SIEMENS

Ingenuity for life

SINAMICS S120

The flexible drive system for high-performance motion control applications

usa.siemens.com/sinamics-s120

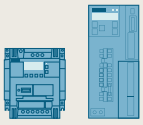
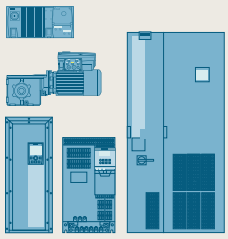
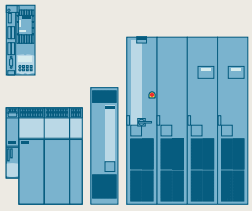
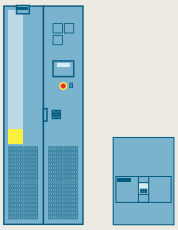
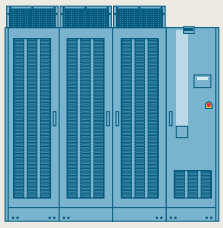
SINAMICS

One family, one source, all applications

The SINAMICS family offers the ideal drive for every drive application—and all of the drives can be engineered, parameterized, commissioned and operated in a standard way.

SINAMICS—can tackle any drive application

- Wide range of power ratings from 0.12 kW to 85 MW
- Available in low-voltage and medium-voltage versions
- Standard functionality using a common hardware and software platform
- Standard engineering using just two tools for all drives: SIZER for engineering and STARTER for parameterization and commissioning
- High degree of flexibility and combinability

Low-voltage AC			DC-voltage	Medium-voltage AC
Basic Performance	**General Performance**	**High Performance**	**DC applications**	**For applications with high power ratings**
				
V-series	**G-series**	**S-series**	**DCM**	**Medium-voltage series**
0.12 – 30 kW	0.37 – 6,600 kW	0.12 – 5,700 kW	6 kW – 30 MW	0.15 – 85 MW
When it comes to the hardware as well as the functionality, SINAMICS V drives concentrate on the essentials. This results in a high degree of ruggedness with low associated investment costs.	The functionality of SINAMICS G drives makes them the perfect choice when addressing basic and medium requirements relating to the control of dynamic performance.	SINAMICS S drives are ideal for demanding single- and multi-axis applications in plant construction and machine building, as well as the widest range of motion control tasks.	In addition to the highest power ratings, SINAMICS DC drives also offer the maximum degree of availability.	Our seamless and integrated range—which is unique worldwide—encompasses all dynamic response and performance levels in voltage classes 2.3 to 11 kV.

The best perspectives for a productive future

SINAMICS S120 versions					
AC/AC drive units for single-axis applications		DC/AC drive units for multi-axis applications			
Blocksize	Chassis	Booksize Compact	Booksize	Chassis	Cabinet Modules
					

SINAMICS is the modular drive system for sophisticated single- and multi-axis applications

High degree of flexibility for successful machine designs

As member of the SINAMICS drive family, the modular S120 platform addresses demanding applications in plant construction and machine building. Single- and multi-axis drives sporting a high dynamic performance with integrated comprehensive functionality, along with a scalable number of axes, can address almost any drive application.

The SINAMICS S120 facilitates the implementation of flexible and modular machine designs that can address specific customer requirements.

The answer to complex requirements

Today, machines have to be manufactured even more cost-effectively—and should offer end-users increasingly higher degrees of productivity. Our SINAMICS S120 drive system addresses both of these goals.

Its sophisticated functionality and high dynamic performance facilitate new and innovative machine designs and significantly increase production yield. In addition, simple operation and maintenance increase the availability and reduce overall lifecycle costs. In other words—SINAMICS S120 increases the competitiveness of both manufacturers and end-users.

Modularity for machine building

The SINAMICS S120 is flexibly-designed to support the modular demands of machine building. This includes:

- Single-axis and multi-axis drives
- Distributed multi-axis drives with the power unit mounted on the motor to minimize the cabinet size
- Integrated motion control functions in the drive system (SIMOTION D)

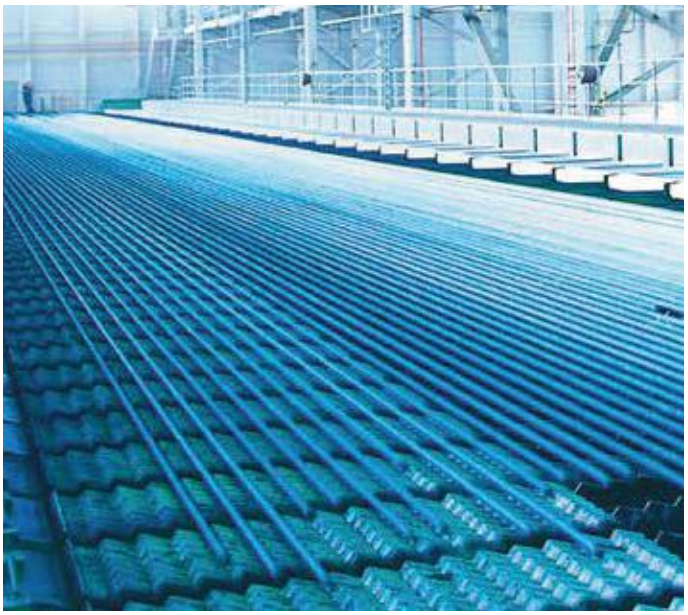
As modular machine designs can be created, you are always in a position to address the range of variants in demand—now and in the future.

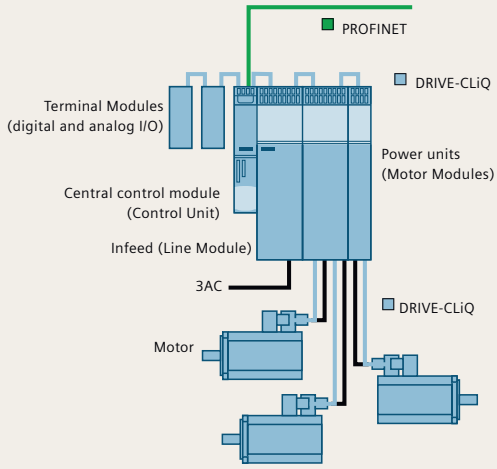
Applications in machine building

The SINAMICS S120 platform boosts the performance of your machines—no matter if it involves continuous material webs or clocked and highly-dynamic processes such as:

- Packaging machines
- Plastics machines
- Textile machines
- Printing machines
- Paper machines
- Hoisting gear
- Handling and assembly systems
- CNC machine tools
- Rolling mills
- Test stands

Modular portfolio from the Control Unit to the cabling





Modular design with digital DRIVE-CLiQ system interface

Flexibility and scalability as a result of the modular design

Multi-axis devices set themselves apart as a result of modular design. The complete drive intelligence is embedded in the Control Units (CU). The CU handles all of the closed-loop control functions in the drive lineup and it executes all of the other drive functions — for example logically combining drive-related I/O, positioning functions, etc. — while having PROFIBUS DP or PROFINET as central interfaces to connect to higher-level automation systems.

SIMOTION D or SINUMERIK can be used as special control units for motion control or CNC applications. SIMOTION D devices are modular control units that also have an integrated motion control system — in addition to the closed-loop drive control. SINUMERIK CNCs are modular control units to automate machine tools.

Line modules supply the central DC link to which the motor modules (power units) are connected. Depending upon the selected line module type, energy can be fed back into the three-phase line supply, the DC link voltage can be controlled and line harmonics can be reduced.

Energy is exchanged between motoring and generating motor modules via the central DC link. Only the summated or excess energy is drawn from or injected back into the line supply — or is dissipated in braking resistors. Drive-related inputs/outputs can be expanded using terminal modules

Drive systems in the Booksize format facilitate an especially compact design. Double axis modules allow the width of Booksize devices to be reduced.

Modular drive configuration SINAMICS S120 DC/AC drives

- One control unit with the complete drive intelligence (including the interface to higher-level controls or HMI devices)
- A line module (infeed converter) to provide the DC link voltage from the three-phase line supply
- One or several motor modules to control the motors
- Optional I/O modules to connect encoders and drive-related inputs and outputs
- Simple wiring using DRIVE-CLiQ
- All interfaces communicate using pre-configured cables
- Drive components are detected using electronic type plates
- Motor modules and line modules in Booksize Compact, Booksize and Chassis formats

Intelligent products for more drive

CU320-2
control unit

SIMOTION D4x5
control unit

SINUMERIK NCU 7
control unit

I/O modules
(TM31, TM54F)

Control Unit modules

Control Unit (CU) modules represent the central intelligence of an S120 drive system. In addition to the basic functions, such as operating system, communication and closed-loop control, they also include the user configuration.

A distinction is made between the following versions:

- **CU320-2 control unit**
  The control module for several drives
- **SIMOTION D4x5-2**
  Motion control for the coordinated operation of several drives
- **SINUMERIK NCU 7x0.3 PN**
  The CNC system for the medium- and upper-performance range

I/O modules

In addition to the I/O of the CU modules, I/O modules represent the connection of the drive system to the plant.

The following are available:

- Binary inputs and outputs, also fail safe
- Relay outputs
- Analog inputs and outputs
- Fast inputs / outputs, e.g. for cam sequencers
- Modules to connect motor and machine encoders without the DRIVE-CLiQ interface
- Temperature evaluation (KTY84-130 or PTC)

DRIVE-CLiQ digital interface— low wiring costs

The components of the S120 drive system communicate via the DRIVE-CLiQ system interface.

Essential features include:

- They connect Motor Modules, I/O modules etc. with the CU
- They connect motor encoders, where relevant, with electronic type plates for encoder and motor, as well as machine encoder
- Simple wiring using a plug-in system based on the RJ45 standard.

Product variance can be reduced and stock inventory costs minimized as a result of the standard cable and plug connector systems used. Additionally, commissioning time and costs are reduced as a result of the lower amount of work required.

The optimal line infeed

Overview of SINAMICS line modules

Basic Line Modules

Our Basic Line Modules are used for applications where energy must only be taken from the line supply. If an excessive amount of energy is regenerated, then this must be dissipated in a braking resistor using a braking module (braking chopper).

Highlights include:

- Space-savings
- Optimized cost
- For applications without, or only a low level of excessive braking energy

Smart Line Modules

Use our Smart Line Modules if, in addition to drawing energy from the line supply, energy must also be fed back into the line supply. Using an additional braking module with braking resistor, drives can be braked in a specific way even when the power fails.

Highlights include:

- Space-savings
- Energy recovery
- For applications with excess braking energy

Active Line Modules

Self-commutated infeed / regenerative feedback units are suitable for motoring and regenerative operation. The Active Line Module can be used for reactive power compensation. Like a Smart Line Module, it's also possible to use a braking chopper.

Highlights include:

- Low line harmonics as a result of the almost sinusoidal line current characteristics
- Controlled DC link voltage, essentially decoupled from the line supply, suitable for high-speed applications — for example cross-cutters, even when connected to weak line supplies
- For applications with excess braking energy
- Power factor cosφ1 = 1, or can be adjusted

Independent of the Line Module type, energy is always exchanged between the individual drives through the DC link.

Properties	Basic Line Module	Smart Line Module	Active Line Module
Operating mode	Uncontrolled	Uncontrolled	Controlled (sinusoidal line current drawn)
Line fluctuations	Not compensated	Not compensated	Controlled
Energy recovery	No	Yes	Yes
Harmonics	High	High	Low
Reactive power compensation	No	No	Yes

Efficient motor control

Booksize Compact format	Booksize format	Chassis format
		

Version and combinability

As an DC to AC power inverter, Motor Modules control the motors with variable voltage and frequency. They are available in the Booksize Compact, Booksize and Chassis formats.

Different versions can be operated on one DC link.

The Chassis Motor Modules are either air- or liquid-cooled.

The advantages of water-cooling for high power ratings when compared to air-cooling are the smaller mounting footprint and quiet converter operation. It makes sense to use water-cooling in small and poorly ventilated areas (e.g. onboard ships) or for locations where low noise is specified (e.g. test equipment).

Innovation meets continuity—
new Motor Modules in the Booksize format are available

- Less space required in the control cabinet
  - **Reduced width:**
    New Motor Modules with three-fold overload capacity
  - **Reduced height:**
    New integrated motor plug
- Faster and convenient connection of the motor plug
- Consistent improvement of the shielding concept, mounting technology and the mounting plate

Ready-to-connect decentralized servo axis reduces cabling and cabinet space

Distributed SINAMICS S120M with adapter module and hybrid cable

SINAMICS S120M expands the SINAMICS S120 drive system to include a distributed version. This includes a compact, ready-to-connect drive unit comprising of:

- Synchronous servomotor with multiturn absolute encoder
- Integrated power unit (Motor Module)

The power unit migrates from the cabinet to the motor and is directly integrated in the driven axis. This provides advantages and flexibility for existing as well as new machine concepts.

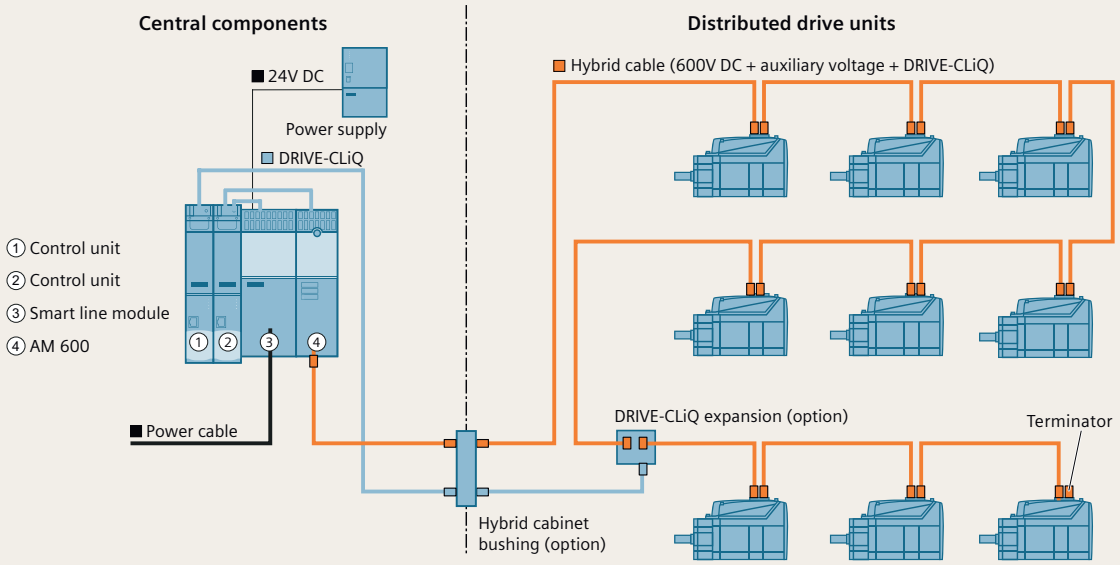
Applications

The packaging, printing, glass and textile industries include some of the typical SINAMICS S120M applications. It's ideally suited for:

- Machines that extend over wide areas (long cables)
- Limited cabinet envelope dimensions
- Modular machine concepts with flexible machine layout

SNAMICS S120M features

- Up to 12 distributed SINAMICS S120M servo drives can be operated on one adapter module (depending on the power)
- As many adapter modules as required can be operated on an appropriately-dimensioned infeed unit
- DI / DOs integrated in the drive for user-friendly adaptation to the machine environment
- With the Terminal Module (TM54F) or via PROFIsafe, all of the Safety Integrated functions available in the SINAMICS S120 system are available
- Optimal integration into the SIMOTION motion controllers and SINUMERIK CNC systems

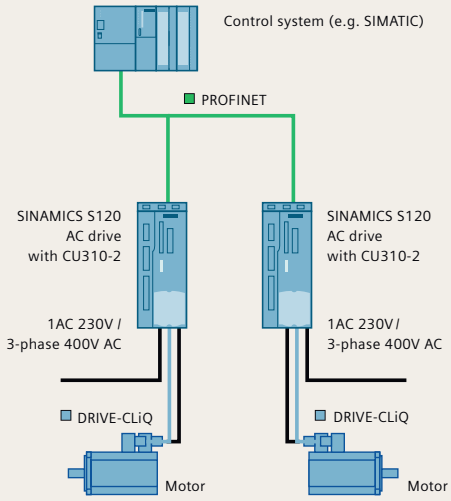


SINAMICS S120M—highlights at a glance	
Description	**Your benefits**
Motor Module is integrated in the SINAMICS S120M	Smaller cabinet envelope dimensions
Less heat to be dissipated as a result of the distributed topology	Reduced control cabinet requirements
The pre-fabricated hybrid cable includes all of the signal and power cables	Less time for cabling and shorter cable lengths
For retrofits, limited, if any impact on control cabinet	Increased flexibility for retrofits
SINAMICS S120M is part of the SINAMICS S120 system	All safety and communication versions are available

Independent single-motor drive with Control Unit and Power Module

Blocksize devices from 0.55 to 132 kW

Chassis device
110 up to 250 kW



SINAMICS S120 single-axis drive

AC drives for single-axis applications

- An independent, single motor SINAMICS S120 AC drive includes a control unit and power module
- Alternatively, a power module can be integrated into a multi-axis lineup via a CU adapter
- Power modules are available in the Blocksize and Chassis formats

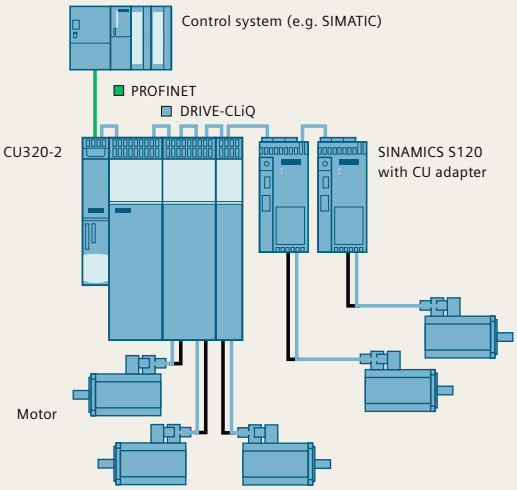
Typical application areas

Single-axis drives are suitable for every application — for example, travel drives, centrifuges, elevators and extruders, as well as mixers and kneaders.

Single-axis SINAMICS S120 AC drives are also the ideal solution for multi-axis applications, where the drive axes are located remotely from each other. The same is true for modular machine concepts, which are being increasingly implemented in the packaging and woodworking industry.

For single-axis drives, the line infeed and the power supply of the motor are combined into one device — the power module. For single-axis applications, closed-loop drive control is handled by a single axis control unit (e.g. CU310-2) mounted onto the power module; or for multi-axis applications, using a control unit (e.g. CU 320-2) coupled via DRIVE-CLiQ. In the latter case, instead of the control unit, a CU adapter is mounted onto the power module.

Coupled decentrally via PROFIBUS DP or PROFINET to a higher-level control system, positioning tasks in automatic assembly machines and handling systems can be reliably tackled by SINAMICS S120 AC drives.



SINAMICS S120 mixed lineup with DRIVE-CLiQ adapter

CU310-2 control unit | **SIMOTION D410 control unit** | **CUA31 adapter** | **CUA32 adapter**

Central control intelligence interfacing to the control system—CU310-2 control unit

AC drives are equipped with a CU310-2 control unit for coupling to a higher-level control. It offers functions from a basic speed controller up to extensive positioning functions.

CU310-2 DP with PROFIBUS DP connection or CU310-2 PN with integrated PROFINET interface are available. Drive-related inputs / outputs in the CU can be simply and logically combined using BICO technology. As a result, the highest possible degree of decoupling between the drive and higher-level control system can be achieved. For AC drives, when required, an additional encoder and drive-related I/O can be connected via DRIVE-CLiQ.

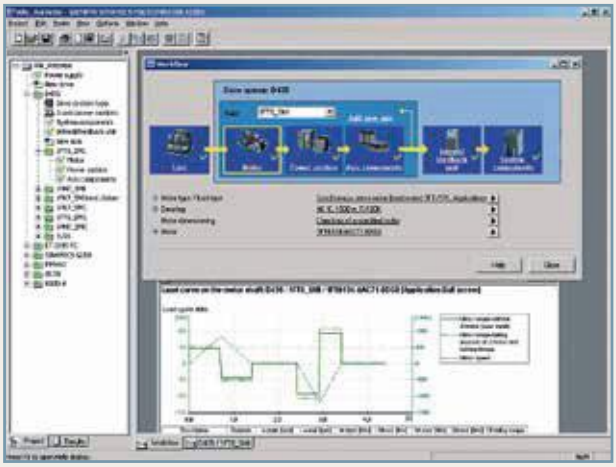
Motion Control integrated in the drive— SIMOTION D410 control unit

The SIMOTION D410 control unit is the ideal solution if, beyond the closed-loop control intelligence, motion control is required for an axis and PLC functionality in a compact format. SIMOTION D410 can be used for single-axis applications, such as winders, cross cutters and feed equipment, or also in synchronous groups as is the case for modular machine designs. The machine module automated with SIMOTION D410 receives the master value from a higher-level control system and synchronizes its axis to this leading value. D410 DP with PROFIBUS DP connection or D410 PN with integrated PROFINET interface can be selected. Up to four fast cam outputs or three probe inputs can be implemented using the onboard inputs / outputs.

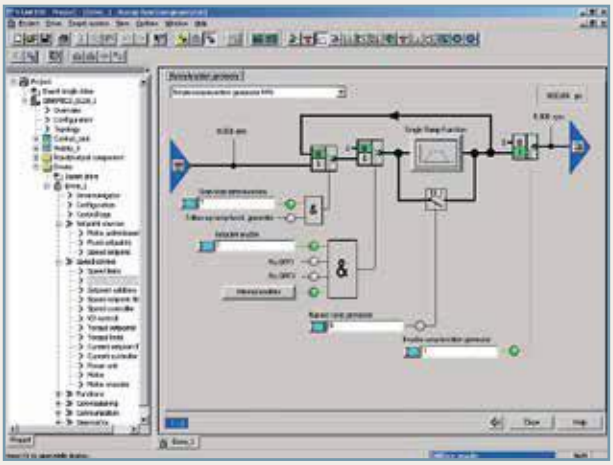
CUA31 / 32 control unit adapter for multi-axis applications with SINAMICS S120 AC drive

The drive is connected to a multi-axis control unit, e.g. CU320-2, using the CU adapter CUA31 via the DRIVE-CLiQ interface. This control unit then handles drive functionality for the AC drive. In this configuration, SINAMICS S120 AC drives can also be used in mixed operation with SINAMICS S120 multi-axis devices. This facilitates maximum flexibility when using SINAMICS S120 devices. In comparison to the CUA31, the CUA32 also has an integrated HTL / TTL encoder interface to connect an external encoder.

Engineering and handling made easy



SIZER for Siemens drives configuration



STARTER tool

Favorably priced—with system-based flexibility

SINAMICS covers the entire range of power ratings with a seamless, uniquely-integrated philosophy and operator navigation. This means that simple entry into the system, and expertise can be directly applied by using higher-level tools for engineering, configuring and commissioning.

The optimal configuration—quickly and reliably with SIZER for Siemens drives engineering

A SINAMICS drive system can be selected and dimensioned fast and with ease. This is because the SIZER engineering tool includes all of the components that can be used to create a drive system. SIZER can be learned quickly and operated intuitively thanks to its graphical user interface and integrated wizard.

STARTER speeds up commissioning

Our STARTER software is the standard commissioning tool for all SINAMICS drives. Commissioning engineers can configure and optimize even complex systems in a very short amount of time as a result of the transparent layout. STARTER is available as stand-alone or integrated into SCOUT for applications with the SIMOTION motion controller.

Fast and automatic—electronic type plate recognition

Electronic type plates in every component are an important element when digitally linking the SINAMICS S120 drive system. They can be used to automatically identify all of the drive components via the DRIVE-CLiQ interface. This means that when commissioning or replacing components, data does not have to be manually entered—and commissioning becomes even more reliable. For example, electrical equivalent diagram and integrated motor encoder parameters are saved in the electronic type plates of the motors. The type plates also include information such as the HW version and identification numbers.

Made easy—engineering and handling

- All of the drive components are very easily connected using pre-fabricated DRIVE-CLiQ cables
- Automatic parameterization of the drive configuration using electronic type plates
- Fast and reliable drive selection and dimensioning using the SIZER engineering tool
- User-friendly commissioning using the STARTER commissioning tool

Integrated web server for efficient diagnostics and maintenance—any time, any place

The SINAMICS drive system with integrated web server is expanded to include efficient diagnostic and maintenance options. It is an integral component of the SINAMICS S120 firmware. Every PC capable of going online with a browser is able to execute functions, for example:

- Configuration download
- Firmware update
- Status overview of the drive
- Alarm and fault message evaluation
- Parameter setting monitoring and adaption
- Saving machine documentation, including notes
- Creating user administration for access protection

Many new options relating to drive diagnostics and remote maintenance can be obtained based upon the web server.

Uses for the SINAMICS web server

The integrated web server is ideal for applications where the STARTER commissioning software and version inter-dependencies are not desirable. Series commissioning is also possible without STARTER.

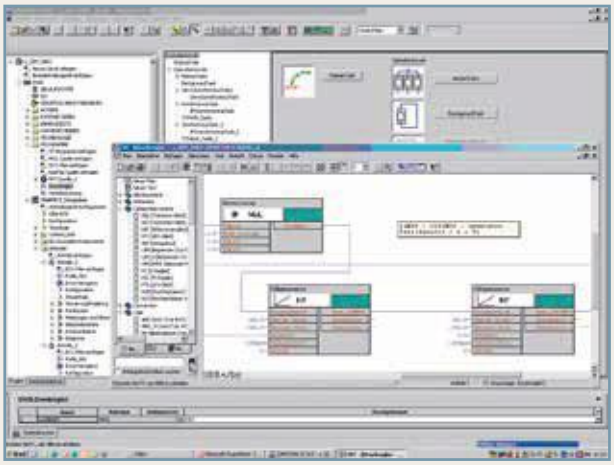
Local and remote diagnostics, along with maintenance, are straightforward, taking into account the appropriate security measures (e.g. firewall). A current Internet browser is sufficient to obtaining access.

usa.siemens.com/sinamics-webserver

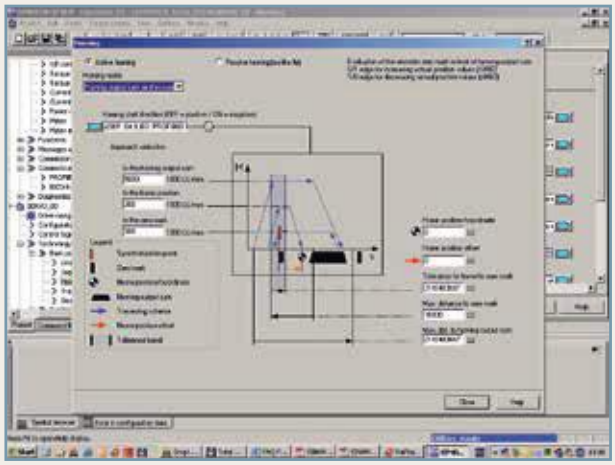
Efficient diagnostics and maintenance—highlights of the SINAMICS web server

- Shorter machine downtimes through efficient diagnostics and maintenance
- Directly toggle between English, German and Chinese
- Included as standard in the firmware—no additional costs
- Can be accessed via all LAN and PROFINET interfaces
- Two users with different authorization levels can be configured, e.g. for operating and service personnel

Positioning, synchronous operation and adaptation



Graphic parameterization with DCC



Parameterizing screen form for EPos

Drive Control Charts (DCC)—optimal adaptation to the drive task

Drive Control Charts provide the option of freely configuring technological functions for the SINAMICS S120 drive system very easily in STARTER. As a result, users have a new dimension when it comes to individually adapting the system to address the specific drive tasks of their particular machine. Drive Control Charts (DCC) are control, arithmetic and logic blocks that are available in a drive control block (DCB), which can be used to configure specific functions. Using the DCC Editor, multi-instance-capable blocks can be linked by dragging and dropping to create open-and closed-loop control functions.

Extending Drive Control Blocks (DCB)

DCB Extension is an extension of the block scope, which can be used as an additional, autonomous library in the DCC Editor. DCB Extension involves new motion control blocks that are available in the form of a motion control library.

Using these blocks, the following positioning and synchronous functions can be implemented with DCC in SINAMICS S120:

- Positioning
- 1:1 synchronous operation
- Gearing
- Gearing and positioning
- Camming

With DCB Extension, there is the possibility of creating user-specific blocks.

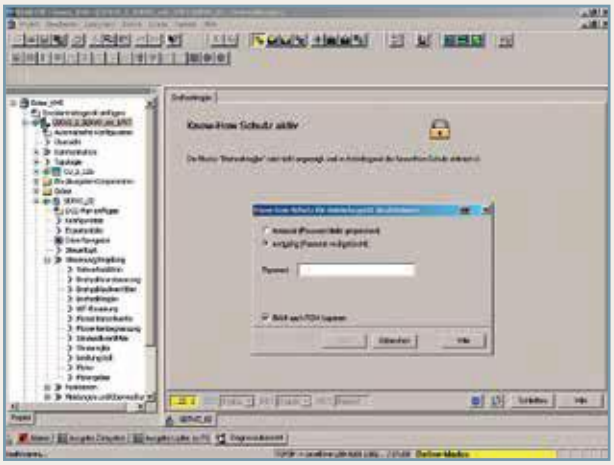
Drive Control Charts/Drive Control Block Extension—the highlights

- Drive-related open- and closed-loop control tasks can be shifted from the control into the drive.
- Higher-level controller systems can be relieved
- Lower costs can be achieved when implementing machine sequences
- Increased machine performance
- Simpler implementation of modular machine concepts
- Implement positioning and synchronous operation functions
- User-friendly graphical programming using the DCC Editor
- Linking multi-instance-capable blocks by drag-and-drop
- Test and diagnostic functions to verify program behavior and fault diagnostics

EPos—integrated positioning functions

With the integrated EPos positioning functions, an additional higher-level control is not required for many positioning applications. This integrated functionality is also extremely flexible—it can be used for servo control with a high dynamic performance, as well as for more basic applications with vector-controlled induction motors. When commissioning, up to 64 target positions or travel paths including the associated travel velocities can be permanently saved in the drive. Positioning can be specified to either be absolute or relative.

It's also possible to transfer these parameters from a higher-level PLC, as required. When positioning, it's even possible to change the target positions and velocities on the fly.



Parameterizing screen form with active know-how protection

SINAMICS know-how protection

The SINAMICS drive family has been expanded to include know-how protection. This is an efficient and unique function to safely protect your engineering investment. Know-how protection is directly activated at the drive and is password-protected. When know-how protection is active, parameter settings are hidden and locked so that they cannot be accessed by a third-party. The OEM can individually declare everything that should be freely accessible in the form of a "Do not hide list" for everything that is required to use the machine function. It provides protection against:

- The accessing of engineering data
- Unauthorized copying
- Manipulation

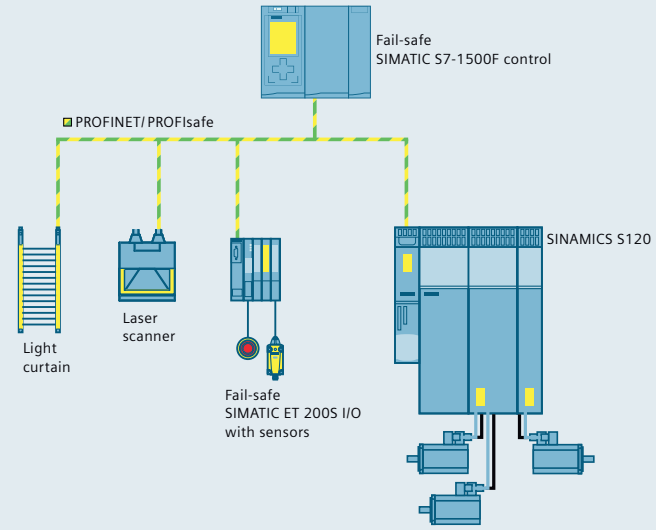
This protects your ideas and engineering know-how; and therefore your investments.

When copy protection is activated, the serial numbers of the (target) memory card and control units are also incorporated in the protection. As a result, parameterization can only be used on the specified hardware.

SINAMICS know-how protection—the highlights

- Integral component of the SINAMICS firmware
- Can be combined with copy protection
- A know-how-protected Compact Flash (CF) card can also be created offline (without CU) just using STARTER
- An exception list with freely accessible parameters can be defined, e.g. for operation and service personnel

Integrated safety to protect people and machines



In this configuration example, SINAMICS S120 Booksize with integrated safety functions are connected to a fail-safe SIMATIC S7-1500F control

Safety Integrated functions for the quick and economic implementation of safety concepts

Integrated safety functions are suitable for plants and machines where flexible safety functions are required. These support the creation of customized concepts. As standard, SINAMICS S120 provides the following Safety Integrated functions:

Safe Torque Off (STO)—this function ensures that a motor can no longer develop a torque; therefore preventing undesirable starting.

Safe Stop 1 (SS1)—this function quickly stops a motor and once it has come to a standstill, switches it into a no-torque condition by activating STO.

Safe Brake Control (SBC)—this function is used to safely control a holding brake.

The following Safety Integrated functions are optional and available through a license:

Safe Stop 2 (SS2)—this function quickly stops a motor and after it has come to a standstill, maintains the position and monitors the standstill position with SOS.

Safe operating stop (SOS, Safe Operating Stop)—this function safely monitors standstill without deactivating the closed-loop drive control.

Safely-Limited Speed (SLS)—this function monitors that the drive does not exceed a pre-set speed or velocity limit.

Safe Direction (SDI)—this function ensures that the drive can only rotate in the selected direction.

Safe speed monitoring (SSM)—signals if a drive is operating below a speed or velocity limit that can be set.

Safely-Limited Position (SLP)—this function monitors that the axis moves in a defined traversing range.

Safe Brake Test (SBT)—this function safely tests the function of the brake.

Safe Position (SP)—this function transfers the safely-determined position actual value in the drive to a safety-relevant control via the safety-relevant PROFIsafe.

SINAMICS safety solutions are certified according to IEC 61508 SIL 2 and EN ISO 13849-1, PL d and Category 3. The safety functions are controlled via safety input terminals, which are either on the control unit or the TM54F terminal module. Control is possible via PROFIBUS and PROFINET with PROFIsafe when the drive is integrated into a complete automation solution.

PROFINET-based communication

PROFINET — for more performance and open IT communication

SINAMICS S120 is also available with a PROFINET interface. This Ethernet-based bus allows control data to be quickly exchanged, which means that SINAMICS S120 drives can even be used in the highest performance multi-axis applications. PROFINET simultaneously transmits operating and diagnostics information to higher-level systems using standard IT mechanisms (TCP / IP). This means that it can be integrated quickly and easily into an IT factory environment. SINAMICS S120 also supports EtherNet / IP connectivity through the CBE 20 option board.

PROFIBUS — the established, universal fieldbus

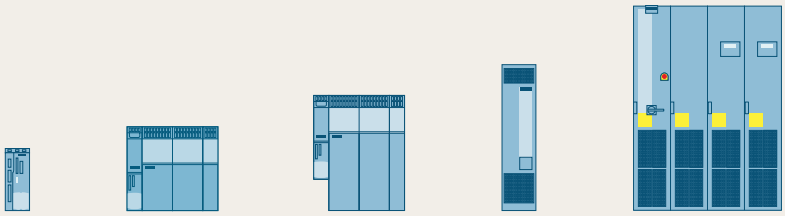
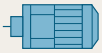
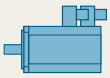
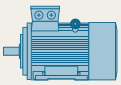
SINAMICS S120 supports PROFIBUS DP — the standard fieldbus within Totally Integrated Automation. It ensures powerful and seamless communication between every component involved in the automation solution: HMI (operator control and visualization), control, drives and I/O.

PROFIdrive — the drive profile for PROFINET

For PROFINET and PROFIBUS, the functional interface between the control and the drives is defined by the PROFIdrive drive profile from PROFIBUS International (PI). PROFIdrive is specified by the PI User Organization and is established through Standard IEC 61800-7 as the standard that is fit for the future.

PROFINET users who are already operating drives connected to PROFIBUS benefit from this. A user program does not have to be changed when making a transition from PROFIBUS to PROFINET. PROFIdrive defines the device behavior and the way internal device data is accessed for electric drives connected to PROFIBUS and PROFINET — from basic drives, up to high-performance servo controllers.

Sets productivity standards

SIMATIC PLC automation system	SIMOTION motion control system	SINUMERIK CNC system
SINAMICS S120		
		
SIMOTICS motors		
 Induction motors	 Synchronous motors	 Synchronous reluctuance motors

TIA is the basis for customized automation solutions

With Totally Integrated Automation (TIA), Siemens is the only single-source supplier that can provide a seamless and integrated range of products and systems for every application. Coordinated to the individual customer requirements, and based upon TIA, efficient, industry- and application-specific automation solutions can be implemented. Reduced lifecycle costs during plant and system operation, along with a significantly-reduced time-to-market, will result in significant increases in your productivity and higher investment security.

Easy and straight-forward—
Totally Integrated Automation with SINAMICS S120

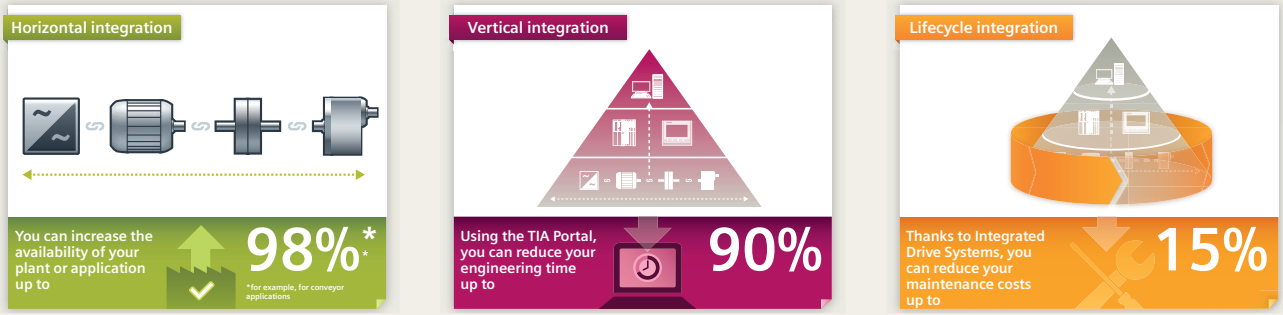
In addition to SIMATIC, SIMOTION and SINUMERIK, SINAMICS also belongs to the core components of TIA. The STARTER commissioning tool is also a supported component of the TIA platform. All automation solution components can be parameterized, programmed and commissioned with this seamless and integrated engineering platform without the need to transition to another system. Seamless and integrated data management ensures consistent data and simple archiving of the complete plant or system project.

Totally Integrated Automation with SINAMICS S120

- TIA—seamless and integrated industry- and application-specific automation solutions
- PROFIBUS and PROFINET are integral components of TIA
- Motion control with SIMOTION
- Machine tool numerical control with SINUMERIK CNC

For higher efficiency, reliability and productivity

Triple integration creates a true value-add



Horizontal integration

The integrated drive portfolio — all drives, motors, couplings and gearboxes are available from a single source. Perfectly integrated, perfect inter-operability — for every power and performance class as a standard solution or as a completely customized solution.

Vertical integration

Integrated in the automation technology — from the field through the controller level, up to the manufacturing execution system (MES) thanks to Totally Integrated Automation — for each and every application.

Lifecycle integration

Integrated software and services over the complete lifecycle — extensive software tools and expert service for the complete lifecycle, from planning, to the engineering of the application, up to service — for higher performance and maximum investment security.

Horizontal integration — your advantages

- A unique product range from a single source
- Guaranteed compatibility of the drive train
- Reliable system performance

Vertical integration — your advantages

- The drive train as an integral component of Totally Integrated Automation (TIA)
- Intelligent monitoring and open-loop control
- Perfect interaction between automation components and higher-level control, sensors, user interfaces and communication

Lifecycle integration — your advantages

- The configuration optimizes efficiency — from the coupling up to the control unit
- Shorter time-to-market — with engineering tools from design, all the way up to commissioning
- Productivity proven through simulation already during the early stages of development
- Outstanding product, lifecycle and industry expertise

The optimal solution for each and every task

The drive solution that offers you everything

The wide range of functionality and flexibility make SINAMICS S120 the universal drive solution for machine building.

A broad range of motors and control systems optimally tailored to address the various applications permits fully integrated solutions—simple to design, commission and operate. The motors are connected to the power units through pre-fabricated Motion Connect power and data cables. Electronic motor nameplates guarantee reliable auto-parameterization of the drive lineup. In operation, the encoder values are transferred to the drive line-up in real time via the DRIVE-CLiQ interface.

The drive is connected to the automation system via the various connectivity to fieldbuses and industrial ethernet networks.

Synchronous and induction motors can be operated with SINAMICS S120

In addition to its range of SIMOTICS low-voltage motors, Siemens also has a wide range of different motor types specifically designed for motion control applications.

SIMOTICS low-voltage motors—standard and reluctance motors, plus explosion-protected versions for almost every industrial application

SIMOGEAR gear motors

SIMOTICS-S servomotors—optionally equipped with various gearbox types, for high-speed positioning tasks, clocked axes and feed drives

SIMOTICS-M main motors—for high-speed, high-precision rotary axes, e.g. for winding and synchronous operation applications—as well as main spindles in machine tools

SIMOTICS-L linear motors—for positioning and feed axes demanding the highest dynamic performance

SIMOTICS-T torque motors—directly mounted to the machine component demanding the highest dynamic performance

Modular and fit for the future

SINAMICS S120 in machine building

SINAMICS S120 and SIMOTION—in machine building, increasingly complex motion control tasks have to be mastered, which must always run faster and with higher precision. Here, SIMOTION motion controllers and SINAMICS S120 high-performance drive system form the perfect team.

SINAMICS S120 and SINUMERIK—SINUMERIK CNC and SINAMICS S120 form the ideal system platform for machine tools. Thanks to scalable hardware and software, SINUMERIK provides almost unlimited possibilities in CNC applications.

SINAMICS S120 in plant construction

The design of SINAMICS S120 allows fast and simple mechanical and electrical integration into the plant or system; therefore reducing engineering costs, as well as engineering risks. Based upon a comprehensive range of options, the drive system can be flexibly adapted to plant- and system-specific requirements.

SINAMICS S120 in machine building—your advantages

- Positioning tasks and basic, drive-related closed-loop control functions are engineered using the integrated EPos and DCC functions
- Motion control applications are engineered using the SIMOTION motion controller or SIMATIC PLCs
- Machine tools are engineered using SINUMERIK CNCs

SINAMICS S120 in plant construction—your advantages

- Flexible development of drive versions
- Scalable power and performance
- Ready-to-connect cabinet modules
- Chassis units for cabinet integration
- Low costs for training, engineering and commissioning
- Simple to replace, spare parts inventory, logistics
- Low lifecycle costs through energy-saving and reduced maintenance costs
- Highest possible security of investment

Technical information

Components and advantages at a glance

- **Control modules** (control units) process cross drive and axis functions, and are the central link to higher-level controls
- **Motor modules** operate as the drive, and supply the connected motors
- **Line modules** feed the central power into the DC link, regenerate into the line supply and compensate line fluctuations
- **Power modules** for AC drives combine the power infeed and the power inverter
- **Electronic options** extend the functionality and represent various interfaces to encoders and process signals
- **DC link components** are used to connect with the DC link voltage
- **Line-side power components** such as fuses, contactors, reactors and filters round off the system

- Dynamic and precise — 32-bit technology
- Fast — short current rise time
- Universal — for synchronous and induction motors
- Rugged — high overload factor
- Safe — Safety Integrated
- Flexible and simple — BICO technology
- Plug-and-play — possible through DRIVE-CLiQ
- Customized — Drive Control Chart

SINAMICS S120 integrated safety functions

STO	Safe Torque Off
SBC	Safe Brake Control
SS1	Safe Stop 1 (Safe shutdown, stop Category 1)
SOS	Safe Operating Stop
SS2	Safe Stop 2 (Safe shutdown, stop Category 2)
SLS	Safely-Limited Speed
SSM	Safe Speed Monitor
SDI	Safe Direction
SLP	Safely-Limited Position
SP	Safe Position
SBT	Safe Brake Test

Drive type
Degree of protection
Line voltage U_{line} / power ranges
1/3AC 200 ... 240V
3 AC 380 ... 480V
3 AC 500 ... 690V
Power infeed
Energy recovery
Line frequency
Output voltage
Output frequency
U/f control
Vector control
Servo control
Control technique
U/f control
Vector control with / without encoder
Servo control with / without encoder
Motors
Induction motors
Servomotors
Main motors
Linear motors
Torque motors
Control dynamic performance
Vector control
• Rise time closed-loop speed control
• Rise time closed-loop torque control
Servo control
• Rise time closed-loop speed control
• Rise time closed-loop torque control
Technological functions
Safety functions
Interfaces
Tools
Typical application technologies
Catalog

S120 — the modular drive system for demanding single- and multi-axis applications

Blocksize	Chassis	Booksize Compact	Booksize	Chassis	Cabinet Modules
					
Single-axis	Single-axis	Multi-axis	Multi-axis	Multi-axis	Multi-axis
IP20	IP20	IP20	IP20	IP00 / IP20	IP20 (IP21 / IP23 / IP54)
0.55 ... 55 kW	–	–	–	–	–
0.55 ... 132kW	110 ... 250 kW	1.6 ... 9.7 kW	1.6 ... 107 kW	110 ... 800 kW / 3000 kW[2]	4.8 ... 800 kW / 3000 kW[2]
11–132kW	–	–	–	75 ... 1500 kW / 5700 kW[2,3]	75 ... 1200 kW / 4500 kW[2]
Uncontrolled	Uncontrolled	Uncontrolled	Optionally uncontrolled or controlled		
No	No	Yes	Yes, for controlled infeed		
47 ... 63 Hz	47 ... 63 Hz	47 ... 63 Hz	47 ... 63 Hz	47 ... 63 Hz	47 ... 63 Hz
0 ... 0.95 x U_{line}	0 ... 0.97 x U_{line}	0 ... U_{line}	0 ... U_{line}	0 ... U_{line}	0 ... U_{line}
0 ... 400 Hz[1]	0 ... 200 Hz[1]	0 ... 400 Hz[1,3]	0 ... 400 Hz[1,3]	0 ... 200 Hz[1]	0 ... 200 Hz[1]
0 ... 300 Hz[1]	0 ... 160 Hz[1]	0 ... 300 Hz[1]	0 ... 300 Hz[1]	0 ... 160 Hz[1]	0 ... 160 Hz[1]
0 ... 550 Hz[1,3]	0 ... 330 Hz[1]	0 ... 550 Hz[1,3]	0 ... 550 Hz[1,3]	0 ... 330 Hz[1]	0 ... 330 Hz[1]
Yes	Yes	Yes	Yes	Yes	Yes
Yes	Yes	Yes	Yes	Yes	Yes
Yes	Yes	Yes	Yes	Yes	Yes
Yes	Yes	Yes	Yes	Yes	Yes
Yes	Yes	Yes	Yes	Yes	Yes
Yes	Yes	Yes	Yes	Yes	Yes
Yes	Yes	Yes	Yes	Yes	Yes
Yes	Yes	Yes	Yes	Yes	Yes
8 ... 10 ms[1]	11 ... 15 ms[1]	8 ... 10 ms[1]	8 ... 10 ms[1]	11 ... 15 ms[1]	11 ... 15 ms[1]
1 ... 2 ms[1]	2 ... 3 ms[1]	1 ... 2 ms[1]	1 ... 2 ms[1]	2 ... 3 ms[1]	2 ... 3 ms[1]
2 ... 3 ms[1]	5 ... 7 ms[1]	2 ... 3 ms[1]	2 ... 3 ms[1]	5 ... 7 ms[1]	5 ... 7 ms[1]
0.5 ... 1 ms[1]	1 ... 2 ms[1]	0.5 ... 1 ms[1]	0.5 ... 1 ms[1]	1 ... 2 ms[1]	1 ... 2 ms[1]
Flying restart circuit, automatic restart, kinetic buffering, basic positioner, BICO technology, freely-configurable blocks (Drive Control Chart), technology controller, motion control (in conjunction with SIMOTION), numerical control with SINUMERIK solution line					
STO, SBC, SS1, SOS, SS2, SLS, SDI, SLP, SSM, SP, SBT					
Digital, analog, serial (RS 232 / RS 485), PROFIBUS DP, PROFINET, Modbus TCP, CANopen and EtherNet / IP (in conjunction with option card)					
SIZER for engineering, STARTER for commissioning					
High-performance single-motor drives		High-performance multi-motor drives			
Continuous motion control / motion control / positioning tasks in production machines — e.g. packaging, textile, printing, paper, plastics machines, plants and process lines, presses; converting applications; numerical control applications in machine tools					
D21.4	D21.4	D21.4	D21.4, NC 62	D21.4, NC 62	D21.4

[1] Blocksize devices and Booksize devices: for a 4 kHz pulse frequency. Chassis units, Cabinet Modules: for a 2 kHz pulse frequency. Observe the dependency between the max. output frequency and the pulse frequency as well as the current derating.

[2] With four liquid-cooled, vector control Motor Modules connected in parallel

[3] With liquid-cooled Motor Modules

There’s more to it.

usa.siemens.com/sinamics

Everything about our drive family can be found online.

SINAMICS — one family, one source,all applications

Published by
Siemens Industry, Inc.

5300 Triangle Parkway, Suite 100
Norcross, GA 30092

1-800-879-8079

Order No. DRBR-S120X-0117

Printed in USA

usa.siemens.com/motioncontrol