56	134 162	_	-	_	<u>-</u>	=	_	_	-	-	_	
3RW40 73 3RW40 74 3RW40 75	230 280 356	_	=	=	-	-	_	_	-	=	-	
3RW40 76	432	_		_	_		_	_		_	_	

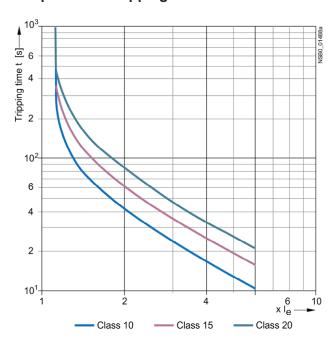


1601	Soft starters	Nomi-	Line contactors		Motor starter protect	ctors				Line protection, m		۵
	121	nal current	(optional)		400 V +10%		Rated current	575 V +10%	Rated		Rated	Size
	Q11	current	Q21		Q1		Carront	Q1	odiron	F1	ourront	
	Туре	Α			Туре		Α	Туре	Α	Туре	Α	
5	Type of coord	dination	2 ¹⁾ : I _q = 65 kA at 6	600 V + 5%								
	3RW40 24	12.5	3RT10 24	3RT20 25/ 3RT20 18 (in size S00	3RV1 021-4KA10	3RV20 21-4AA/ 3RV20 11-4AA (in size S00)	16	-	=:	3NA3 820-6	50	00
	3RW40 26	25	3RT10 26	3RT20 26	3RV1 021-4DA10	3RV20 21-4DA	25	_		3NA3 822-6	63	00
- 10	3RW40 27	32	3RT10 34	3RT20 27	3RV1 031-4EA10	3RV20 21-4EA	32		-	3NA3 824-6	80	00
8	3RW40 28	38	3RT10 35	3RT20 28	3RV1 031-4FA10	3RV20 21-4FA	40	· —	-	3NA3 824-6	80	00
	3RW40 36	45	3RT10 36		3RV1 031-4GA10		45	-	-	3NA3 130-6	100	1
- 10	3RW40 37	63	3RT10 44		3RV1 041-4JA10		63	-	-	3NA3 132-6	125	1
	3RW40 38	72	3RT10 45		3RV1 041-4KA10		75	(-)	 2	3NA3 132-6	125	1
	3RW40 46	80	3RT10 45		3RV1 041-4LA10		90	-	-	3NA3 136-6	160	1
1	3RW40 47	106	3RT10 46		3RV1 041-4MA10		100	11-11	-	3NA3 136-6	160	1
- 12	3RW40 55	134	3RT10 55-6A.36		3VL3 720		200	3VL3 720	200	3NA3 244-6	250	2
	3RW40 56	162	3RT10 56-6A.36		3VL3 720		200	3VL3 720	200	3NA3 244-6	250	2
	3RW40 73	230	3RT10 65-6A.36		3VL4 731		315	3VL5 731	315	2 x 3NA3 354-6	2 x 355	3
12	3RW40 74	280	3RT10 66-6A.36		3VL4 731		315	3VL5 731	315	2 x 3NA3 354-6	2 x 355	3
	3RW40 75 3RW40 76	356 432	3RT10 75-6A.36 3RT10 76-6A.36		3VL4 740 3VL5 750		400 500	3VL5 740 3VL5 750	400 500	2 x 3NA3 365-6 2 x 3NA3 365-6	2 x 500 2 x 500	3
	31744-0 70	452	311 10 70-0A.30		3713730		300	3713730	300	2 x 314A3 303-0	Z X 300	5

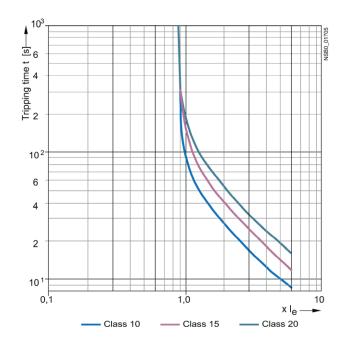
¹⁾ The types of coordination are described in chapter Types of coordination (Page 170). Type of coordination 2 only refers to soft starters in conjunction with the stipulated protective device (motor starter protector / fuse), not to additional components in the feeder.



13.2.27 Motor protection tripping characteristics for 3RW40 (with symmetry)



13.2.28 Motor protection tripping characteristics for 3RW40 (with asymmetry)

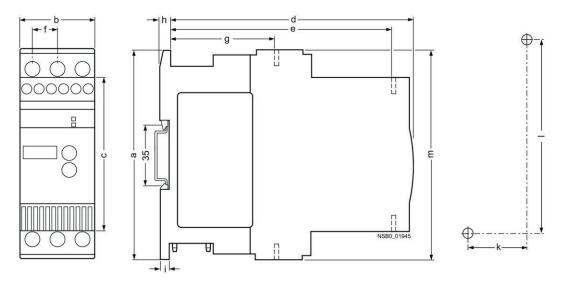




Dimension drawings

14

14.1 3RW30 for standard applications

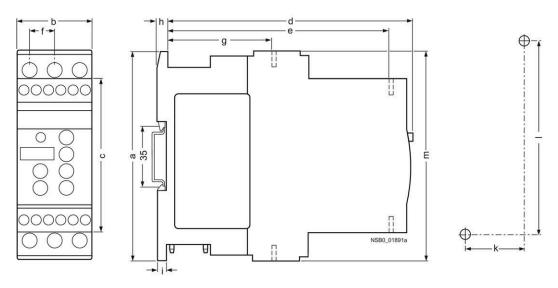


Type / dimensions (mm)	а	b	С	d	е	f	g	h	j	k	1	m
3RW3011.	95	45	62	146	126	14.4	63	5	6.5	35	85	95
3RW3012.	95	45	62	146	126	14.4	63	5	6.5	35	85	117.2
3RW3021.	125	45	92	146	126	14.4	63	5	6.5	35	115	125
3RW3022.	125	45	92	146	126	14.4	63	5	6.5	35	115	150
3RW303.	160	55	110	163	140	18	63	5	6.5	30	150	144
3RW304.	170	70	110	181	158	22.5	85	5	10	60	160	160

Distances from grounded parts (mm)	Lateral	Тор	Bottom	Fixing screws	Tightening torques (Nm)
3RW301.	5	60	40	M4	1
3RW302.	5	60	40	M4	1
3RW303.	30	60	40	M4	1
3RW304.	30	60	40	M4	2



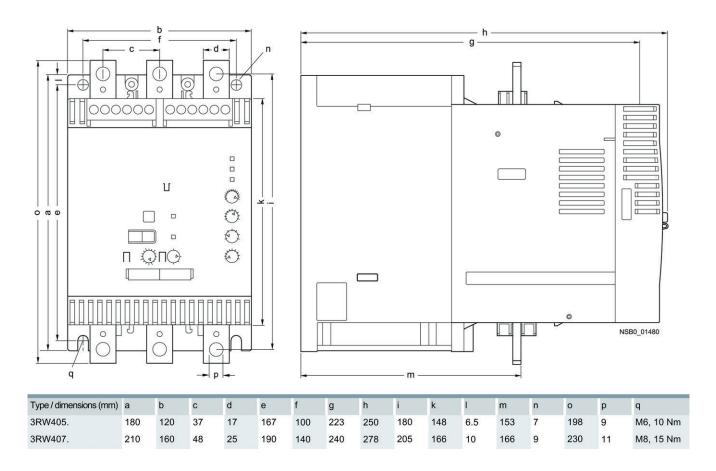
14.2 3RW40 for standard applications



Type/dimension (mm)	а	b	С	d	е	f	g	h	i	k	I	m
3RW4021. 3RW4022.	125 125	45 45	92 92	149 149	126 126	14.4 14.4	63 63	5 5	6.5 6.5	35 35	115 115	125 150
3RW403.	160	55	110	165	140	18	63	5	6.5	30	150	144
3RW404.	170	70	110	183	158	22.5	85	5	10	60	160	160

Distances to grounded parts (mm)	Side	Тор	Bottom	Retaining screws	Tightening torque (Nm)
3RW402.	5	60	40	M4	1
3RW403.	30	60	40	M4	1
3RW404.	30	60	40	M4	2









Typical circuit diagrams

15

15.1 Typical circuit for the optional thermistor motor protection evaluation

A thermistor motor protection evaluation function is optionally available for the 24 V AC/DC control voltage version of the 3RW40 2 to 3RW40 4.

Note

If a thermistor is connected (PTC type A or Klixon), you must remove the copper jumper between terminals T11/21 and T22.

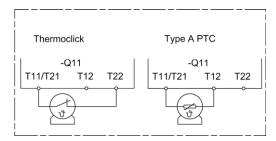


Figure 15-1 Optional thermistor motor protection evaluation



15.2 Control by pushbutton

15.2.1 Control of the 3RW30 by pushbutton

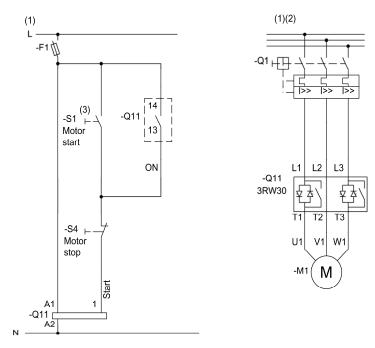


Figure 15-2 Wiring of the 3RW30 control and main circuits

- (1) For the permissible values for the main and control voltage (dependent on the MLFB), refer to chapter Technical data (Page 135) .
- (2) Alternatively, the motor feeder can be assembled as a fuseless or fused version with type of coordination 1 or 2. For the assignment of fuses and switching devices, refer to chapter Technical data (Page 135)



(3) Automatic restart. Can result in death, serious injury, or property damage.

Faults caused by incorrect control voltage, a missing load, or a phase failure (refer to chapter 3RW30: LEDs (Page 52)) are automatically reset when the system returns to normal. An automatic restart is initiated and the 3RW restarted if a start command is present at the input.

If you do not want the motor to start automatically, you must integrate suitable additional components, e.g. phase failure or load monitoring devices, into the control and main circuits.



15.2.2 Control of the 3RW40 by pushbutton

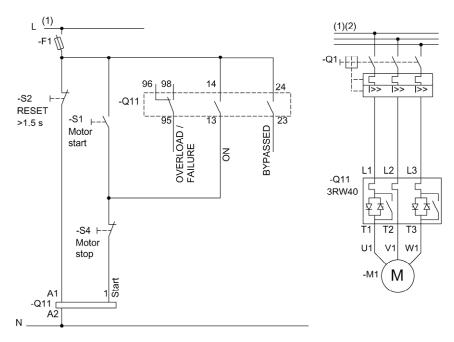


Figure 15-3 Wiring of the 3RW40 2 to 3RW40 4 control circuit and the 3RW40 2 to 3RW40 7 main circuit



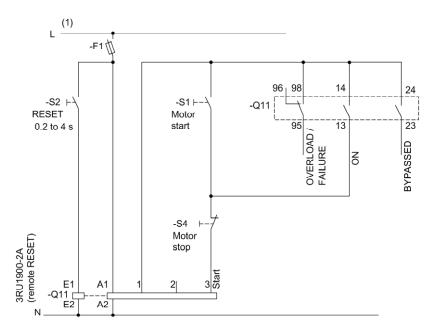


Figure 15-4 Wiring of the 3RW40 5 to 3RW40 7 control circuit

- (1) For the permissible values for the main and control voltage (dependent on the MLFB), refer to chapter Technical data (Page 135) .
- (2) Alternatively, the motor feeder can be assembled as a fuseless or fused version with type of coordination 1 or 2. For the assignment of fuses and switching devices, refer to chapter Technical data (Page 135)

For the optional thermistor motor protection evaluation, refer to Typical circuit for the optional thermistor motor protection evaluation (Page 181).



15.3 Control by switch

15.3.1 Control of the 3RW30 by switch

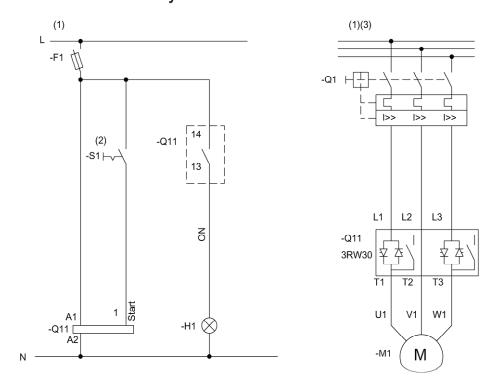


Figure 15-5 Wiring of the control and main circuits

(1) For the permissible values for the main and control voltage (dependent on the MLFB), refer to chapter Technical data (Page 135) .



(2) Automatic restart. Can result in death, serious injury, or property damage.

Faults caused by incorrect control voltage, a missing load, or a phase failure (refer to chapter 3RW30: LEDs (Page 52)) are automatically reset when the system returns to normal. An automatic restart is initiated and the 3RW restarted if a start command is present at the input.

If you do not want the motor to start automatically, you must integrate suitable additional components, e.g. phase failure or load monitoring devices, into the control and main circuits.



15.3.2 Control of the 3RW40 by switch

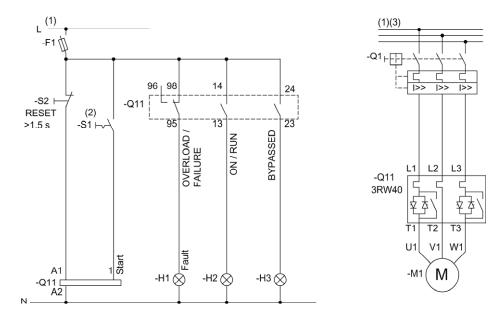


Figure 15-6 Wiring of the 3RW40 2 to 3RW40 4 control circuit and the 3RW40 2 to 3RW40 7 main circuit



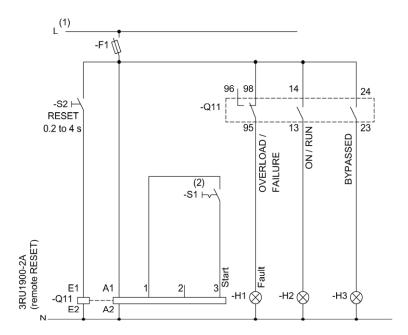


Figure 15-7 Wiring of the 3RW40 5 to 3RW40 7 control circuit



(2) Automatic restart.

Can result in death, serious injury, or property damage.

The start command (e.g. issued by the PLC or switch S1) must be reset prior to issuing a RESET command because the motor attempts to restart again automatically following this RESET command if a start command is still present. This particularly applies if the motor protection has tripped. For safety reasons, you are advised to integrate the group fault output (terminals 95 and 96) in the controller.

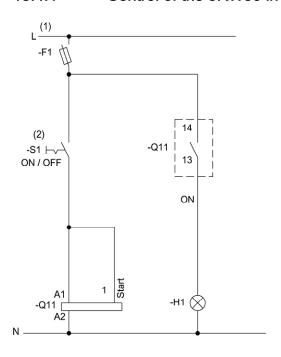
(3) Alternatively, the motor feeder can be assembled as a fuseless or fused version with type of coordination 1 or 2. For the assignment of fuses and switching devices, refer to chapter Technical data (Page 135)

For the optional thermistor motor protection evaluation, refer to Typical circuit for the optional thermistor motor protection evaluation (Page 181).



15.4 Control in automatic mode

15.4.1 Control of the 3RW30 in automatic mode



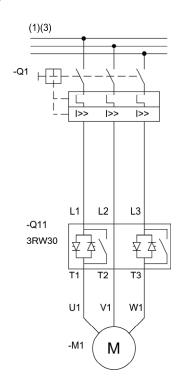


Figure 15-8 Wiring of the 3RW30 control and main circuits

(1) For the permissible values for the main and control voltage (dependent on the MLFB), refer to chapter Technical data (Page 135) .



WARNING

(2) Automatic restart. Can result in death, serious injury, or property damage.

Faults caused by incorrect control voltage, a missing load, or a phase failure (refer to chapter 3RW30: LEDs (Page 52)) are automatically reset when the system returns to normal. An automatic restart is initiated and the 3RW restarted if a start command is present at the input.

If you do not want the motor to start automatically, you must integrate suitable additional components, e.g. phase failure or load monitoring devices, into the control and main circuits.



15.4.2 Control of the 3RW40 in automatic mode

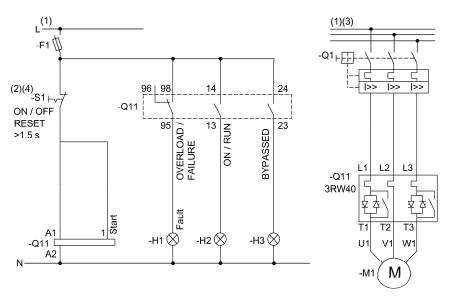


Figure 15-9 Wiring of the 3RW40 2 to 3RW40 4 control circuit and the 3RW40 2 to 3RW40 7 main circuit

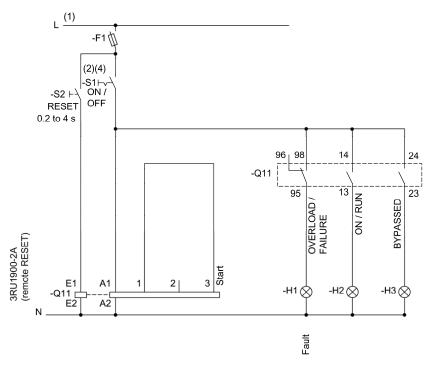


Figure 15-10 Wiring of the 3RW40 5 to 3RW40 7 control circuit





(2) Automatic restart.

Can result in death, serious injury, or property damage.

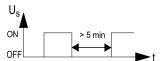
The start command (e.g. issued by the PLC or switch S1) must be reset prior to issuing a RESET command because the motor attempts to restart again automatically following this RESET command if a start command is still present. This particularly applies if the motor protection has tripped. For safety reasons, you are advised to integrate the group fault output (terminals 95 and 96) in the controller.

(3) Alternatively, the motor feeder can be assembled as a fuseless or fused version with type of coordination 1 or 2. For the assignment of fuses and switching devices, refer to chapter Technical data (Page 135).

Note

(4) Idle time until restart.

Owing to the intrinsic protection (3RW), an idle time of at least five minutes must be allowed prior to restarting if the device is switched on and off by means of the control voltage under field conditions.



For the optional thermistor motor protection evaluation, refer to Typical circuit for the optional thermistor motor protection evaluation (Page 181)



15.5 Control by PLC

15.5.1 Control of the 3RW30 with 24 V DC by PLC

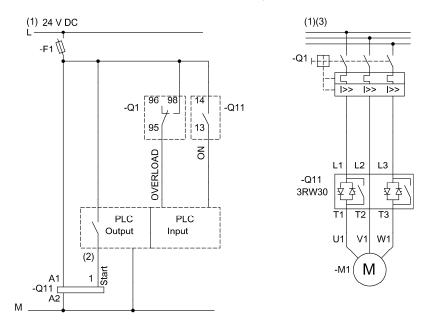


Figure 15-11 Wiring of the 3RW30 control and main circuits

(1) For the permissible values for the main and control voltage (dependent on the MLFB), refer to chapter Technical data (Page 135) .



(2) Automatic restart. Can result in death, serious injury, or property damage.

Faults caused by incorrect control voltage, a missing load, or a phase failure (refer to chapter 3RW30: LEDs (Page 52)) are automatically reset when the system returns to normal. An automatic restart is initiated and the 3RW restarted if a start command is present at the input.

If you do not want the motor to start automatically, you must integrate suitable additional components, e.g. phase failure or load monitoring devices, into the control and main circuits.



15.5.2 Control of the 3RW40 by PLC

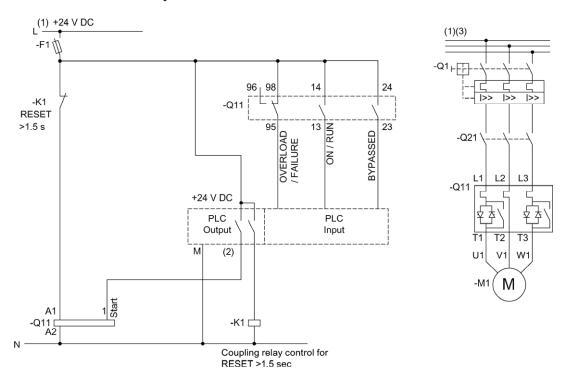


Figure 15-12 Wiring of the 3RW40 2 to 3RW40 4 control circuit (with 24 V control voltage) and the 3RW40 2 to 3RW40 7 main circuit



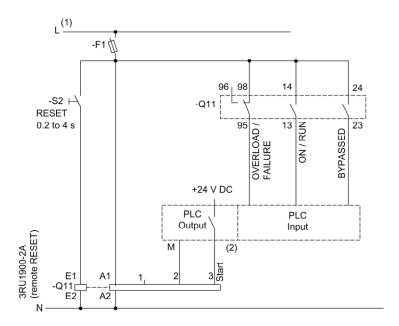


Figure 15-13 Wiring of the 3RW40 5 to 3RW40 7 control circuit



(2) Automatic restart.

Can result in death, serious injury, or property damage.

The start command (e.g. issued by the PLC or switch S1) must be reset prior to issuing a RESET command because the motor attempts to restart again automatically following this RESET command if a start command is still present. This particularly applies if the motor protection has tripped. For safety reasons, you are advised to integrate the group fault output (terminals 95 and 96) in the controller.

(3) Alternatively, the motor feeder can be assembled as a fuseless or fused version with type of coordination 1 or 2. For the assignment of fuses and switching devices, refer to chapter Technical data (Page 135)

For the optional thermistor motor protection evaluation, refer to Typical circuit for the optional thermistor motor protection evaluation (Page 181).



15.6 Control with an optional main / line contactor

15.6.1 Control of the 3RW30 with a main contactor

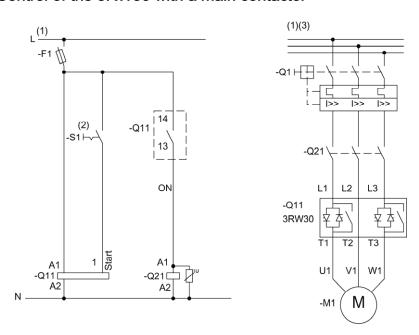


Figure 15-14 Wiring of the 3RW30 control and main circuits

(1) For the permissible values for the main and control voltage (dependent on the MLFB), refer to chapter Technical data (Page 135) .



(2) Automatic restart. Can result in death, serious injury, or property damage.

Faults caused by incorrect control voltage, a missing load, or a phase failure (refer to chapter 3RW30: LEDs (Page 52)) are automatically reset when the system returns to normal. An automatic restart is initiated and the 3RW restarted if a start command is present at the input.

If you do not want the motor to start automatically, you must integrate suitable additional components, e.g. phase failure or load monitoring devices, into the control and main circuits.



15.6.2 Control of the 3RW40 with a main contactor

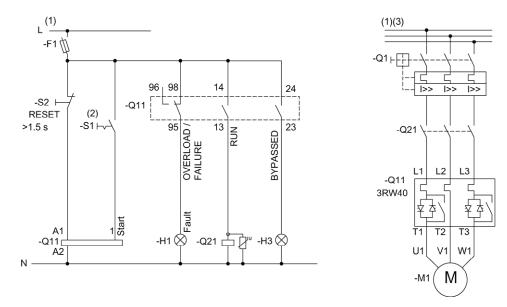


Figure 15-15 Wiring of the 3RW40 2 to 3RW40 4 control circuit and the 3RW40 2 to 3RW40 7 main circuit



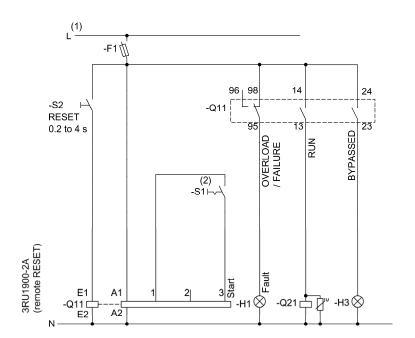


Figure 15-16 Wiring of the 3RW40 5 to 3RW40 7 control circuit

Note

If a soft stop is required, the function of output 13/14 must be reparameterized to "RUN" (refer to Commissioning the 3RW40 (Page 109)).

(1) For the permissible values for the main and control voltage (dependent on the MLFB), refer to chapter Technical data (Page 135) .



WARNING

(2) Automatic restart.

Can result in death, serious injury, or property damage.

The start command (e.g. issued by the PLC or switch S1) must be reset prior to issuing a RESET command because the motor attempts to restart again automatically following this RESET command if a start command is still present. This particularly applies if the motor protection has tripped. For safety reasons, you are advised to integrate the group fault output (terminals 95 and 96) in the controller.

(3) Alternatively, the motor feeder can be assembled as a fuseless or fused version with type of coordination 1 or 2. For the assignment of fuses and switching devices, refer to chapter Technical data (Page 135)

For the optional thermistor motor protection evaluation, refer to Typical circuit for the optional thermistor motor protection evaluation (Page 181).



15.7 Reversing circuit

15.7.1 3RW30 reversing circuit

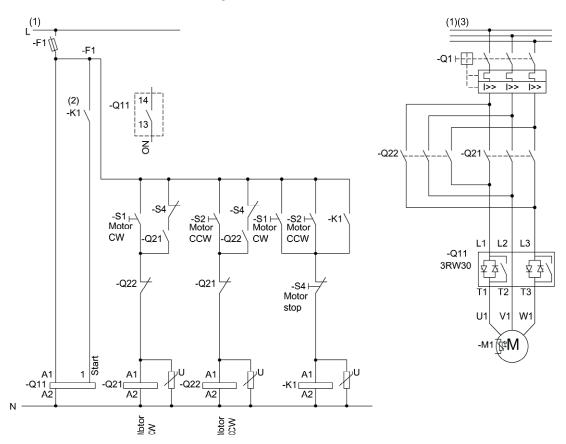


Figure 15-17 Wiring of the 3RW30 control and main circuits

(1) For the permissible values for the main and control voltage (dependent on the MLFB), refer to chapter Technical data (Page 135).

MARNING

(2) Automatic restart. Can result in death, serious injury, or property damage.

Faults caused by incorrect control voltage, a missing load, or a phase failure (refer to chapter 3RW30: LEDs (Page 52)) are automatically reset when the system returns to normal. An automatic restart is initiated and the 3RW restarted if a start command is present at the input.

If you do not want the motor to start automatically, you must integrate suitable additional components, e.g. phase failure or load monitoring devices, into the control and main circuits.



15.7.2 3RW40 reversing circuit

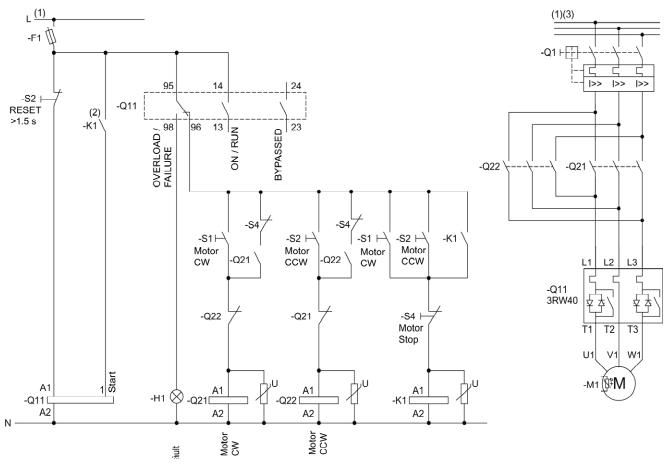


Figure 15-18 Wiring of the 3RW40 2 to 3RW40 5 control circuit and the 3RW40 2 to 3RW40 7 main circuit



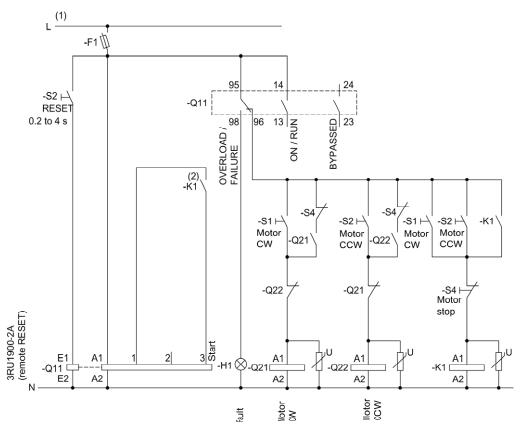


Figure 15-19 Wiring of the 3RW40 5 to 3RW40 7 control circuit



(2) Automatic restart.

Can result in death, serious injury, or property damage.

The start command (e.g. issued by the PLC or switch S1) must be reset prior to issuing a RESET command because the motor attempts to restart again automatically following this RESET command if a start command is still present. This particularly applies if the motor protection has tripped. For safety reasons, you are advised to integrate the group fault output (terminals 95 and 96) in the controller.

(3) Alternatively, the motor feeder can be assembled as a fuseless or fused version with type of coordination 1 or 2. For the assignment of fuses and switching devices, refer to chapter Technical data (Page 135)

For the optional thermistor motor protection evaluation, refer to Typical circuit for the optional thermistor motor protection evaluation (Page 181).

Note

No soft stop possible. Set the ramp-down time to 0 s with the potentiometer.



15.8 Control of a magnetic parking brake

15.8.1 3RW30 motor with magnetic parking brake

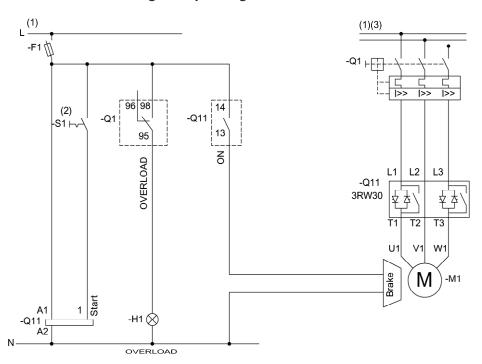


Figure 15-20 Wiring of the 3RW30 control and main circuits

(1) For the permissible values for the main and control voltage (dependent on the MLFB), refer to chapter Technical data (Page 135) .



(2) Automatic restart. Can result in death, serious injury, or property damage.

Faults caused by incorrect control voltage, a missing load, or a phase failure (refer to chapter 3RW30: LEDs (Page 52)) are automatically reset when the system returns to normal. An automatic restart is initiated and the 3RW restarted if a start command is present at the input.

If you do not want the motor to start automatically, you must integrate suitable additional components, e.g. phase failure or load monitoring devices, into the control and main circuits.



15.8.2 3RW40 2 to 3RW40 4, control of a motor with a magnetic parking brake

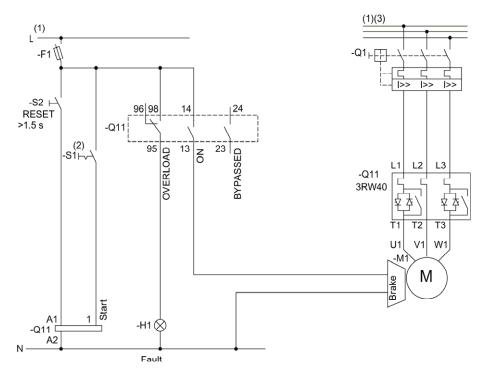


Figure 15-21 Wiring of the 3RW40 2 to 3RW40 4 control / main circuit

(1) For the permissible values for the main and control voltage (dependent on the MLFB), refer to chapter Technical data (Page 135) .



(2) Automatic restart.

Can result in death, serious injury, or property damage.

The start command (e.g. issued by the PLC or switch S1) must be reset prior to issuing a RESET command because the motor attempts to restart again automatically following this RESET command if a start command is still present. This particularly applies if the motor protection has tripped. For safety reasons, you are advised to integrate the group fault output (terminals 95 and 96) in the controller.

(3) Alternatively, the motor feeder can be assembled as a fuseless or fused version with type of coordination 1 or 2. For the assignment of fuses and switching devices, refer to chapter Technical data (Page 135)

For the optional thermistor motor protection evaluation, refer to Typical circuit for the optional thermistor motor protection evaluation (Page 181).

Note

No soft stop possible. Set the ramp-down time to 0 s with the potentiometer.



15.8.3 3RW40 5 to 3RW40 7, control of a motor with a magnetic parking brake

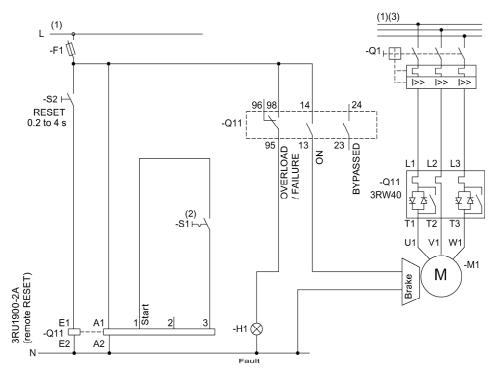


Figure 15-22 Wiring of the 3RW40 5 to 3RW40 7 control / main circuit

(1) For the permissible values for the main and control voltage (dependent on the MLFB), refer to chapter Technical data (Page 135) .



(2) Automatic restart.

Can result in death, serious injury, or property damage.

The start command (e.g. issued by the PLC or switch S1) must be reset prior to issuing a RESET command because the motor attempts to restart again automatically following this RESET command if a start command is still present. This particularly applies if the motor protection has tripped. For safety reasons, you are advised to integrate the group fault output (terminals 95 and 96) in the controller.

(3) Alternatively, the motor feeder can be assembled as a fuseless or fused version with type of coordination 1 or 2. For the assignment of fuses and switching devices, refer to chapter Technical data (Page 135)

For the optional thermistor motor protection evaluation, refer to Typical circuit for the optional thermistor motor protection evaluation (Page 181).

Note

No soft stop possible. Set the ramp-down time to 0 s with the potentiometer.



15.9 Emergency stop

15.9.1 3RW30 emergency stop and 3TK2823 safety relay

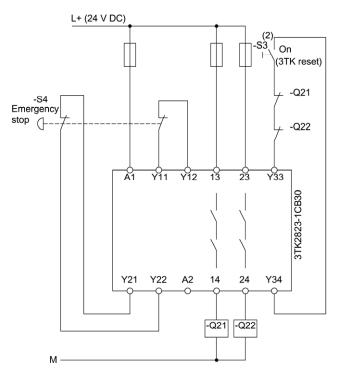


Figure 15-23 Wiring of the emergency stop control circuit and the 3TK28 safety relay



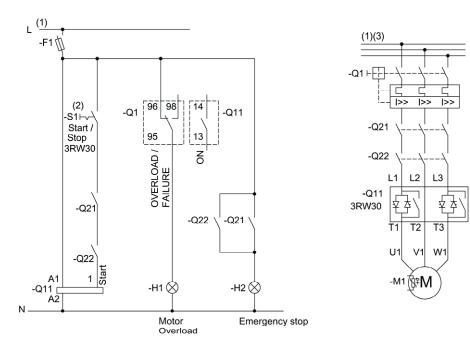


Figure 15-24 Wiring of the 3RW30 control and main circuits



WARNING

(2) Automatic restart. Can result in death, serious injury, or property damage.

- If the 3TK28 is reset

Faults caused by incorrect control voltage, a missing load, or a phase failure (refer to chapter 3RW30: LEDs (Page 52)) are automatically reset when the system returns to normal.

An automatic restart is initiated and the 3RW restarted if a start command is present at the input.

If you do not want the motor to start automatically, you must integrate suitable additional components, e.g. phase failure or load monitoring devices, into the control and main circuits.



15.9.2 3RW40 2 to 3RW40 4 emergency stop and 3TK2823 safety relay

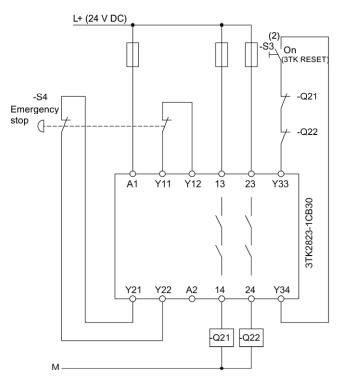
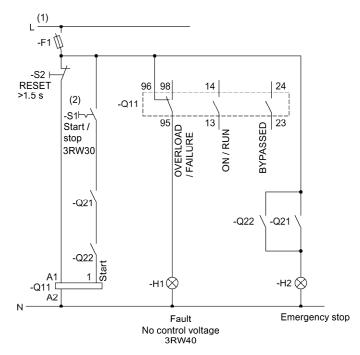


Figure 15-25 Wiring of the emergency stop control circuit and the 3TK28 safety relay





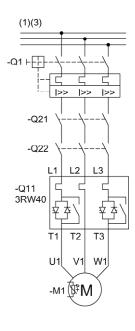


Figure 15-26 Wiring of the 3RW40 2 to 3RW40 4 control circuit and the 3RW40 2 to 3RW40 7 main circuit



WARNING

(2) Automatic restart.

Can result in death, serious injury, or property damage.

The start command (e.g. issued by the PLC or switch S1) must be reset prior to issuing a RESET command because the motor attempts to restart again automatically following this RESET command (3TK or 3RW) if a start command is still present. This particularly applies if the motor protection has tripped. For safety reasons, you are advised to integrate the group fault output (terminals 95 and 96) in the controller.

(3) Alternatively, the motor feeder can be assembled as a fuseless or fused version with type of coordination 1 or 2. For the assignment of fuses and switching devices, refer to chapter Technical data (Page 135)

For the optional thermistor motor protection evaluation, refer to Typical circuit for the optional thermistor motor protection evaluation (Page 181).

Note

If the soft stop function is set (ramp-down time potentiometer set to >0 s) and the emergency stop circuit is tripped, a "Missing load voltage, phase failure / missing load" fault may be indicated on the soft starter. In this case, the soft starter must be reset according to the selected RESET MODE.



15.9.3 3RW40 5 to 3RW40 7 emergency stop and 3TK2823 safety relay

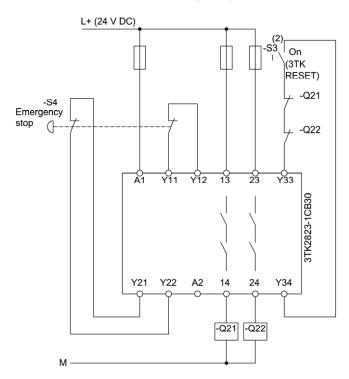


Figure 15-27 Wiring of the emergency stop control circuit and the 3TK28 safety relay

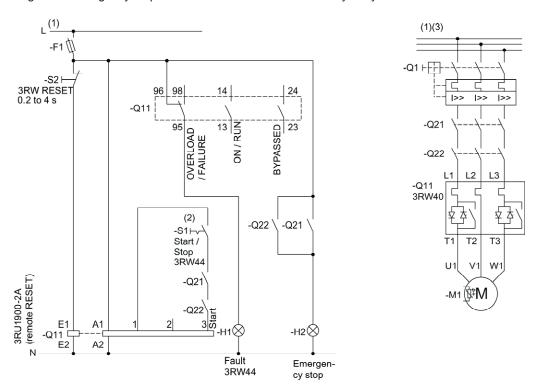


Figure 15-28 Wiring of the 3RW40 5 to 3RW40 7 control circuit and the 3RW40 2 to 3RW40 7 main circuit





(2) Automatic restart.

Can result in death, serious injury, or property damage.

The start command (e.g. issued by the PLC or switch S1) must be reset prior to issuing a RESET command because the motor attempts to restart again automatically following this RESET command (3TK or 3RW) if a start command is still present. This particularly applies if the motor protection has tripped. For safety reasons, you are advised to integrate the group fault output (terminals 95 and 96) in the controller.

(3) Alternatively, the motor feeder can be assembled as a fuseless or fused version with type of coordination 1 or 2. For the assignment of fuses and switching devices, refer to chapter Technical data (Page 135)

For the optional thermistor motor protection evaluation, refer to Typical circuit for the optional thermistor motor protection evaluation (Page 181).

Note

If the soft stop function is set (ramp-down time potentiometer set to >0 s) and the emergency stop circuit is tripped, a "Missing load voltage, phase failure / missing load" fault may be indicated on the soft starter. In this case, the soft starter must be reset according to the selected RESET MODE.



15.10 3RW and contactor for emergency starting

15.10.1 3RW30 and contactor for emergency starting

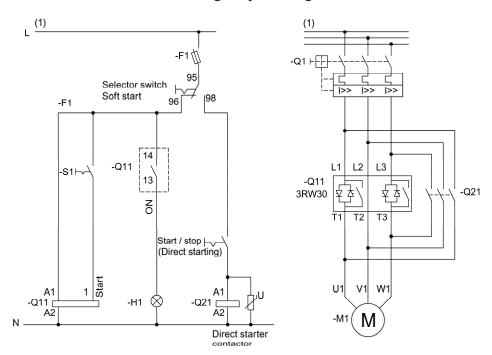


Figure 15-29 Wiring of the 3RW30 control and main circuits

(1) For the permissible values for the main and control voltage (dependent on the MLFB), refer to chapter Technical data (Page 135) .



(2) Automatic restart. Can result in death, serious injury, or property damage.

Faults caused by incorrect control voltage, a missing load, or a phase failure (refer to Troubleshooting chapter) are automatically reset when the system returns to normal. An automatic restart is initiated and the 3RW restarted if a start command is present at the input.

If you do not want the motor to start automatically, you must integrate suitable additional components, e.g. phase failure or load monitoring devices, into the control and main circuits.



15.10.2 3RW40 and contactor for emergency starting

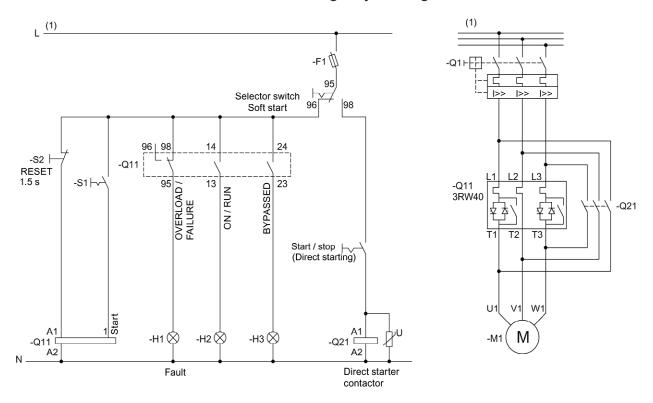


Figure 15-30 Wiring of the 3RW40 2 to 3RW40 4 control circuit and the 3RW40 2 to 3RW40 7 main circuit



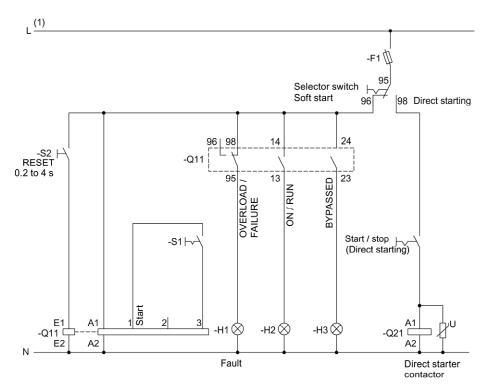


Figure 15-31 Wiring of the 3RW40 5 to 3RW40 7 control circuit



(2) Automatic restart.

Can result in death, serious injury, or property damage.

The start command (e.g. issued by the PLC or switch S1) must be reset prior to issuing a RESET command because the motor attempts to restart again automatically following this RESET command if a start command is still present. This particularly applies if the motor protection has tripped. For safety reasons, you are advised to integrate the group fault output (terminals 95 and 96) in the controller.

(3) Alternatively, the motor feeder can be assembled as a fuseless or fused version with type of coordination 1 or 2. For the assignment of fuses and switching devices, refer to chapter Technical data (Page 135)

For the optional thermistor motor protection evaluation, refer to Typical circuit for the optional thermistor motor protection evaluation (Page 181).



15.11 Dahlander / multispeed motor

15.11.1 3RW30 and Dahlander motor starting

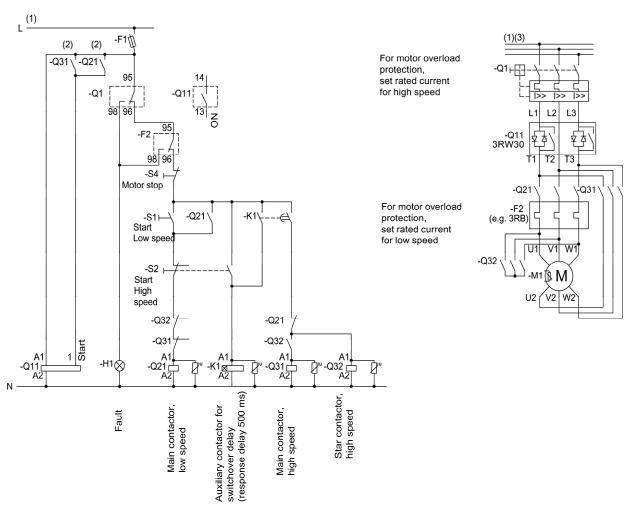


Figure 15-32 Wiring of the 3RW30 control and main circuits



WARNING

(2) Automatic restart. Can result in death, serious injury, or property damage.

Faults caused by incorrect control voltage, a missing load, or a phase failure (refer to chapter 3RW30: LEDs (Page 52)) are automatically reset when the system returns to normal. An automatic restart is initiated and the 3RW restarted if a start command is present at the input.

If you do not want the motor to start automatically, you must integrate suitable additional components, e.g. phase failure or load monitoring devices, into the control and main circuits.



15.11.2 3RW40 2 to 3RW40 4 and Dahlander motor starting

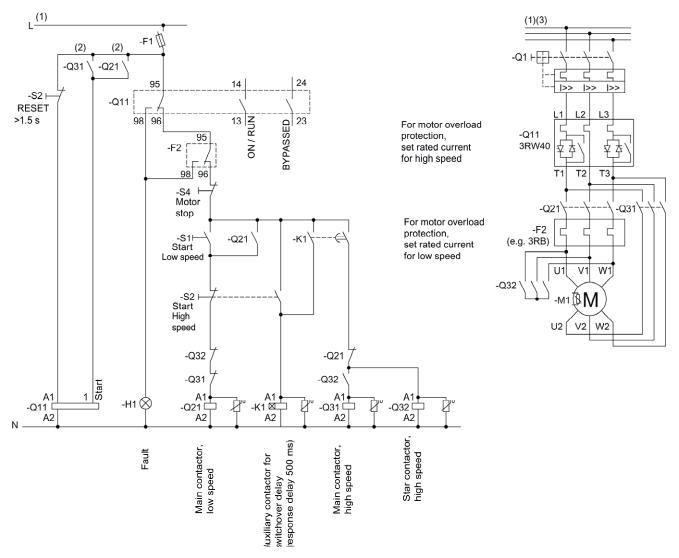


Figure 15-33 Wiring of the 3RW40 2 to 3RW40 4 control circuit and the 3RW40 2 to 3RW40 7 main circuit





(2) Automatic restart.

Can result in death, serious injury, or property damage.

The start command (e.g. issued by the PLC or switch S1) must be reset prior to issuing a RESET command because the motor attempts to restart again automatically following this RESET command if a start command is still present. This particularly applies if the motor protection has tripped. For safety reasons, you are advised to integrate the group fault output (terminals 95 and 96) in the controller.

(3) Alternatively, the motor feeder can be assembled as a fuseless or fused version with type of coordination 1 or 2. For the assignment of fuses and switching devices, refer to chapter Technical data (Page 135)

For the optional thermistor motor protection evaluation, refer to Typical circuit for the optional thermistor motor protection evaluation (Page 181).

Note

No soft stop possible. Set the ramp-down time to 0 s with the potentiometer.



15.11.3 3RW40 5 to 3RW40 7 and Dahlander motor starting

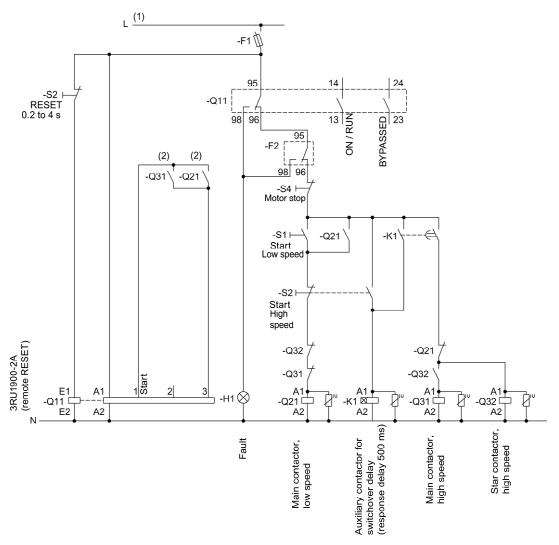


Figure 15-34 Wiring of the 3RW40 5 to 3RW40 7 control circuit



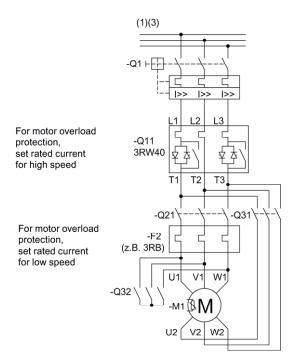


Figure 15-35 Wiring of the 3RW40 5 to 3RW40 7 main circuit

(1) For the permissible values for the main and control voltage (dependent on the MLFB), refer to chapter Technical data (Page 135) .



(2) Automatic restart.

Can result in death, serious injury, or property damage.

The start command (e.g. issued by the PLC or switch S1) must be reset prior to issuing a RESET command because the motor attempts to restart again automatically following this RESET command if a start command is still present. This particularly applies if the motor protection has tripped. For safety reasons, you are advised to integrate the group fault output (terminals 95 and 96) in the controller.

(3) Alternatively, the motor feeder can be assembled as a fuseless or fused version with type of coordination 1 or 2. For the assignment of fuses and switching devices, refer to chapter Technical data (Page 135)

Note

No soft stop possible. Set the ramp-down time to 0 s with the potentiometer.





Accessories

16.1 Box terminal blocks for soft starters

	For soft starter type	Size	Version	Order No.
Box terminal blocks fo (2 required per device	r soft starters for round a)	nd ribbon cable	98	
	3RW40 5.	S6	 Max. 70 mm² Max. 120 mm² Auxiliary conductor terminal for box terminal 	3RT19 55-4G 3RT19 56-4G 3TX7 500-0A
	3RW40 7.	S12	Max. 240 mm² With auxiliary conductor terminal	3RT19 66-4G

16.2 3-phase infeed terminals

	Connection cross-sections			Tightening torque	For soft starter size	Order No.
000	Solid or stranded	Finely stranded with end sleeve	AWG cables, solid or stranded			
חוויי	mm ²	mm²	AWG	Nm		
	2.5 16	2.5 16	10 4	3 4	S00 (3RW30 1.) S0 (3RW30 2.) S0 (3RW40 2.)	3RV2925-5AB

16.3 Auxiliary conductor terminals

	For soft starter type	Size	Order No.				
Auxiliary conductor terminals, 3-pole							
	3RW30 4. 3RW40 4.	S3	3RT19 46-4F				



16.4 Covers for soft starters

	For soft starter type	Size	Order No.			
Terminal covers for box t	erminals					
	Additional touch protection to be fitted at the box terminals (2 units required per device)					
None States	3RW30 3.	S2	3RT19 36-4EA2			
	3RW40 3.					
	3RW30 4.	S3	3RT19 46-4EA2			
	3RW40 4.					
	3RW40 5.	S6	3RT19 56-4EA2			
	3RW40 7.	S12	3RT19 66-4EA2			
Terminal covers for cable	lug and busbar connections					
and the		For complying with the phase clearances and as touch protection if box terminal is remove (2 units required per contactor)				
	3RW30 4.	S3	3RT19 46-4EA1			
ada dada	3RW40 4.					
	3RW40 5.	S6	3RT19 56-4EA1			
	3RW40 7.	S12	3RT19 66-4EA1			
Sealing covers						
	3RW40 2 to 3RW40 4.	S0, S2, S3	3RW49 00-0PB10			
	3RW40 5. and 3RW40 7	S6 S12	3RW49 00-0PB00			



16.5 Modules for RESET

	For soft starter type	Size	Version	Order No.
Modules for remote	RESET, electrical			
	Operating range 0.8 Power consumption ON time 0.2 s to 4 s Switching frequency	AC 80 VA, DC 70 W,		
	3RW40 5. and 3RW40 7.	S6, S12	• AC/DC 24 V 30 V	3RU19 00-2AB71
			• AC/DC 110 V 127 V	3RU19 00-2AF71
			• AC/DC 220 V 250 V	3RU19 00-2AM71
Mechanical RESET,	comprising			
JA.	3RW40 5. and 3RW40 7.	S6, S12	 Resetting plunger, holder, and former 	3RU19 00-1A
			 Suitable pushbutton IP65, 22 mm diameter, 12 mm stroke 	3SB30 00-0EA11
			Extension plunger	3SX13 35
Cable releases with	holder for RESET			
	For 6.5 mm diamete	er holes in the control pa	nel; max. control panel thickr	ess 8 mm
6	3RW40 5. and	S6,	 Length 400 mm 	3RU19 00-1B
	3RW40 7.	S12	Length 600 mm	3RU19 00-1C

Note

Remote RESET is already integrated in the 3RW40 2. to 3RW40 4. soft starters.



16.6 Link modules to 3RV10 motor starter protectors

	For soft starter type	Size	Motor starter protector size	Order No.
Link modules to 3F	RV10 motor starter protectors	S		
	3RW30 13, 3RW30 14, 3RW30 16, 3RW30 17, 3RW30 18	S00	S0	3RA19 21-1A
	3RW30 26 3RW40 24 3RW40 26	S0	S0	3RA19 21-1A
	3RW30 36 3RW40 36	S2	S2	3RA19 31-1A
	3RW30 46, 3RW30 47	S3	S3	3RA19 41-1A
	3RW40 46, 3RW40 47			

16.7 Link modules to 3RV20 motor starter protectors

	For soft starter type	Size	Motor starter protector size	Order No.
ink modules to 3F	RV20 motor starter protectors	s ¹⁾		
M. villet	With screw terminals			
	3RW30 1.	S00	S00	3RA29 21-1BA00
	3RW30 2.	S0	S00/S0	3RA29 21-1BA00
1 1 1	3RW40 2.	S0	S00/S0	3RA29 21-1BA00
	With spring-loaded ter	minals		
	3RW30 1.	S00	S00	3RA29 11-2GA00
	3RW30 2.	S0	S0	3RA29 21-2GA00
	3RW40 2	S0	S0	3RA29 21-2GA00

¹⁾ Size S0 can be used up to 32 A.



Optional fan to increase the switching frequency (3RW40 2. to 3RW40 4.)

	For soft starter type	Size	Order No.				
Fan (to increase the switching frequency and for device mounting in positions different from the normal position)							
	3RW40 2.	S0	3RW49 28-8VB00				
1	3RW40 3.,	S2,	3RW49 47-8VB00				
	3RW40 4	S3					



16.9 Spare parts for fans (3RW40 5., 3RW40 7.)

For soft starter type	Size	Version Rated control supply voltage U _s	Order No.
3RW40 5BB3.	S6	115 V AC	3RW49 36-8VX30
3RW40 5BB4.	S6	230 V AC	3RW49 36-8VX40
3RW40 7BB3.	S12	115 V AC	3RW47 36-8VX30
3RW40 7BB4.	S12	230 V AC	3RW47 36-8VX40

16.10 Operating instructions

For soft starter type	Size	Order No.
Operating instructions for soft star	ters	
3RW30 1. to 3RW30 4.	S00 to S3	3ZX10 12-0RW30-2DA1
3RW40 2. to 3RW40 4.	S0 to S3	3ZX10 12-0RW40-1AA1
3RW40 5., 3RW40 7.	S6 , S12	3ZX10 12-0RW40-2DA1

Note

The operating instructions are included in the scope of supply.





Appendix



A.1 Configuration data

Siemens AG

Technical Support Low-Voltage Control Systems

Phone: +49 (0) 911-895-5900 Fax: +49 (0) 911-895-5907

e-mail: technical-assistance@siemens.com

Motor data

Siemens motor? Rated output: kW Rated voltage: Mains frequency: Hz Rated current: Α Starting current: Α Rated speed: rpm Rated torque: Nm Breakdown torque: Nm Mass moment of inertia: kg*m2

Speed / torque characteristic curve

(The speed increments of the value pairs do not have to be equal)

n _M 1/m						"n _{syn} "
M _M / M _B						

Speed / current characteristic curve

(The speed increments of the value pairs do not have to be equal)

n _M 1/m			"n _{syn} "
I _M / I _B			



rpm

Load data

Rated speed:

Load type (e.g. pump, mill etc.):

	Rated torque or rated output					Nm or kW					
	Mass moment of inertia (load-specific) Mass moment of inertia (motor-specific)						kg*m² kg*m²				
	Speed / torque cha	Speed / torque characteristic curve									
	(The speed increme	ents of the va	lue pairs	do not h	ave to be	e equal)					
n∟ 1/m									"n _{syn} "		
M _L / M _B									risyn		
		I						1			
	Start conditions										
	Starting fraguency					Starts					
	Starting frequency Switching cycles:				Stai	ıs					
	• .	Operating tim	ie								
		Idle time									
		Stopping time)								
	Ambient temperature			°C							
				Yes	5	Value	е				
	-	Starting current limitation? Acceleration torque limitation? Maximum starting time?									
	Maximum starting t			u							
	Personal details										
	Last name, first name:										
	Company:										
	Department:										
	Street:										
	Zip code, town/city:										
	Country:										
	Phone:										
	Fax:										
	e-mail:										



A.2 Table of parameters used

You can document your parameter settings in the table below.

.5	istor	Klixon							
	Thermistor	DTG	×						
	Output ON / RUN	вли	×						
	Outp ON/	NO							
	RESET MODE LED	Manual AUTO Remote							
		fanual AUTi	×						
	IE.	оът (о							
3RW40 parameters	CLASS value	oclass	class	CLASS OF	CLASS OFF	CLASS OFF	CLASS OFF	CLASS	OLASS OFF
	Factor le limit value	x l ₀ 2 3 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	3x72A 3x72A 1216A	۲ اله عمر الم	۲ اله عبر الم	ل ال	ر ال _ه الم	4 lb. 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	4 lb. **
	le motor A	-	ς lb. 200 32 72A	5 Pe 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	ζ [] _e ² 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2		ال ا	5 Pe ™ 2 M 2 M 2 M 2 M 2 M 2 M 2 M 2 M 2 M 2	ς 10, 20 mm
	t ramp-down s	1 002	10 10		O L			O L	O. L.
ieters r 3RW40	t ramp-up s	0 0 0 0 0 0 0 0 0 0 0 0	O L 10		Ö [L				
Parameters 3RW30 or 3RW40	U starting %	400%		e Company	e Company	e Our Lu	Č L	e Company	e Company
3	Plant identifier		Pump XYZ 3RW4038-1TB04	3RWB	3RWB	3RWB	3RW - B	3RWB	3RWB
			Pump XYZ						



A.3 Correction sheet

TO FROM (please complete):

SIEMENS AG Name

I IA CE MK&ST 3

Company / Department

92220 Amberg / Germany

Address

Phone

Fax: 0 96 21 / 80-33 37 Fax

System Manual for SIRIUS 3RW30 / 3RW40 soft starters

Have you noticed any errors while reading this manual?

If so, please use this form to tell us about them.

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