SINAMICS S120 drive system

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Overview

With its separate power units and Control Units, the SINAMICS S120 drive system can be perfectly adapted to a wide variety of different drive tasks.

The Control Unit is selected according to the number of drives to be controlled and the required performance level, while the power unit must be rated to meet the energy requirements of the system. The connection between the Control Unit and power unit is made very simply using the digital system interface DRIVE-CLiQ.

Control Units

CU310-2 PN and SIMOTION D4x5-2 Control Units

CU310-2 DP and CU310-2 PN Control Units

CU310-2 Control Units are designed to control a single drive. They feature as standard a PROFIBUS interface (CU310-2 DP) or PROFINET interface (CU310-2 PN) and a TTL/HTL encoder evaluation circuit.

CU320-2 Control Unit

The CU320-2 Control Unit has been designed to control multiple drives. A CU320-2 Control Unit is capable of operating up to

- 12 drives in *V/f* control mode or
- 6 drives in Servo or Vector control mode.

The CU320-2 Control Unit can be used to control a group of single drives and implement basic drive technology functions.

SIMOTION D Control Units

A SIMOTION D Control Unit is used for applications requiring coordinated Motion Control such as synchronous operation, electronic gear, cam disk or complex technology functions. SIMOTION D Control Units are available in a range of performance variants:

- SIMOTION D410-2 for controlling 1 to 3 axes
- SIMOTION D425-2 for controlling up to 16 axes
- SIMOTION D435-2 for controlling up to 32 axes
- SIMOTION D445-2 for controlling up to 64 axes
- SIMOTION D455-2 for controlling up to 128 axes

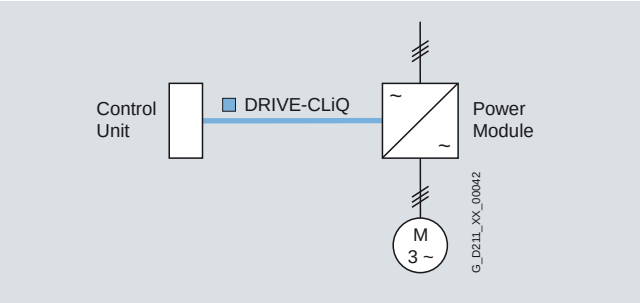
The STARTER commissioning tool is used to commission and diagnose the various types of SINAMICS drives through the Control Units. The SCOUT engineering system, which includes the STARTER tool, is required for SIMOTION D Control Units.

For further information about STARTER and SCOUT, see Engineering software and chapter SIMOTION Motion Control System.

Power Modules

The stand-alone version of a SINAMICS S120 drive system consists of a CU310-2 Control Unit and a Power Module. A mains rectifier, a voltage-source DC link and an inverter for supplying a motor are integrated in the Power Module.

Power Module in blocksize format with CU310-2 Control Unit



Power Modules are designed for single drives which are not capable of regenerating energy to the supply. Generated energy produced during braking can be converted to heat via braking resistors.

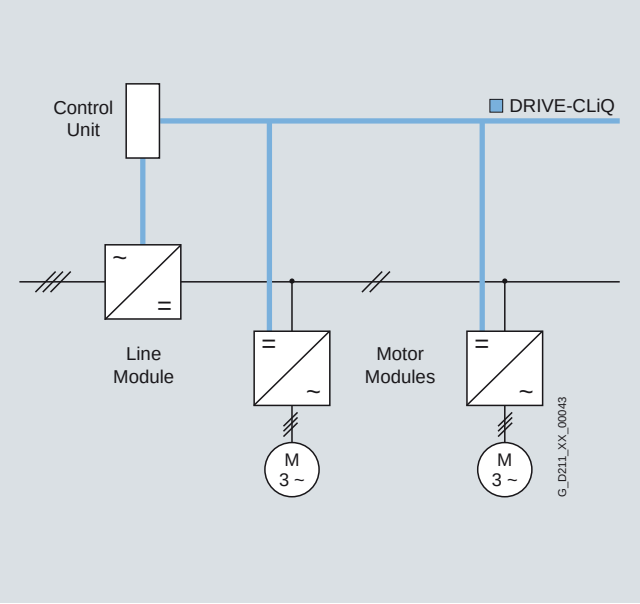
Power Modules can also be operated by a CU320-2 Control Unit, SIMOTION D4x5-2 or CX32-2 Controller Extension, e.g. in configurations where a single drive has been added to a multi-axis drive group. In this case, the Power Modules in blocksize format must be equipped with the CUA31/CUA32 Control Unit Adapter. This is connected with the CU320-2 Control Unit, SIMOTION D4x5-2 or CX32-2 Controller Extension using DRIVE-CLiQ. Power Modules in chassis format can be directly connected to the mullti-axis Control Unit using a DRIVE-CLiQ cable.

Overview (continued)

Motor Modules

A voltage-source DC link and an inverter for supplying a motor are integrated in the Motor Module.

CU320-2 Control Unit, Line Module and three Motor Modules in booksize format



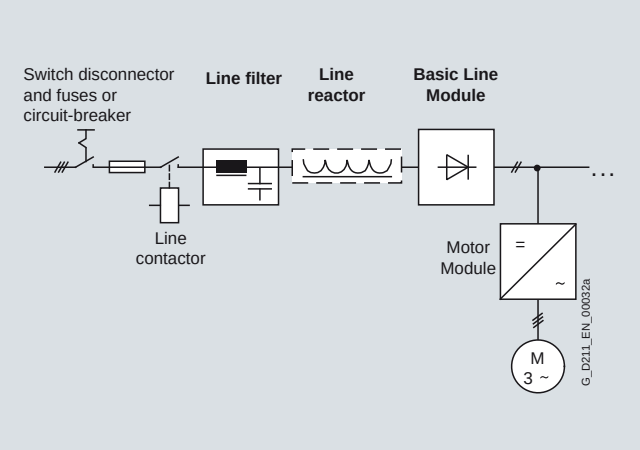
Motor Modules are designed for multi-axis drive systems and are controlled by a CU320-2 Control Unit, a SIMOTION D4x5-2 or CX32-2 Controller Extension. Motor Modules are interconnected by means of a shared DC busbar. Since the Motor Modules have a common DC link, they can exchange energy with one another, i.e. if one Motor Module operating in generator mode produces energy, the energy can be used by another Motor Module operating in motor mode. The voltage-source DC link is supplied with main line voltage by a Line Module.

Line Modules

Line Modules generate a DC voltage from the line voltage and supply Motor Modules with energy via the voltage-source DC link.

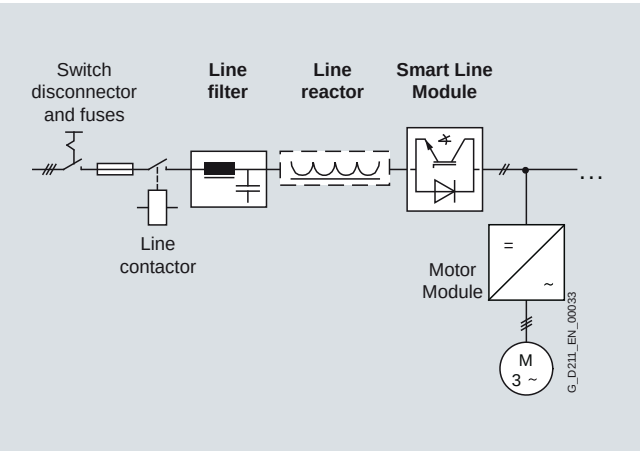
Basic Line Modules

Basic Line Modules are designed only for infeed operation, i.e. they are not capable of feeding regenerative energy back into the supply system. If regenerative energy is produced, e.g. when drives brake, it must be converted to heat by means of a Braking Module and a braking resistor. When a Basic Line Module is used as the infeed, the matching line reactor must be installed. A line filter can be installed optionally in order to restrict conducted interference to Class C2 limits (EN 61800-3).



Smart Line Modules

Smart Line Modules can supply energy and return regenerative energy to the supply system. A Braking Module and braking resistor are required only if the drives need to be decelerated in a controlled manner after a power failure (when energy cannot be recovered to the supply). When a Smart Line Module is used as the infeed, the matching line reactor must be installed. A line filter can be installed optionally in order to restrict conducted interference to Class C2 limits (EN 61800-3).



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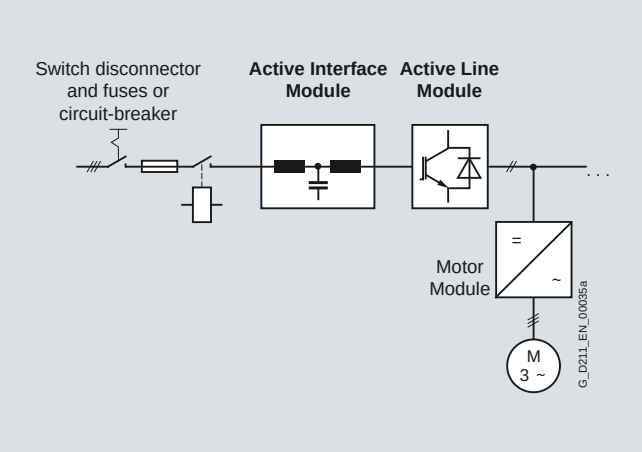
Overview (continued)

Active Line Modules

Active Line Modules can supply energy and return regenerative energy to the supply system. A Braking Module and braking resistor are required only if the drives need to be decelerated in a controlled manner after a power failure (when energy cannot be recovered to the supply). In contrast to Basic Line Modules and Smart Line Modules, however, Active Line Modules generate a regulated DC voltage which remains constant despite fluctuations in the line voltage. In this case, the line voltage must remain within the permissible tolerance range. Active Line Modules draw a virtually sinusoidal current from the supply which limits any harmful harmonics.

In order to operate an Active Line Module, it is absolutely essential to use the Active Interface Module for the appropriate rating. A line filter can be installed optionally in order to restrict conducted interference to Class C2 limits (EN 61800-3).



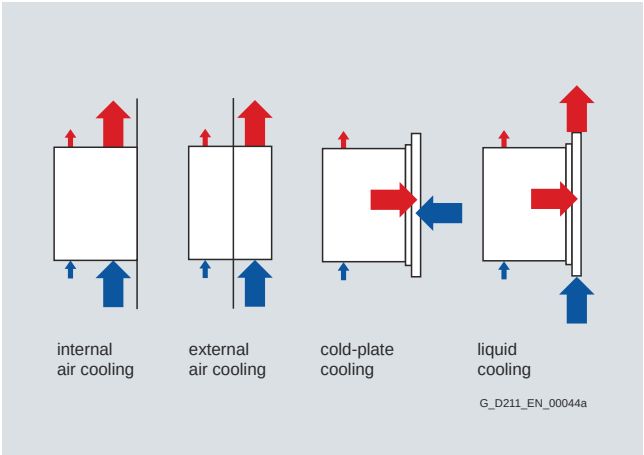
Please refer to chapter System description – Dimensioning for more information about designing a drive system with SINAMICS S120.

Power Modules, Motor Modules and Line Modules are available in booksize, booksize compact, blocksize and chassis format:

- Power Modules in blocksize and chassis format
- Motor Modules and Line Modules in booksize, booksize compact and chassis format.

Type of cooling

Depending on the frame size, there are several cooling options:



Internal air cooling

In this standard solution, the power loss from the electronics and power units of the drive components is removed by natural cooling or by a forced-ventilation system and routed to the interior of the control cabinet.

External air cooling

External air cooling uses the "through-hole" method. The components' power unit heat sinks pass through the mounting surface in the control cabinet and can thus release the heat losses of the power circuit to a separate external cooling circuit. The only heat loss that remains in the cabinet is that emitted by the electronics. Degree of protection IP54 can be achieved at this "mechanical interface" – the external heat sink. The heat sink, with its cooling fins and the fan unit (part of the scope of supply), protrudes through the back into a separate ventilation duct, which can also open outwards.

Cold plate cooling

Units designed with cold plate cooling can pass the power unit heat losses to an external heat sink via a thermal interface on the unit's rear panel. This external heat sink is water-cooled, for example.

Liquid cooling

On liquid-cooled units, the power semiconductors are mounted on a heat sink through which the cooling medium flows. Most of the heat produced by the unit is absorbed by the cooling medium and can be dissipated outside the control cabinet.

Overview (continued)

Customized applications

The devices can be purchased in the different formats as a complete system solution. The user profits from the know-how of the drive specialists and no longer has to consider the thermal design of the application. Especially in applications with devices that use cold plate cooling, external air cooling and liquid-cooled devices in chassis format, the user obtains a technically reliable solution and saves time on engineering. The system solution ranges, for example, from a drive line-up in booksize format with cold plate cooling completely installed on a common cooling plate through to complete control cabinets with a cooling system and temperature/condensation control.

Further information on request.

Energy efficiency

The SINAMICS S120 drive system saves energy by recovering energy from the axes and using it within the DC link group of a multi-axis configuration and by feeding it back into the supply system. Even at full infeed capacity, no unnecessary heat is generated in the control cabinet.

Because the Active Line Modules prevent capacitive and inductive reactive currents, SINAMICS S120 also ensures that no unnecessary power losses occur in the power supply and that no current harmonics occur. This not only prevents detrimental effects on other loads, but it also reduces the heat generated in the control cabinet.

System components

System components are divided into the following categories:

- ***DC link components***
  e.g. Braking Modules and braking resistors
- ***Power components on the output side***
  e.g. motor reactors
- ***Supplementary system components***
  e.g. Terminal Modules, Operator Panels and Communication Boards
- ***Encoder system interface***
  for connecting various types of encoders to SINAMICS S120

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Overview (continued)

Booksize format

Booksize format units are optimized for multi-axis applications and are mounted adjacent to one another. The connection for the shared voltage-source DC link is an integral feature. The booksize format offers the full range of cooling options: Internal air cooling, external air cooling, cold plate cooling and liquid cooling in some cases.

Booksize compact format

Derived from the booksize format we developed the booksize compact format for machines with particularly high requirements for the compactness of their drives. The booksize compact format combines all benefits of the booksize format and provides the same performance with an even smaller overall height and an extended overload capability. The booksize compact format is thus particularly suitable for integration into machines with high dynamic requirements and confined installation conditions.

The booksize compact format has the same design for the cooling methods of internal air cooling and cold plate cooling.

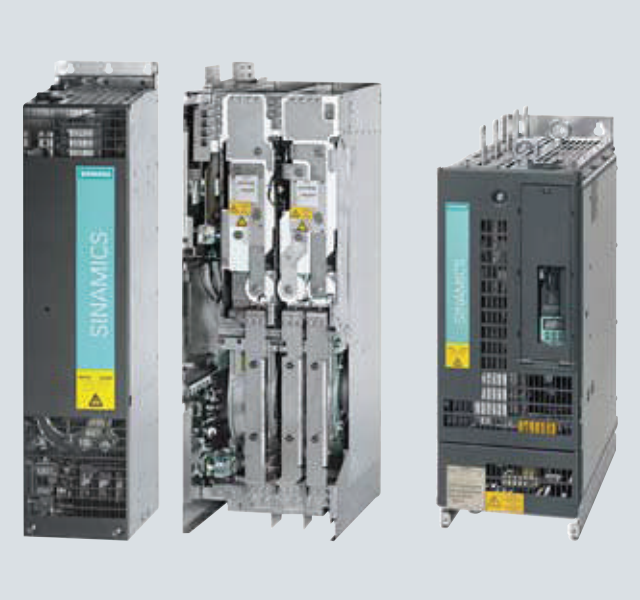
Blocksize format

Blocksize format units are optimized for single-axis applications and are supplied only as Power Modules.

The CU310-2 Control Unit can be snapped onto them directly. The units are cooled by internal air cooling or liquid cooling.

Chassis format

Higher-output units (approximately 100 kW and above) are constructed in chassis format. These are available as Line Modules, Power Modules and Motor Modules. Chassis format units are cooled by an internal air cooling circuit as standard. For special applications, e.g. for extrusion or marine applications, liquid-cooled devices can be ordered. The CU310-2 Control Unit can be integrated in the Power Modules.



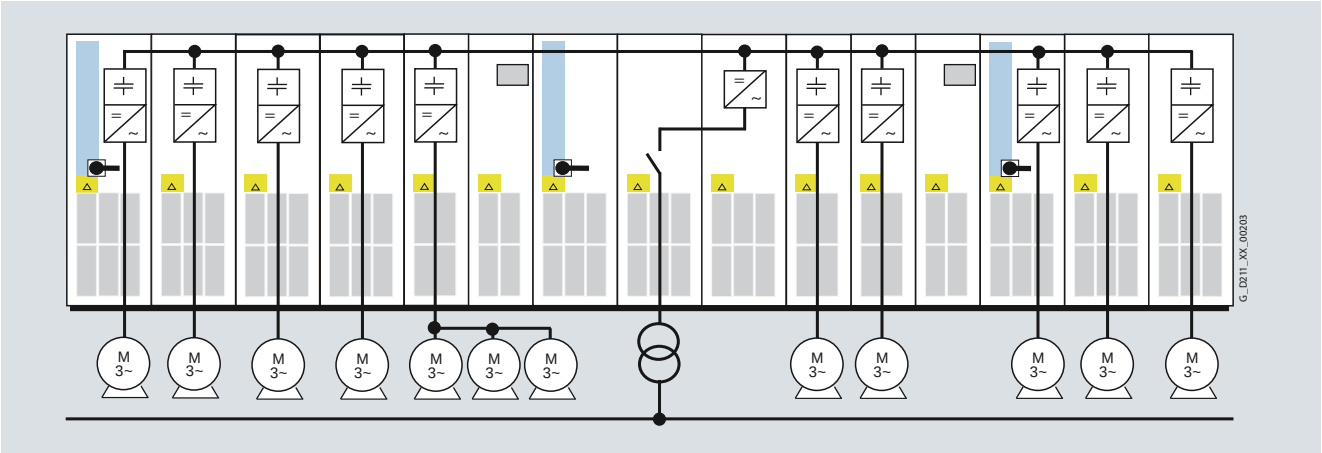
Overview (continued)

Cabinet Module format

Apart from the built-in converter units described in this catalog, SINAMICS S120 Cabinet Modules represent a cabinet-mounted system that is specially designed for use in plant construction and can be combined with drive cabinet series with a total output of up to 4500 kW (6000 HP).

The modular system is ideally suited to multi-motor drives with a central supply infeed and a common DC busbar, of the type typically used in, for example, paper-making machines, roller mills, test stands, or hoisting gear. The modular concept allows all components to be combined to meet requirements in a closed cabinet system.

For the Cabinet Modules, apart from Motor Modules, the three Basic Line Module, Smart Line Module and Active Line Module infeeds are available as well as special Braking Modules and Auxiliary Modules. The system is available with the degrees of protection IP20, IP21, IP23, IP43 and IP54. Communication between the Power Modules and the central Control Unit takes place via DRIVE-CLiQ.



Example of a drive line-up with SINAMICS S120 Cabinet Modules for a multi-motor drive

The power range can be extended as required by means of a parallel connection of up to 4 individual modules.

Further information is available on request.

General technical specifications

Technical specifications

Unless specified otherwise, the following technical specifications are valid for all the following components of the SINAMICS S120 drive system.

Electronics power supply	24 V DC, -15 %/+20 %
Vibratory load	
• Transport [1] acc. to EN 60721-3-2	
- All units and components except for chassis format	Class 2M3
- Chassis format units	Class 2M2
• Operation Test values acc. to EN 60068-2-6	Test Fc 10 ... 58 Hz: Constant deflection 0.075 mm (0.0030 in) 58 ... 150 Hz: Constant acceleration = 9.81 m/s^2 (1 × *g*)
Shock stressing	
• Transport [1] acc. to EN 60721-3-2	
- All units and components except for chassis format	Class 2M3
- Chassis format units	Class 2M2
• Operation Test values acc. to EN 60068-2-27	Test Ea
- Booksize and blocksize formats FSA to FSC	147 m/s^2 (15 × *g*)/11 ms
- Blocksize format FSD to FSF	49 m/s^2 (5 × *g*)/30 ms
- Chassis format	98 m/s^2 (10 × *g*)/20 ms
Ambient conditions	
• Protection class acc. to EN 61800-5-1	Class I (with protective conductor system) and Class III (PELV)
• Touch protection	DIN VDE 0106 Part 100 and BGV A 3 when used properly
• Type of cooling	Internal/external air cooling, power units with forced air cooling by means of built-in fan
Permissible ambient/ coolant temperature (air) during operation	
• For line-side components, Power Modules, Line Modules and Motor Modules	0 ... 40 °C (32 ... 104 °F) without derating, > 40 ... 55 °C (104 ... 131 °F), see derating characteristics
• For Control Units, supplementary system components, DC link components, and Sensor Modules	0 ... 55 °C (32 ... 131 °F) up to 2000 m (6562 ft) above sea level
Climatic ambient conditions	
• Storage [1] acc. to EN 60721-3-1	Class 1K4 Temperature -25 ... +70 °C (-77 ... +158 °F)
• Transport [1] acc. to EN 60721-3-2	Class 2K4 Temperature -40 ... +70 °C (-104 ... +158 °F) Max. air humidity 95 % at 40 °C (104 °F)
• Operation acc. to EN 60721-3-3	Class 3K3 Temperature 0 ... 55 °C (32 ... 131 °F) Condensation, splashwater, and ice formation are not permitted (EN 60204, Part 1)
Environmental class/ harmful chemical substances	
• Storage [1] acc. to EN 60721-3-1	Class 1C2
• Transport [1] acc. to EN 60721-3-2	Class 2C2
• Operation acc. to EN 60721-3-3	Class 3C2
Organic/biological influences	
• Storage [1] acc. to EN 60721-3-1	Class 1B1
• Transport [1] acc. to EN 60721-3-2	Class 2B1
• Operation acc. to EN 60721-3-3	Class 3B1
Degree of contamination acc. to EN 61800-5-1	2

European standards	
EN 954-1	Safety of machinery – safety-related parts of control systems; Part 1: General design principles
EN 61508-1	Functional safety of electrical/electronic/ programmable electronic safety-related systems Part 1: General requirements
EN 50370-1	Electromagnetic compatibility (EMC) – Product family standard for machine tools Part 1: Radiated interference
EN 55011	Industrial, scientific and medical high-frequency devices (ISM devices) – radio interference – limit values and measuring techniques
EN 60204-1	Electrical equipment of machines Part 1: General definitions
EN 61800-3	Variable-speed electric drives Part 3: EMC product standard including specific test methods
EN 61800-5-1	Adjustable-speed electrical power drive systems Part 5: Safety requirements Main section 1: Electrical and thermal requirements
North American standards	
UL508C	Power Conversion Equipment
CSA C22.2 No. 14	Industrial Control Equipment
Approvals	
cULus	Testing by UL (Underwriters Laboratories, www.ul.com) according to UL and CSA standards

More information

For satisfactory and reliable operation of the drive system, original components of the SINAMICS system and the original Siemens accessories as described in this Catalog and the Configuration Manuals, in the functional descriptions or user manuals should be used.

The user must observe the configuring instructions.

Combinations that differ from the configuring instructions (also in conjunction with non-Siemens products) require a special agreement.

If no original components are used, for example, for repairs, approvals such as UL, EN and Safety Integrated can become invalid and thus the operation authorization for the machine with the non-Siemens components installed becomes invalid.

All of the approvals, certificates, declarations of conformity, test certificates, e.g. CE, UL, Safety Integrated etc. have been performed with the associated system components as they are described in the Catalogs and Configuration Manuals. The certificates are only valid if the products are used with the described system components, are installed according to the Installation Guidelines and are used for their intended purpose. In other cases, the vendor of these products is responsible for arranging that new certificates are issued.

Please refer to chapter System description – Dimensioning for more engineering guidance to design a drive system with SINAMICS S120.

Note: The products described in this catalog may cause high-frequency disturbances in a residential environment and necessitate the implementation of interference-suppression measures.

Overview

Innovative system architecture with a central Control Unit

Electronically coordinated single drives work together to perform your drive tasks. Higher-level controllers operate the drives to achieve the required coordinated movement. This requires cyclic data exchange between the controller and the drives. This exchange usually took place via a field bus, which required a great deal of time and effort for installation and configuration. SINAMICS S120 takes a different approach: A central Control Unit controls the drives for all connected axes and also establishes the technological links between the drives and/or axes. Since all the required data is stored in the central Control Unit, it does not need to be transferred. Inter-axis connections can be established within a Control Unit and easily configured in the STARTER commissioning tool using a mouse.

- Simple technological tasks can be carried out automatically by the SINAMICS S120 Control Unit
- The **CU310-2 DP** or **CU310-2 PN** Control Unit are available for single drives
- The **CU320-2** Control Unit is designed for multi-axis applications
- Sophisticated Motion Control tasks can be implemented with the support of the more powerful **D410-2**, **D425-2**, **D435-2**, **D445-2** and **D455-2** Control Units of **SIMOTION D** (graded according to performance)

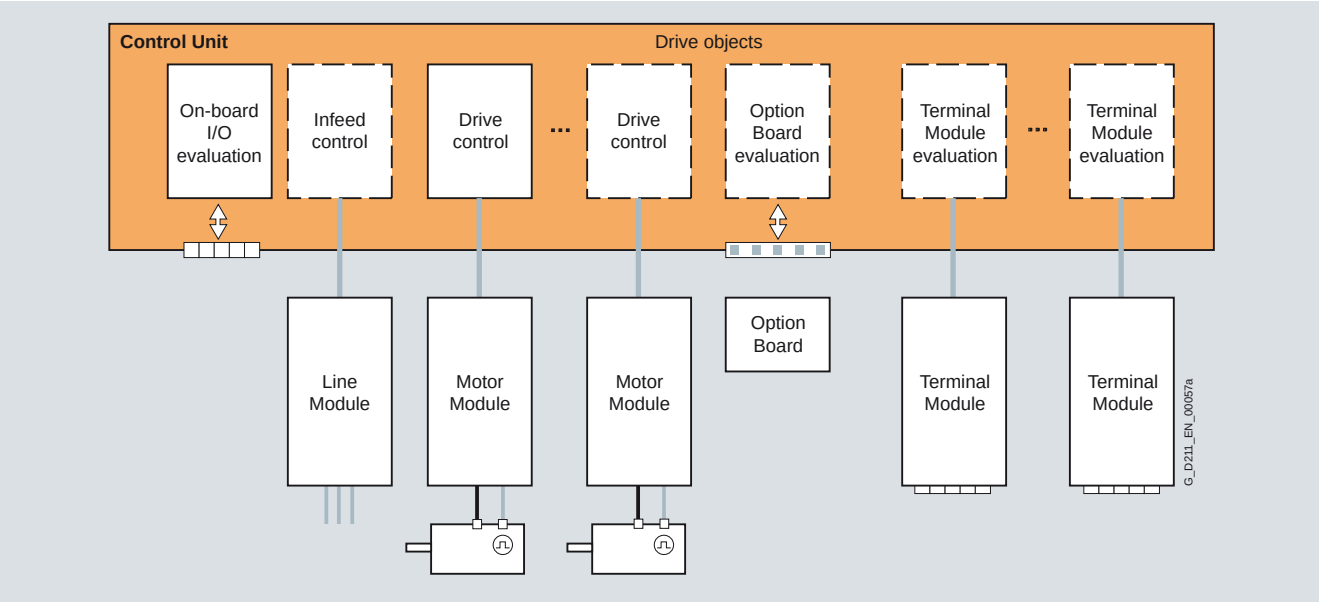
Each of these Control Units is based on an object-oriented SINAMICS S120 standard firmware which contains all of the most popular control modes and can be scaled to meet even the most advanced performance requirements.

The drive controls are supplied as ready-to-configure drive objects:

- Infeed Control for line infeed,
- Vector Control for the broad scope of rugged asynchronous (induction) motor applications
- Servo Control for permanent-field synchronous motors with demanding dynamic requirements
- *V/f* control modes for simple applications such as group drives with SIEMOSYN motors

Drive objects

A drive object is a self-contained software function with its own parameters and, if necessary, its own fault messages and alarms.



Extended technology with SIMOTION

SIMOTION D Control Units support the coordinated Motion Control of multiple drives. Technology objects are implemented in addition to drive objects on these Control Units. These are grouped to form technology packages and make available extended Motion Control functions (e.g. synchronous operation, cam disk, path interpolation and others) or technological functions (e.g. a cam controller, a temperature or pressure control). The IEC 61131-3-compliant PLC integrated in SIMOTION D Control Units means that they are not just capable of controlling sequences of motions, but the entire machine including HMI and I/Os.

Comprehensive package of open-loop and closed-loop control functions

A wide variety of standard functions such as setpoint input, data set changeover, controller optimization and kinetic buffering ensure a high degree of functional reliability and excellent flexibility of application.

[1] In transport packaging.

Control Units

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Overview (continued)

Overview of key open-loop and closed-loop control functions

	Closed-loop control types S120	Open-loop control types S120	Main functions S120 for booksize/chassis	Comment, note
Infeed Control	• Booksize - Current control with/without mains sensor - V_{DC} control with/without mains sensor • Chassis - Current control with mains sensor - V_{DC} control with mains sensor	• Booksize/chassis - Basic Mode Rectification only - Smart Mode Rectification and regenerative feedback	• Mains identification • Controller optimization • Harmonics filter • Automatic restart	The mains sensor is the VSM 10 Voltage Sensing Module; "current" is the line current; 3-phase with line frequency
Vector Control	• Asynchronous (induction) motor - Torque control with/without encoder - Speed control with/without encoder • Torque motor - Torque control with encoder - Speed control with/without encoder • Asynchronous (induction) motor, torque motor - Position control with encoder	• Linear/parabolic characteristic • Fixed-frequency characteristic (textile) • Independent voltage setpoint input	• Data set changeover • Extended setpoint input • Motor identification • Current/speed controller optimization • Technology controller • Basic positioner • Automatic restart • Flying restart with/without encoder • Kinetic buffering • Synchronization • Droop • Brake control	Mixed operation with *V/f* control modes is possible; it is for this reason that the *V/f* control modes are stored only once in the "Vector control" drive object Position control can be selected as a function module from both Servo and Vector mode. Synchronous motors (1FK and 1FT) and linear motors can be operated only in Servo mode.
Servo Control	• Asynchronous (induction) motor - Torque control with encoder - Speed control with/without encoder • Synchronous motor, linear motor and torque motor - Torque control with encoder - Speed control with encoder • All motor types - Position control with encoder	• Linear/parabolic characteristic • Fixed-frequency characteristic (textile) • Independent voltage setpoint input	• Data set changeover • Setpoint input • Motor identification • Damping application • Technology controller • Basic positioner • Brake control	Mixed operation with *V/f* control modes is possible; it is for this reason that the *V/f* control modes are stored only once in the "Vector control" drive object Position control can be selected as a function module from both Servo and Vector mode.

Overview (continued)

BICO technology

Every drive object contains a large number of input and output variables which can be freely and independently interconnected using Binector Connector Technology (BICO). A binector is a logic signal which can assume the value 0 or 1. A connector is a numerical value, e.g. the actual speed or current setpoint.

Drive Control Chart (DCC)

DCC Drive Control Chart for SINAMICS S120 for simple, graphical configuration of control, logic and calculation functions at the drive level.

It expands the possibilities for easy configuring of technology functions for the SIMOTION Motion Control system as well as for the SINAMICS S120 drive system.

The user-friendly DCC editor supports easy graphical configuration and a clear presentation of control loop structures.

The associated block library contains a large choice of closed-loop control, calculation and logic modules as well as more complex open-loop and closed-loop control functions.

Drive Control Chart for SINAMICS S120 therefore provides a convenient basis for resolving drive-level open-loop and closed-loop control tasks directly in the converter.

Function module

The basic positioner EPos can be called on all SINAMICS S120 Control Units as an additionally activatable function module. The basic positioner can be used to resolve basic Motion Control tasks without additional external technological outlay from the drive itself.

The **Technology controller** is designed as a PID controller. It is suitable for implementing controls for regulating variables such as fill level, temperature, tension, pressure, flow rate and dancer position.

Integral safety functions (Safety Integrated)

The Control Units support comprehensive safety functions.

The integrated safety functions are the Safety Integrated Basic Functions

- STO = Safe Torque Off
- SBC = Safe Brake Control
- SS1 = Safe Stop 1

and the Safety Integrated Extended Functions that require a license

- SS2 = Safe Stop 2
- SOS = Safe Operating Stop
- SLS = Safely-Limited Speed
- SSM = Safe Speed Monitor
- SDI = Safe Direction
- SLP = Safely-Limited Position

(abbreviations in accordance with IEC 61800-5-2)

If the extended integrated safety functions are used, licenses, supplementary system components such as TM54F terminal modules, or suitable safety controls will be necessary.
For further information on the integrated safety functions see chapter Safety Integrated.

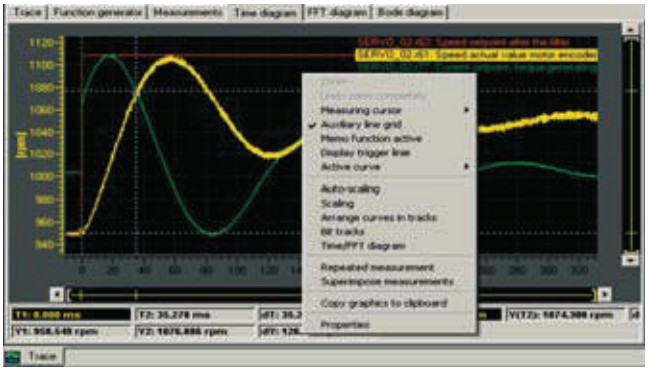
CompactFlash card

The functions of the SINAMICS S120 drives are stored on a CompactFlash card. This card contains the firmware and parameter settings for all drives in the form of a project. The CompactFlash card can also hold additional projects, which means that the correct project can be accessed immediately when series machines of different types are commissioned. When the Control Unit has booted, the data on the CompactFlash card are read and loaded to the RAM.

The firmware is organized in objects. Drive objects are used to implement open-loop and closed-loop control functions for Line Modules, Motor Modules, Power Modules and other system components connected by DRIVE-CLiQ.

Diagnostics optimally supported by trace function

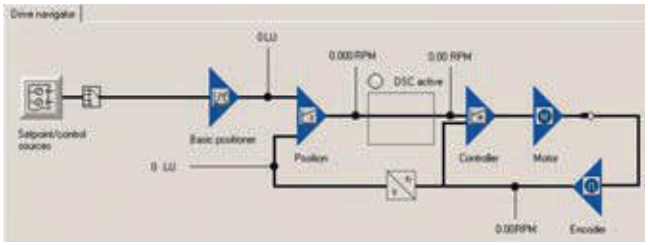
The time characteristics of input and output variables associated with drive objects can be measured by the integrated trace function and displayed using the STARTER commissioning tool. The trace can record up to 4 signals simultaneously. A recording can be triggered dependent on freely selectable boundary conditions, e.g. the value of an input or output variable.

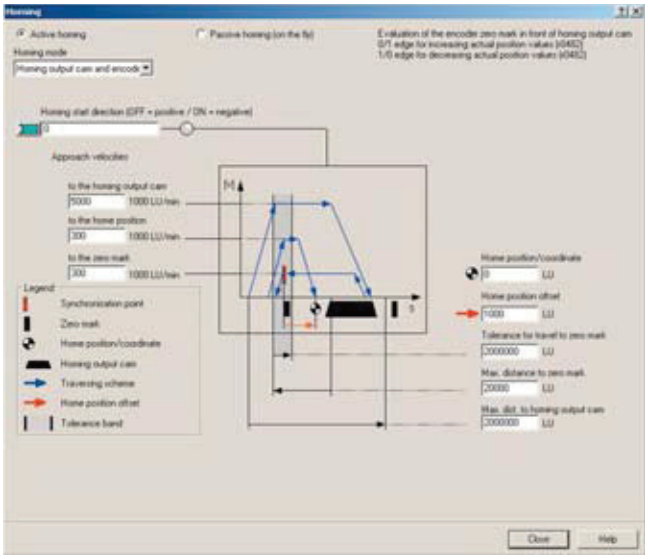


EPos basic positioner

Overview

Integrated functionality for absolute and relative positioning of linear and rotary axes with motor encoders or machine encoders.





The EPos basic positioner in the SINAMICS S120 drive system provides powerful and precise positioning functions. Due to its flexibility and adaptability, the basic positioner can be used for a wide range of positioning tasks.

The functions are easy to handle both during commissioning and during operation, and the comprehensive monitoring functions are outstanding.

In many applications, external position controls can thus be dispensed with.

The EPos basic positioner is used to position linear and rotary axes (modulo) in absolute/relative terms with rotary as well as linear motor encoder or machine encoder (indirect or direct measuring system).

EPos is a function module that can be activated in Servo Control and in Vector Control.

User-friendly configuring and commissioning including control panel (operation using PC) and diagnostics with the STARTER commissioning tool.

In addition to extremely flexible positioning functions, EPos offers a high degree of user-friendliness and reliability thanks to integral monitoring and compensation functions.

Different operating modes and their functionality increase flexibility and plant productivity, for example, by means of "on-the-fly" and bumpless correction of the Motion Control.

Preconfigured PROFIdrive positioning frames are available which, when selected, automatically establish the internal "connection" to the basic positioner.

Functionality of the EPos basic positioner

Lower-level closed-loop position control with the following essential components

- Position actual value sensing (including the lower-level measuring probe evaluation and reference mark search)
- Position controller (including limits, adaptation and pre-control calculation)
- Monitoring functions (standstill, positioning and dynamic following error monitoring, cam signals)

Mechanical system

- Backlash compensation
- Modulo offset

Limits

- Speed/acceleration/delay/jerk limitation
- Software limit switch (traversing range limitation by means of position setpoint evaluation)
- Stop cams (traversing range limitation by means of hardware limit switch evaluation)

Homing and alignment

- Set reference point (for an axis at standstill that has reached its target position)
- Search for reference (separate mode including reversing cam functionality, automatic reversal of direction, homing to "output cam and encoder zero mark" or only "encoder zero mark" or "external zero mark (BERO)")
- Flying referencing (seamless homing possible during "normal" traversing with the aid of the measuring input evaluation; generally evaluation, e.g. of a BERO. Subordinate function for the modes "jog", "direct setpoint specification/MDI" and "traversing blocks").
- Absolute encoder alignment

Traversing blocks mode (64 traversing blocks)

- Positioning using traversing blocks that can be stored in the drive unit including block change enable conditions and specific tasks for an axis that was previously referenced
- Traversing block editor using STARTER
- A traversing block contains the following information:
  - Job number and job (e.g. positioning, waiting, GOTO set jump, setting of binary outputs, travel to fixed stop)
  - Motion parameters (target position, velocity, override for acceleration and deceleration)
  - Mode (e.g.: hide block, continuation conditions such as "Continue_with_stop", "Continue_flying" and "Continue_externally using high-speed probe inputs")
  - Job parameters (e.g. wait time, block step conditions)

Direct setpoint input (MDI) mode

- Positioning (absolute, relative) and setting-up (endless closed-loop position control) using direct setpoint inputs (e.g. via the PLC using process data)
- It is always possible to influence the motion parameters during traversing (on-the-fly setpoint acceptance) as well as for on-the-fly change between the setup and positioning modes
- The direct setpoint specification operating mode (MDI) can also be used in the relative positioning or setup mode if the axis is not homed. This means that on-the-fly synchronization and re-homing can be carried out using "flying referencing".

Jog mode

- Closed-loop position-controlled traversing of the axis with the "endless position controlled" or "jog incremental" modes, which can be toggled between (traverse through a "step width")

CU310-2 Control Unit for single-axis drives

Overview

CU310-2 PN and CU310-2 DP Control Units

The CU310-2 Control Unit that is designed for the communication and open-loop/closed-loop control functions of a SINAMICS S120 (AC/AC) is combined with the PM340 Power Module to create a powerful single-axis drive. PROFINET (PN) and PROFIBUS (DP) variants are available for fieldbus communication.

Design

CU310-2 Control Units feature the following connections and interfaces as standard:

- Fieldbus interface
  - CU310-2 PN: 1 PROFINET interface with 2 ports (RJ45 sockets) with PROFIdrive V4 profile
  - CU310-2 DP: 1 PROFIBUS interface with PROFIdrive V4 profile
- 1 DRIVE-CLiQ socket for communication with the DRIVE-CLiQ motor or other DRIVE-CLiQ devices (e.g. Sensor Modules or Terminal Modules)
- 1 encoder evaluation for evaluating the following encoder signals
  - Incremental encoder TTL/HTL
  - SSI encoder without incremental signals
- 1 PE (protective earth) connection
- 1 connection for the electronics power supply via the 24 V DC power supply connector
- 1 temperature sensor input (KTY84-130 or PTC)
- 3 parameterizable, fail-safe (can be used with firmware version 4.5 and higher) digital inputs (isolated) or alternatively 6 parameterizable digital inputs (isolated).
  The fail-safe digital inputs can be routed, i.e. they can be routed via PROFIsafe to a higher-level controller.
- 5 parameterizable digital inputs (floating)
- 1 parameterizable, fail-safe (can be used with firmware version 4.5 and higher) digital output (isolated) or alternatively 1 digital output (isolated)
- 8 parameterizable bidirectional digital inputs/outputs (non-floating)
- 1 analog input, either ± 10 V (resolution 12 bit + sign) or ± 20 mA (11 bit + sign)
- 1 Ethernet interface (socket RJ45) for commissioning and diagnostics
- 1 slot for the CompactFlash card on which firmware and parameters are stored
- 1 PM-IF interface for communication with the Power Modules in blocksize format
- 3 test sockets and one reference ground for commissioning support
- 1 interface for the BOP20 Basic Operator Panel

The status of the CU310-2 Control Unit is indicated via multi-color LEDs.

A BOP20 Basic Operator Panel can also be snapped directly onto the CU310-2 Control Unit for diagnostic procedures.

As the firmware and parameter settings are stored on a plug-in CompactFlash card, the Control Unit can be changed without the need for software tools.

Integration

The CU310-2 Control Unit drives Power Modules in blocksize format via the PM-IF interface. DRIVE-CLiQ motors or Sensor Modules (SMC) can also be connected to the integrated DRIVE-CLiQ socket to permit the operation of motors without a DRIVE-CLiQ interface.

Parameters can be changed directly on the device with the BOP20 Basic Operator Panel. The BOP20 Basic Operator Panel can also be snapped onto the CU310-2 Control Unit during operation to perform troubleshooting procedures.

The CU310-2 Control Unit and other connected components are commissioned and diagnosed with the STARTER commissioning tool. The CU310-2 Control Unit requires a CompactFlash card with firmware version V4.5 or higher.

A CU310-2 PN Control Unit communicates with the higher-level control system using PROFINET IO and the PROFIdrive V4 profile.

The SINAMICS S120 drive system with the CU310-2 PN Control Unit then assumes the function of a PROFINET IO device and can perform the following functions:

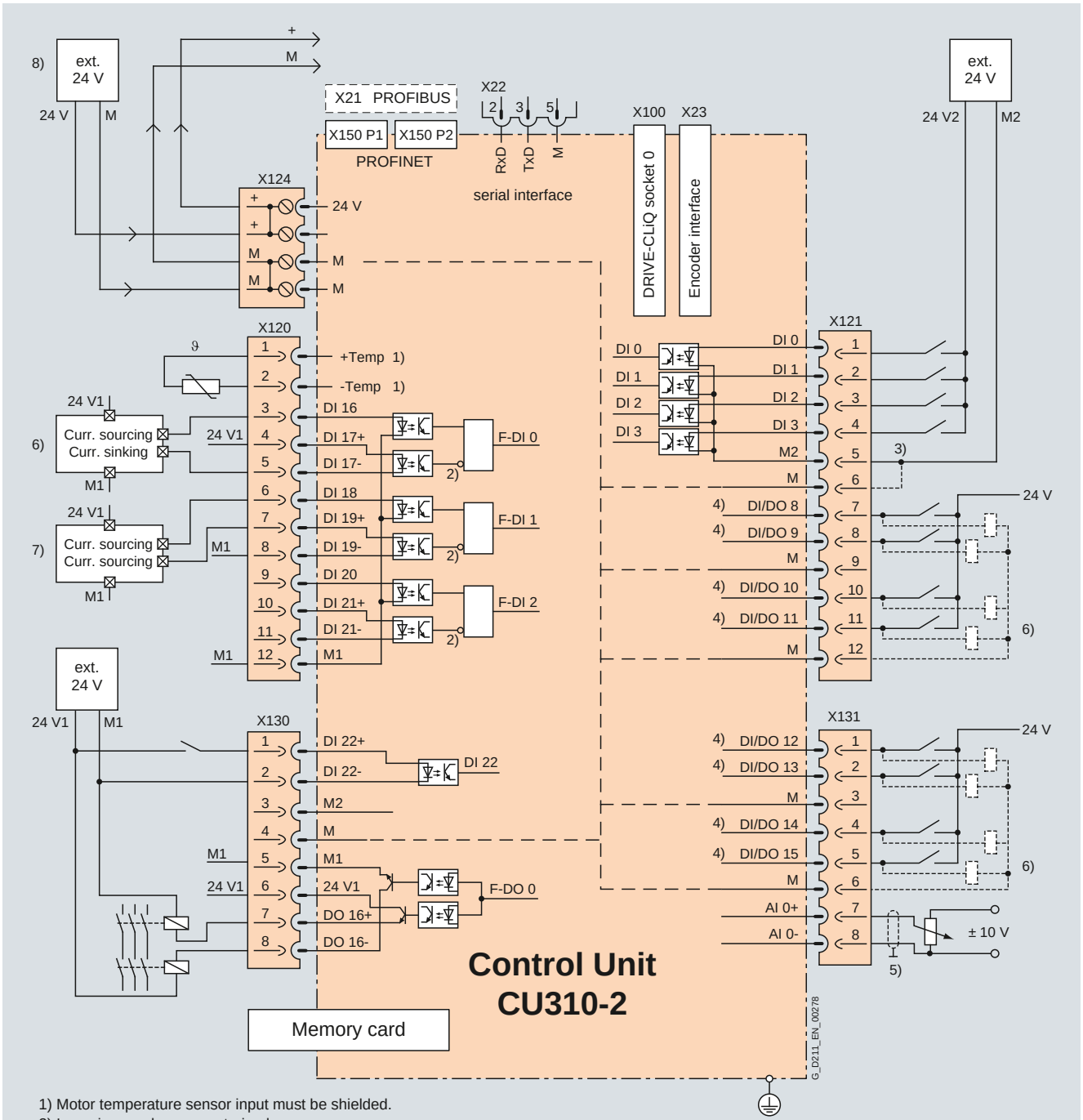
- PROFINET IO device
- 100 Mbit/s full duplex
- Supports real-time classes of PROFINET IO:
  - RT (Real-Time)
  - IRT (Isochronous Real-Time), minimum send cycle 500 µs
- Connects to controls as PROFINET IO devices using PROFIdrive compliant with Specification V4
- Standard TCP/IP communication for engineering processes using the STARTER commissioning tool
- Integrated 2-port switch with two RJ45 sockets based on the ERTEC ASIC. The optimum topology (line, star, tree) can therefore be configured without additional external switches.

A 24 V supply voltage must be connected to terminal X124 for the digital outputs to be used. The CU310-2 Control Unit requires a CompactFlash card with firmware V4.5 or higher.

CU310-2 Control Unit for single-axis drives

3

Integration



1) Motor temperature sensor input must be shielded.
2) Inversion can be parameterized.
3) Jumper open, isolation for digital inputs (DI).
4) High-speed inputs must be shielded.
5) Analog input must be shielded.
6) Safety-related control with current sourcing and current sinking outputs.
7) Safety-related control with two current sourcing outputs.
8) In order to use the digital outputs, an external 24 V power supply must be connected to terminal X124.

Connection example of CU310-2 Control Unit

Technical specifications

CU310-2 Control Unit PROFINET: 6SL3040-1LA01-0AA0 PROFIBUS: 6SL3040-1LA00-0AA0	
Current requirement, max. At 24 V DC, without taking account of digital outputs and DRIVE-CLiQ supply	0.35 A for CU310-2 + 0.5 A for PM340 Power Module
Conductor cross-section, max.	2.5 mm^2
Fuse protection, max.	20 A
Digital inputs	in accordance with IEC 61131-2 Type 1 5 floating digital inputs 8 bidirectional non-floating digital inputs/digital outputs 3 parameterizable, fail-safe digital inputs (isolated) or alternatively 6 parameterizable digital inputs (isolated)
• Voltage	-3 … +30 V
• Low level (an open digital input is interpreted as "low")	-3 … +5 V
• High level	15 … 30 V
• Current consumption at 24 V DC, typ.	10 mA
• Delay time of digital inputs [1], approx.	
- L → H	50 µs
- H → L	100 µs
• Delay time of high-speed digital inputs [1], approx. (high-speed digital inputs can be used for position detection)	
- L → H	5 µs
- H → L	50 µs
• Conductor cross-section, max.	1.5 mm^2
Digital outputs (sustained short-circuit strength)	8 bidirectional non-floating digital outputs/digital inputs
• Voltage	24 V DC
• Load current per digital output [2], max.	500 mA
• Delay time [1], typ./max.	
- L → H	150 µs/400 µs
- H → L	75 µs/100 µs
• Conductor cross-section, max.	1.5 mm^2
Analog input	1 analog input for current or voltage input, switchable
• Voltage	-10 ... +10 V; R_i > 100 Ω
• Current	-20 ... +20 mA; R_i > 250 Ω
• Max. range that can be resolved	-11 ... +11 V
• Common-mode range	±12 V
• Resolution	13 bit (with respect to the maximum range that can be resolved)

CU310-2 Control Unit PROFINET: 6SL3040-1LA01-0AA0 PROFIBUS: 6SL3040-1LA00-0AA0	
Encoder evaluation	• Incremental encoder TTL/HTL • SSI encoder without incremental signals
• Input impedance	
- TTL	570 Ω
- HTL, max.	16 mA
• Encoder supply	24 V DC/0.35 A or 5 V DC/0.35 A
• Encoder frequency, max.	300 kHz
• SSI baud rate	100 ... 250 kBaud
• Resolution absolute position SSI	30 bit
• Cable length, max.	
- TTL encoder	100 m (328 ft) (only bipolar signals permitted) [3]
- HTL encoder	100 m (328 ft) for unipolar signals 300 m (984 ft) for bipolar signals [3]
- SSI encoder	100 m (328 ft)
Power loss	< 20 W
PE connection	M5 screw
Dimensions	
• Width	73 mm (2.87 in)
• Height	191 mm (7.52 in)
• Depth	75 mm (2.95 in)
Weight, approx.	0.95 kg (2 lb)
Approvals, according to	cULus

Selection and ordering data

Description	Order No.
CU310-2 PN Control Unit Without CompactFlash card	**6SL3040-1LA01-0AA0**
CU310-2 DP Control Unit Without CompactFlash card	**6SL3040-1LA00-0AA0**
Accessories	
STARTER commissioning tool	**6SL3072-0AA00-0AG0**
Accessories for re-ordering	
SINAMICS/SINUMERIK/SIMOTION dust-proof blanking plugs (50 units) For DRIVE-CLiQ port	**6SL3066-4CA00-0AA0**

For information on connectors and cables, please refer to Catalog IK PI and the Siemens Industry Mall: www.siemens.com/industrymall

[1] The specified delay times refer to the hardware. The actual reaction time depends on the time slice in which the digital input or output is processed.

[2] In order to use the digital outputs, an external 24 V power supply must be connected to terminal X124.

[3] Signal cables twisted in pairs and shielded.

CompactFlash card for CU310-2

Overview

The CompactFlash card contains the firmware and parameter settings. The CompactFlash card is plugged into the appropriate slot on the CU310-2 Control Unit.

Design

A CU310-2 Control Unit can perform the communication, open-loop and closed-loop control functions for one Power Module. The performance expansion is not required in this case.

In addition to the firmware, the CompactFlash card also contains licensing codes which are required to enable firmware options (Safety Integrated Extended Functions in the current version). The Safety Integrated Extended Functions must be ordered via the order code **F01** in addition to the order number.

The firmware option can also be enabled on-site, for example, if the Safety Integrated Extended Functions are to be enabled retrospectively. You will need the serial number of the CompactFlash card and the Order No. of the firmware option to be enabled. With this information, you can purchase the associated license code from a license database and enable the firmware option. The license code is only valid for the CompactFlash card declared and cannot be transferred to other CompactFlash cards.

Selection and ordering data

Description	Order No.
CompactFlash card for CU310-2 PN and CU310-2 DP Control Units without safety license	
including Certificate of License	**6SL3054-0E■00-1BA0**
CompactFlash card for CU310-2 PN and CU310-2 DP Control Units with safety license	
including Certificate of License and with safety license	**6SL3054-0E■00-1BA0-Z F01**
Firmware **V4.5**	**F**
Firmware **V4.6**	**G**
Post-licensing	
Safety Integrated Extended Functions option including Certificate of License for one axis for upgrading the license of a CompactFlash card.	**6SL3074-0AA10-0AA0**

Overview

The communication, open-loop and closed-loop control functions for one or more Motor Modules and the Line Module are executed in a CU320-2 Control Unit. The CU320-2 Control Unit is designed for multi-axis operation.

CU320-2 DP Control Unit with BOP20 Basic Operator Panel

Design

CU320-2 Control Units feature the following interfaces as standard:

- 4 × DRIVE-CLiQ sockets for communication with other DRIVE-CLiQ devices, e.g. Motor Modules, Active Line Modules, Sensor Modules, Terminal Modules
- CU320-2 PN: 1 PROFINET interface with 2 ports (RJ45 sockets) with PROFIdrive V4 profile
- CU320-2 DP: 1 PROFIBUS interface with PROFIdrive V4 profile
- 12 parameterizable digital inputs (floating)
- 8 parameterizable bidirectional digital inputs/digital outputs (non-floating)
- 1 serial RS232 interface
- 1 interface for the BOP20 Basic Operator Panel
- 1 slot for the CompactFlash card on which firmware and parameters are stored
- 1 slot for mounting an option module (e.g. TB30 Terminal Board)
- 2 rotary coding switches for manually setting the PROFIBUS address
- 1 Ethernet interface for commissioning and diagnostics
- 3 test sockets and one reference ground for commissioning support
- 1 connection for the electronics power supply via the 24 V DC power supply connector
- 1 PE (protective earth) connection
- 1 ground connection

A shield connection for the signal cable shield on the option module is located on the CU320-2 Control Unit.

The available option slot is used to expand the interfaces, for example, to include additional terminals or for communication purposes.

The status of the CU320-2 Control Unit is indicated via multi-color LEDs.

As the firmware and parameter settings are stored on a plug-in CompactFlash card, the Control Unit can be changed without the need for software tools.

The CU320-2 Control Unit can be mounted on the side of the Line Module in booksize format via brackets integrated in a Line Module. The CU320-2 Control Unit can also be fixed to the wall of the control cabinet using the integrated fixing lugs. As the CU320-2 Control Unit is not as deep as the Line Modules, suitable spacers are available to increase the depth of the CU320-2 Control Unit to 270 mm (10.6 in).

Integration

DRIVE-CLiQ components, for example, Motor Modules and Active Line Modules, can be connected to a CU320-2 Control Unit. The number of modules depends on the performance required, including duty type and additional functions.

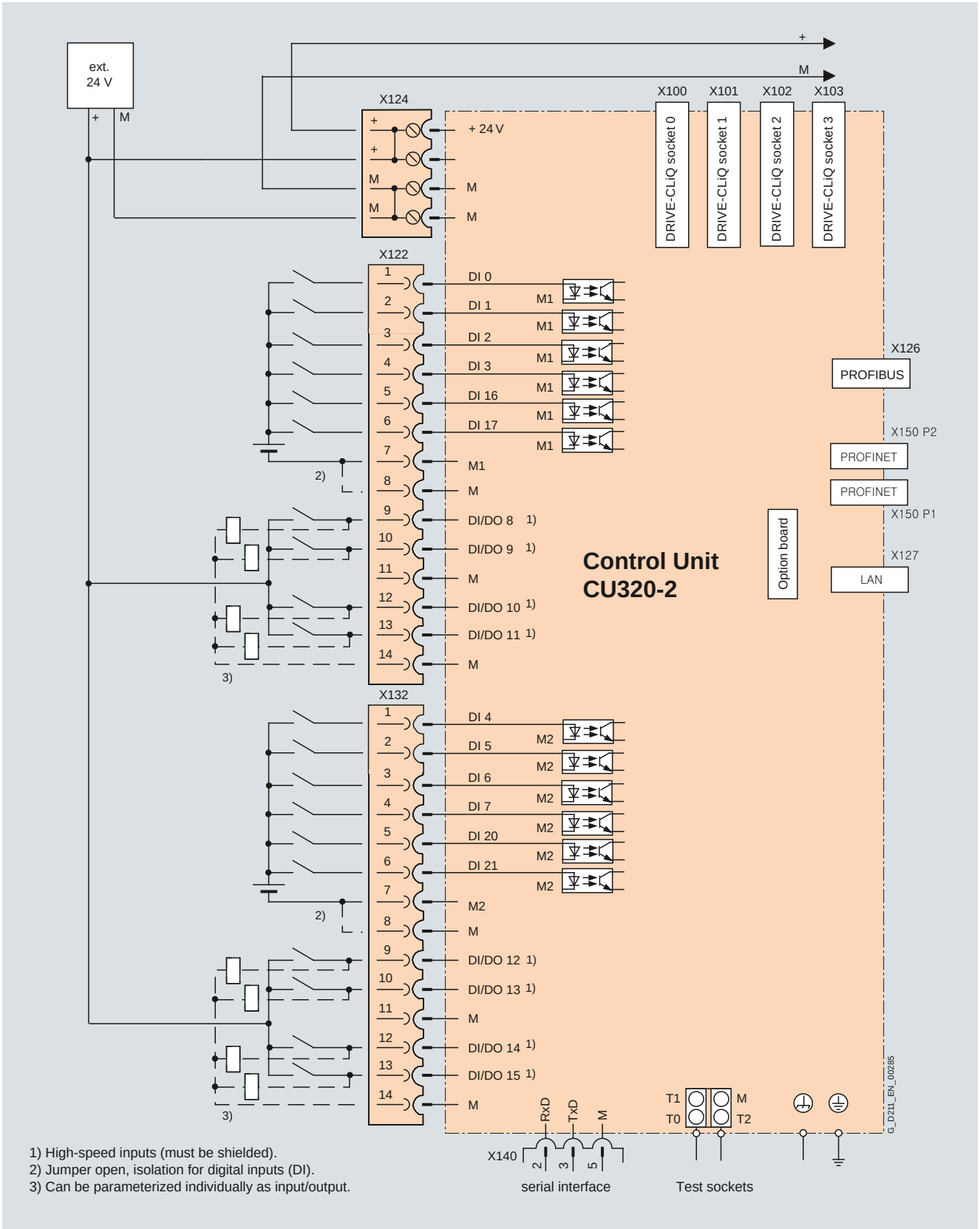
The BOP20 Basic Operator Panel can also be snapped onto the CU320-2 Control Unit during operation to perform troubleshooting procedures.

The CU320-2 Control Unit and other connected components are commissioned and diagnosed with the STARTER commissioning tool.

The CU320-2 PN Control Unit requires a CompactFlash card with firmware V4.4 or higher.
The CU320-2 DP Control Unit requires a CompactFlash card with firmware V4.3 or higher.

3

Integration (continued)



1) High-speed inputs (must be shielded).
2) Jumper open, isolation for digital inputs (DI).
3) Can be parameterized individually as input/output.

Connection example of a CU320-2 Control Unit

Technical specifications

CU320-2 Control Unit PROFINET: 6SL3040-1MA01-0AA0 PROFIBUS: 6SL3040-1MA00-0AA0	
Current requirement, max. At 24 V DC, without taking account of digital outputs, expansion option slot and DRIVE-CLiQ supply	1.0 A
Conductor cross-section, max.	2.5 mm^2
Fuse protection, max.	20 A
Digital inputs	In accordance with IEC 61131-2 type 1 12 floating digital inputs 8 bidirectional non-floating digital inputs/digital outputs
• Voltage	-3 … +30 V
• Low level (an open digital input is interpreted as "low")	-3 … +5 V
• High level	15 … 30 V
• Current consumption at 24 V DC, typ.	9 mA
• Delay time of digital inputs [1], approx.	
- L → H	5 µs
- H → L	50 µs
• Conductor cross-section, max.	1.5 mm^2
Digital outputs (sustained short-circuit strength)	8 bidirectional non-floating digital outputs/digital inputs
• Voltage	24 V DC
• Load current per digital output, max.	500 mA
• Delay time [1], typ./max.	
- L → H	150 µs/400 µs
- H → L	75 µs/100 µs
• Conductor cross-section, max.	1.5 mm^2
Power loss	24 W
PE connection	M5 screw
Ground connection	M5 screw
Dimensions	
• Width	50 mm (1.97 in)
• Height	300 mm (11.8 in)
• Depth	226 mm (8.90 in)
Weight, approx.	2.3 kg (5 lb)
Approvals, according to	cULus

Selection and ordering data

Description	Order No.
CU320-2 PN Control Unit Without CompactFlash card	**6SL3040-1MA01-0AA0**
CU320-2 DP Control Unit Without CompactFlash card	**6SL3040-1MA00-0AA0**
Accessories	
Spacers (2 units) For increasing the depth of the CU320-2 Control Unit to 270 mm (10.6 in) (if the integrated brackets are not used, but the depth still has to be 270 mm (10.6 in))	**6SL3064-1BB00-0AA0**
STARTER commissioning tool	**6SL3072-0AA00-0AG0**
Accessories for re-ordering	
SINAMICS/SINUMERIK/SIMOTION dust-proof blanking plugs (50 units) For DRIVE-CLiQ port	**6SL3066-4CA00-0AA0**

[1] The specified delay times refer to the hardware. The actual reaction time depends on the time slice in which the digital input or output is processed.

CompactFlash card for CU320-2

Overview

The CompactFlash card contains the firmware and parameter settings. The CompactFlash card is plugged into the appropriate slot on the CU320-2 Control Unit.

Design

A CU320-2 Control Unit can perform the communication, open-loop and closed-loop control functions for several Motor Modules. The computing capacity requirement increases in proportion to the number of connected Motor Modules and system components and in relation to the dynamic response required. The performance expansion is required for the CU320-2 Control Unit for 4 axes or more. The utilization of the CU320-2 Control Unit can be calculated with the SIZER configuration tool.

In addition to the firmware, the CompactFlash card also contains licensing codes which are required to enable firmware options (the performance expansion and the Safety Integrated Extended Functions in the current version). To order the Safety Integrated Extended Functions (see chapter Safety Integrated), order codes must be stated (**F..**) in addition to the Order No. for each axis.

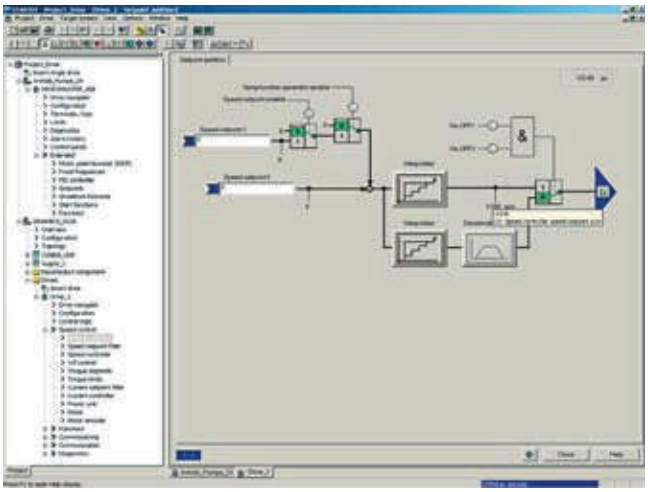
The firmware options can also be enabled on-site, for example, if the performance expansions required are not known at the time of placing the order or the Safety Integrated Extended Functions must be enabled retrospectively. You will need the serial number of the CompactFlash card and the Order No. of the firmware option to be enabled. With this information, you can purchase the associated license code from a license database and enable the firmware option. The license code is only valid for the CompactFlash card declared and cannot be transferred to other CompactFlash cards.

Selection and ordering data

Description	Order No.
CompactFlash card for CU320-2 Control Unit without Safety license	
- Without performance expansion	**6SL3054-0E■00-1BA0**
- With performance expansion firmware option	**6SL3054-0E■01-1BA0**
CompactFlash card for CU320-2 Control Unit with Safety license	
• For **1 axis**	
- Without performance expansion	**6SL3054-0E■00-1BA0-Z F01**
- With performance expansion firmware option	**6SL3054-0E■01-1BA0-Z F01**
• For **2 axes**	
- Without performance expansion	**6SL3054-0E■00-1BA0-Z F02**
- With performance expansion firmware option	**6SL3054-0E■01-1BA0-Z F02**
• For **3 axes**	
- Without performance expansion	**6SL3054-0E■00-1BA0-Z F03**
- With performance expansion firmware option	**6SL3054-0E■01-1BA0-Z F03**
• For **4 axes**	
- With performance expansion firmware option	**6SL3054-0E■01-1BA0-Z F04**
• For **5 axes**	
- With performance expansion firmware option	**6SL3054-0E■01-1BA0-Z F05**
• For **6 axes**	
- With performance expansion firmware option	**6SL3054-0E■01-1BA0-Z F06**
Firmware **V4.5**	**F**
Firmware **V4.6**	**G**
Post-licensing	
• Performance expansion option including Certificate of License for upgrading the license of a CompactFlash card	**6SL3074-0A A01-0AA0**
• Safety Integrated Extended Functions option including Certificate of License for one axis for upgrading the license of a CompactFlash card. This option must be ordered once for each axis, max. 6× for one CompactFlash card	**6SL3074-0A A10-0AA0**

STARTER commissioning tool

Overview



The user-friendly STARTER commissioning tool can be used for

- Commissioning
- Optimizing and
- Diagnostics

This software can be operated either as a standalone PC application, integrated in SIMATIC STEP 7 with TIA compatibility via Drive ES Basic, or it can be integrated into the SCOUT engineering system (for SIMOTION). The basic functions and handling are the same in both cases.

In addition to the SINAMICS drives, the STARTER also supports MICROMASTER 4 devices.

The project wizards can be used to create the drives within the structure of the project tree.

Beginners are supported by solution-based dialog guidance, whereby a standard graphics-based display maximizes clarity when setting the drive parameters.

First commissioning is guided by a wizard which makes all the basic settings in the drive. Therefore, getting a motor up and running is merely a question of setting a few of the drive parameters as part of the drive configuration process.

The individual settings required are made using graphics-based parameterization screens, which also precisely visualize the principle of operation of the drive.

Examples of individual settings that can be made include:

- How terminals are used
- Bus interface
- Setpoint channel (e.g. fixed setpoints)
- Closed-loop speed control (e.g., ramp-function generator, limits)
- BICO interconnections
- Diagnostics

For experts, the expert list can be used to specifically and quickly access individual parameters at any time. An individual compilation of frequently used parameters can be saved in dedicated user lists and watch tables.

In addition, the following functions are available for optimization purposes:

- Self-optimization of the controller settings (depending on drive unit)
- Trace (depending on the drive unit, this is not supported for
  - MICROMASTER 4
  - SINAMICS G110
  - SINAMICS G120 < firmware V4.4
  - SINAMICS G110D
  - SINAMICS G120D)

Diagnostics functions provide information about:

- Control/status words
- Parameter status
- Conditions of use
- Communication states

Performance features

- User-friendly: Only a small number of settings need to be made for successful first commissioning: The motor starts to rotate
- Solution-oriented dialog-based user guidance simplifies commissioning
- Self-optimization functions reduce manual effort for optimization.

Minimum system requirements

The following minimum requirements must be complied with:

- Hardware
  - PG or PC with Pentium III min. 1 GHz (recommended > 1 GHz)
  - Work memory 1 GB (2 GB recommended)
  - Screen resolution 1024 × 768 pixels, 16-bit color depth
  - Free hard disk memory: min. 3 GB
- Software
  - Microsoft Internet Explorer V6.0 or higher
  - 32-bit operating systems:
    Microsoft Windows Server 2003 SP2
    Microsoft Windows Server 2008
    Microsoft Windows XP Professional SP3
    Microsoft Windows 7 Professional incl. SP1
    Microsoft Windows 7 Ultimate incl. SP1
    Microsoft Windows 7 Enterprise incl. SP1
    (standard installation)
  - 64-bit operating systems:
    Microsoft Windows 7 Professional SP1
    Microsoft Windows 7 Ultimate SP1
    Microsoft Windows 7 Enterprise SP1 (standard installation)
    Microsoft Windows Server 2008 R2

Selection and ordering data

	Order No.
STARTER commissioning tool for SINAMICS and MICROMASTER English/French/German Italian/Spanish	**6SL3072-0AA00-0AG0**

STARTER commissioning tool

Accessories

Connection

Depending on the version of the Control Unit, the Control Unit (CU) of the drive unit can communicate with the programming device (PG) or PC via a serial interface, PROFIBUS, or Ethernet/PROFINET. The following accessories are available for the particular drive system as listed in the following table.

Selection and ordering data

		Order No.
• RS232	**SIMATIC S7 connecting cable** Null modem cable, 6 m (19.7 ft)	**6ES7901-1BF00-0XA0**
• PROFIBUS	**PROFIBUS communication module CP 5512** PCMCIA type 2 card + adapter with 9-pin SUB-D socket, for Windows 2000/XP Professional and PCMCIA 32	**6GK1551-2AA00**
	PROFIBUS communication module CP 5711 USB adapter for connecting a PG or notebook to PROFIBUS or MPI USB cable (2 m (6.56 ft)) included in scope of supply	**6ES7901-4BD00-0XA0**
	SIMATIC DP plug-in cable 12 Mbaud, for PG connector, pre-assembled with 2 × 9-pin SUB-D connector, 3 m (9.84 ft)	**6ES7901-4BD00-0XA0**
• PROFINET/ Ethernet	Standard CAT5 Ethernet cable or PROFINET cable	–

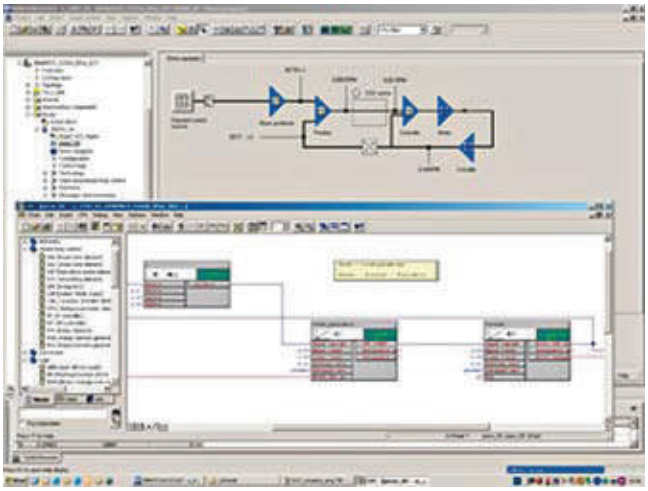
More information

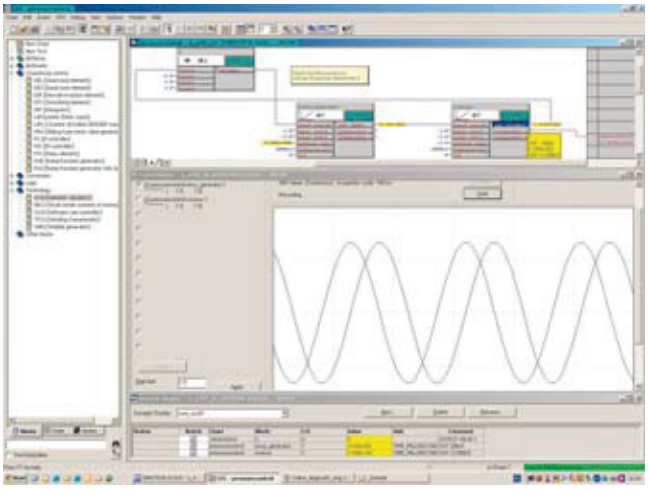
Updates for the STARTER commissioning tool are also available on the Internet at
www.siemens.com/starter/downloads

Drive Control Chart (DCC)

Overview

Drive Control Chart (DCC) expands the scope of device functions by means of freely available closed-loop control, calculation and logic modules and offers a means by which technological functions can be graphically configured in the SINAMICS S120 drive system. DCC is installed as a supplementary application to the STARTER commissioning tool.





Drive Control Chart expands the facility for the simplest possible configuring of technological functions, both for the SIMOTION Motion Control System as well as for the SINAMICS S120 drive system. For users, this opens up a new dimension regarding the adaptability of the systems mentioned to the specific functions of their machines. DCC has no restrictions with regard to the number of usable functions; this is only limited by the performance capability of the target platform.

The user-friendly DCC Editor enables easy graphics-based configuration, allows control loop structures to be clearly represented and provides a high degree of reusability of diagrams that have already been created.

The open-loop and closed-loop control functions are defined by using multi-instance-capable blocks (Drive Control Blocks (DCBs)) from a pre-defined library (DCB library) that are selected and graphically linked with one another by dragging and dropping. Test and diagnostic functions allow the program behavior to be verified and, in the case of a fault, the cause identified.

The block library encompasses a large selection of closed-loop, arithmetic and logic blocks, as well as comprehensive open-loop and closed-loop control functions.

For logically combining, evaluating and acquiring binary signals, all commonly used logic functions are available for selection (AND, XOR, on/off delay, RS flipflop, counter, etc.). A wide range of arithmetic functions, such as absolute value generation, dividers and minimum/maximum evaluation are available to monitor and evaluate numerical quantities. In addition to the closed-loop drive control, axial winder functions, closed-loop PI controllers, ramp-function generators or wobble generators can be configured simply and easily.

Closed-loop control structures can be programmed with almost no restrictions in conjunction with the SIMOTION Motion Control System. These can then be combined with other program sections to form an overall program.

Drive Control Chart for SINAMICS S120 also provides a convenient basis for resolving drive-level open-loop and closed-loop control tasks directly in the converter. This further extends the possibility of adapting SINAMICS to the particular application. Local data processing in the drive supports the implementation of modular machine concepts and results in an increase in the overall machine performance.

Minimum hardware and software requirements

See the SCOUT or STARTER engineering software, since DCC is installed in addition to this.

Selection and ordering data

DCC comprises the graphical configuring tool (DCC Editor) and the block library (DCB Library).

DCC is installed in addition to the SCOUT or STARTER engineering software.

The necessary engineering license for each PC (floating) for DCC is acquired at the same time the order is placed; additional runtime licenses are not required.

DCC can be ordered in two versions: as version for SIMOTION and SINAMICS applications, or as version for SINAMICS applications only.

Existing licenses for DCC version V2.1 can also be used for DCC V2.2 SP1.

An upgrade variant for the engineering license can be selected for existing DCC V2.0 versions.

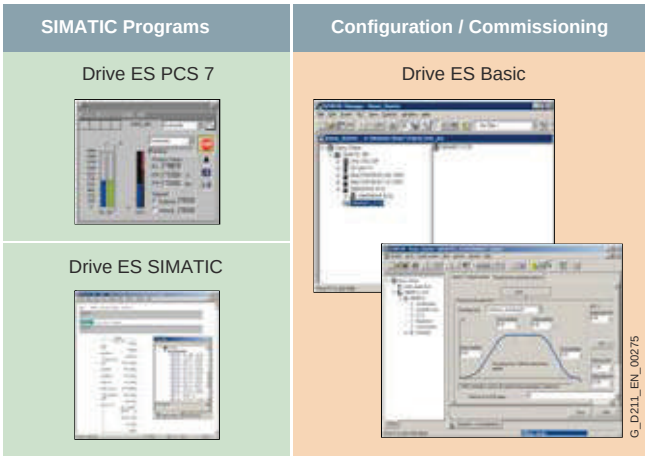
	Order No.
DCC SIMOTION/SINAMICS V2.2 SP1 for SCOUT/STARTER V4.3 SP1	
Graphical configuration with Drive Control Chart	
DCC editor + DCB libraries for use on SIMOTION and SINAMICS S120	
• Single engineering license, with data carrier	**6AU1810-1JA22-1XA0**
• Upgrade engineering license, with data carrier	**6AU1810-1JA22-1XE0**
DCC SINAMICS V2.2 SP1 for STARTER V4.3 SP1	
Graphical configuration with Drive Control Chart	
DCC editor + DCB library for use on SINAMICS S120	
• Single engineering license, with data carrier	**6AU1810-1HA22-1XA0**
• Upgrade engineering license, with data carrier	**6AU1810-1HA22-1XE0**

More information

Updates for the STARTER commissioning tool are also available on the Internet at
www.siemens.com/starter

Drive ES engineering software

Overview



Drive ES is the engineering system used to integrate Siemens drive technology into the SIMATIC automation world easily, efficiently and cost-effectively in terms of communication, configuration and data management.

It is based on the operator interface of the STEP 7 Manager, the essential element when it comes to engineering.

Various software packages are available for selection:

- Drive ES Basic
- Drive ES SIMATIC
- Drive ES PCS 7

Application

Drive ES Basic

Drive ES Basic is for first-time users of the world of Totally Integrated Automation and the basic software for setting the parameters of all drives online and offline in this environment. Drive ES Basic enables both the automation system and the drives to be handled using the SIMATIC Manager user interface. Drive ES Basic is the starting point for common data archiving for complete projects and for extending the use of the SIMATIC routing and teleservice to drives. Drive ES Basic provides the configuration tools for the new Motion Control functions, slave-to-slave communication, equidistance mode and isochronous mode with PROFIBUS DP and ensures that drives with PROFINET IO are simply integrated into the SIMATIC environment.

Drive ES SIMATIC

Drive ES SIMATIC is used for simple parameterization of STEP 7 communication instead of time-consuming programming. It requires STEP 7 to be installed.
It features a SIMATIC function block library; this means that the PROFIBUS and/or PROFINET IO interface can be simply and reliably programmed in the SIMATIC CPU for the drives.
There is no need for separate, time-consuming programming of the data exchange between the SIMATIC CPU and the drive.
All Drive ES users need to remember is:
Copy – Modify – Load – finished.

Customized, fully developed function blocks are copied from the library into your project.
Frequently used functions are fully preprogrammed:

- Read out complete diagnostics buffer automatically from the drive
- Download complete parameter set automatically from the SIMATIC CPU to the drive, e.g. when a device has to be replaced
- Automatically download partial parameter sets (e.g. for recipe or product change) from the SIMATIC CPU to the drive
- Upload the complete parameter assignment or partial parameter sets from the drive to the SIMATIC CPU, i.e. update.

Detailed contents of the Drive ES SIMATIC package

- **"PROFIBUS DP" communications software** for SIMATIC S7-300 with CPUs with integrated DP interface (function block libraries DRVDPS7, POSMO), SIMATIC S7-400 with CPUs with integrated DP interface or with CP 443-5 (DRVDPS7, POSMO function block libraries) and SIMATIC S7-300 with CP 342-5 (DRVDPS7C function block library)
- **"USS protocol" communications software** for SIMATIC S7-300 with integral PtP interfaces or with CP 340/341 and SIMATIC S7-400 with CP 441 (DRVUSSS7 function block library)
- **STEP 7 slave object manager** for easy configuration of drives as well as for non-cyclic PROFIBUS DP communication with the drives
- **STEP 7 device object manager** for easy configuration of drives with PROFINET IO interfaces (V5.4 and higher)
- **SETUP program** for installing the software in the STEP 7 environment
- **"PROFINET IO" communications software** for SIMATIC S7-300 with CPUs with integrated PN interface, SIMATIC S7-400 with CPUs with integrated PN interface or with CP (DRVDPS7 block library, respectively). PROFINET IO and PROFIBUS DP use the same blocks from the DRVDPS7 library, i.e. the blocks are able to serve both buses with a common block (only for V5.4 and higher)

Drive ES PCS 7

Drive ES PCS 7 links the drives with a PROFIBUS DP interface into the SIMATIC PCS 7 process control system, and it requires that SIMATIC PCS 7, V6.1 and higher has first been installed. Drive ES PCS 7 provides a function block library with function blocks for the drives and the corresponding faceplates for the operator station which enables the drives to be operated from the PCS 7 process control system. From version V6.1 and higher, drives will also be able to be represented in the PCS 7 Maintenance Station.

Detailed contents of the Drive ES PCS 7 package

- **Block library for SIMATIC PCS 7** Faceplates and control blocks for SIMOVERT MASTERDRIVES VC and MC, as well as MICROMASTER/MIDIMASTER of the third and fourth generation and SIMOREG DC MASTER and SINAMICS
- **STEP 7 slave object manager** for easy configuration of drives as well as for non-cyclic PROFIBUS DP communication with the drives
- **SETUP program** for installing the software in the PCS 7 environment

Drive ES engineering software

Selection and ordering data

Description	Order No.
Drive ES Basic V5.5 SPx *)	
Configuration software for the integration of drives into TIA (Totally Integrated Automation)	
Requirement: STEP 7 from V5.3, SP3 and higher	
Supplied as: DVD Languages: Ger, Eng, Fr, It, Sp with electronic documentation	
• Floating license, 1 user	**6SW1700-5JA00-5AA0**
• Floating license (copy license), 60 users	**6SW1700-5JA00-5AA1**
• Update service for single-user license	**6SW1700-0JA00-0AB2**
• Update service for copy license, 60 users	**6SW1700-0JA00-1AB2**
• Upgrade from V5.x to V5.5 SPx *)	**6SW1700-5JA00-5AA4**
Drive ES SIMATIC V5.5 SPx *)	
Function block library for SIMATIC for the parameterization of communication with the drives	
Requirement: STEP 7 from V5.3, SP3 and higher	
Supplied as: CD-ROM Languages: Ger, Eng, Fr, It, Sp with electronic documentation	
• Single-user license incl. 1 runtime license	**6SW1700-5JC00-5AA0**
• Runtime license (without data carrier)	**6SW1700-5JC00-1AC0**
• Upgrade from V5.x to V5.5 SPx *)	**6SW1700-5JC00-5AA4**
Drive ES PCS 7 V6.1 SPx *)	
Function block library for PCS 7 for the integration of drives	
Requirement: PCS 7 V6.1 and higher	
Supplied as: CD-ROM Languages: Ger, Eng, Fr, It, Sp with electronic documentation	
• Single-user license incl. 1 runtime license	**6SW1700-6JD00-1AA0**
• Runtime license (without data carrier)	**6SW1700-5JD00-1AC0**
• Update service for single-user license	**6SW1700-0JD00-0AB2**
Drive ES PCS 7 V7.0 SPx *)	
Function block library for PCS 7 for the integration of drives	
Requirement: PCS 7 V7.0 and higher	
Supplied as: CD-ROM Languages: Ger, Eng, Fr, It, Sp with electronic documentation	
• Single-user license incl. 1 runtime license	**6SW1700-7JD00-0AA0**
• Runtime license (without data carrier)	**6SW1700-5JD00-1AC0**
• Update service for single-user license	**6SW1700-0JD00-0AB2**
• Upgrade from V5.x to V7.0 SPx *)	**6SW1700-7JD00-0AA4**
Drive ES PCS 7 V7.1 SPx *)	
Function block library for PCS 7 for the integration of drives	
Requirement: PCS 7 V7.1 and higher	
Supplied as: CD-ROM Languages: Ger, Eng, Fr, It, Sp with electronic documentation	
• Single-user license incl. 1 runtime license	**6SW1700-7JD00-1AA0**
• Runtime license (without data carrier)	**6SW1700-5JD00-1AC0**
• Update service for single-user license	**6SW1700-0JD00-0AB2**
• Upgrade from V6.x to V7.1 SPx *)	**6SW1700-7JD00-1AA4**
Drive ES PCS 7 V8.0 SPx *)	
Function block library for PCS 7 for the integration of drives in the classic style (like the predecessor)	
Requirement: PCS 7 V8.0 and higher	
Supplied as: CD-ROM Languages: Ger, Eng, Fr, It, Sp with electronic documentation	
• Single-user license incl. 1 runtime license	**6SW1700-8JD00-0AA0**
• Runtime license (without data carrier)	**6SW1700-5JD00-1AC0**
• Update service for single-user license	**6SW1700-0JD00-0AB2**
• Upgrade from V6.x to V8.0 SPx *)	**6SW1700-8JD00-0AA4**
Drive ES PCS 7 APL V8.0 SPx *)	
Function block library for PCS 7 for the integration of drives in APL style	
Requirement: PCS 7 V8.0 and higher	
Supplied as: CD-ROM Languages: Ger, Eng, Fr, It, Sp with electronic documentation	
• Single-user license incl. 1 runtime license	**6SW1700-8JD01-0AA0**
• Runtime license (without data carrier)	**6SW1700-5JD00-1AC0**
• Update service for single-user license	**6SW1700-0JD00-0AB2**

*) Orders are automatically supplied with the latest Service Pack (SP).

More information

More information is available on the Internet at:
www.siemens.com/drivesolutions

Air-cooled Power Modules in blocksize format

Design

PM340 Power Modules in blocksize format, frame sizes FSA to FSF

The PM340 Power Modules in blocksize format feature the following connections and interfaces as standard:

- Line connection
- PM-IF interface for connection of the PM340 Power Module and CU310-2/SIMOTION D410-2 Control Unit or CUA31/CUA32 Control Unit Adapter. The PM340 Power Module also supplies power to the CU310-2/SIMOTION D410-2 Control Unit or CUA31/CUA32 Control Unit Adapter by means of an integrated power supply
- Terminals DCP/R1 and R2 for connection of an external braking resistor
- Motor connection made with screw-type terminals or screw studs
- Control circuit for the Safe Brake Relay for controlling a holding brake
- 2 PE (protective earth) connections

Power Modules without integrated line filter can be connected to grounded TN/TT and non-grounded IT systems.
Power Modules with integrated line filter are suitable only for connection to TN systems with grounded star point.

The integrated Braking Unit (Braking Chopper) is rated with the capability to continuously utilize the external braking resistor. The temperature of the external braking resistor must be monitored to provide protection against thermal overloading.

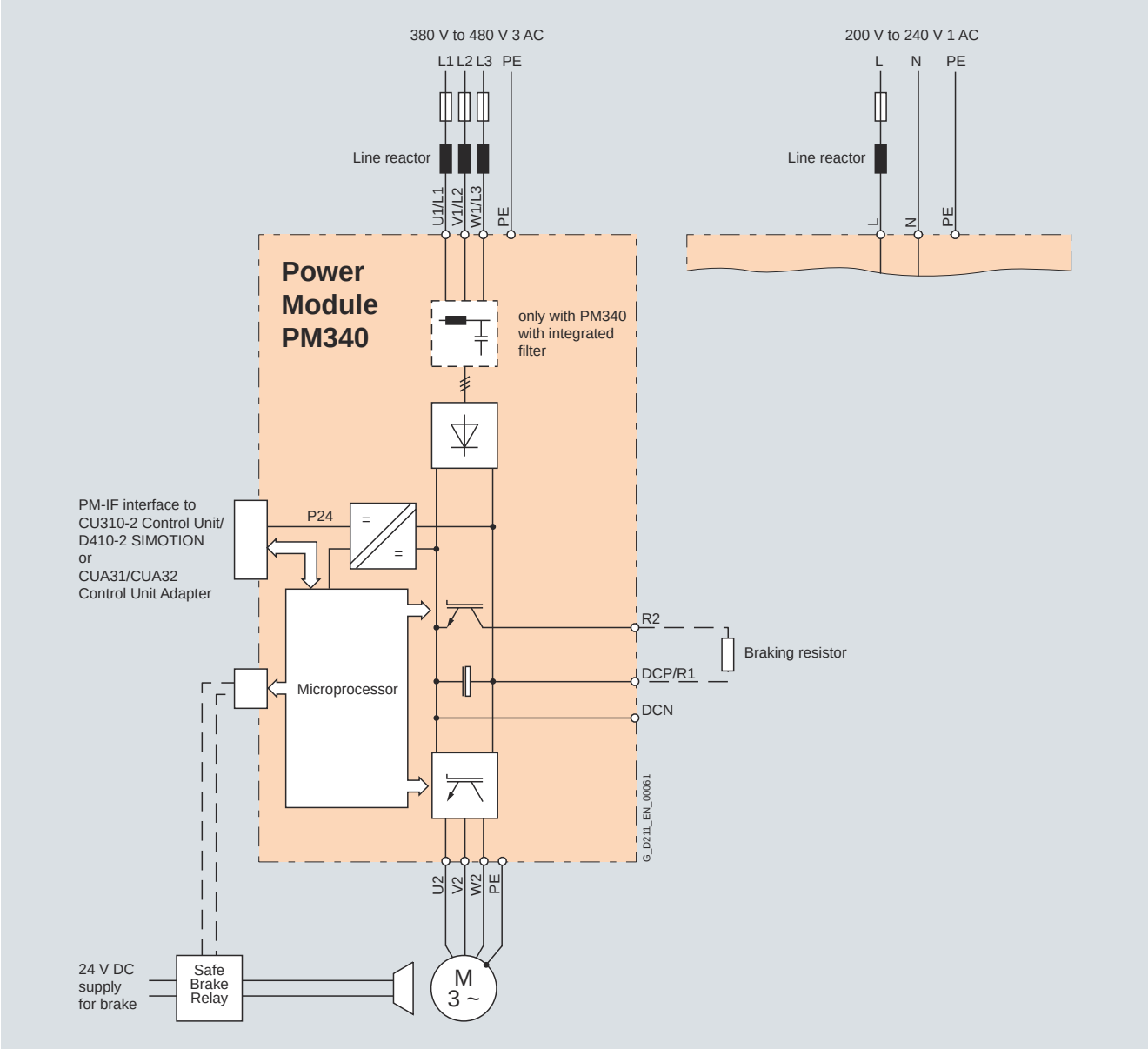
Integration

PM340 Power Module in blocksize format with CU310-2 DP Control Unit

PM340 Power Module in blocksize format with CUA31 Control Unit Adapter

Integration (continued)

The PM340 Power Modules in blocksize format communicate with the CU310-2/SIMOTION D410-2 Control Unit or the CUA31/CUA32 Control Unit Adapter via the PM-IF interface.



Connection example of PM340 Power Module in blocksize format

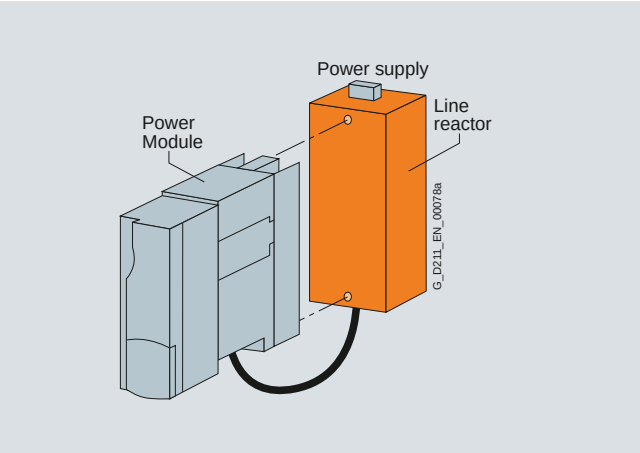
3

Integration (continued)

Many system components for PM340 Power Modules are designed as base components, i.e. the component is mounted on the baseplate and the PM340 Power Module in front of them in a space-saving construction. Up to two base components can be mounted in front of one another

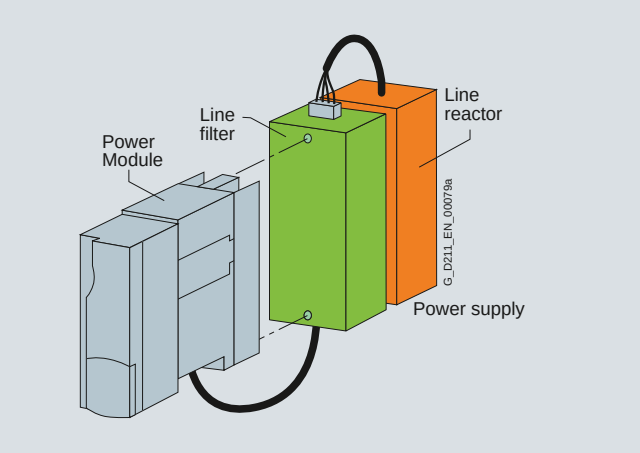
	FSA	FSB	FSC	FSD	FSE	FSF
Line filter	✓	–	–	–	–	–
Line reactor	✓	✓	✓	✓	✓	O
Braking resistor	✓	✓	O	O	O	O
Motor reactor	✓	✓	✓	O	O	O

✓ = suitable as base-type
O = not suitable as base-type
– = not available (use Power Modules with integrated line filter)



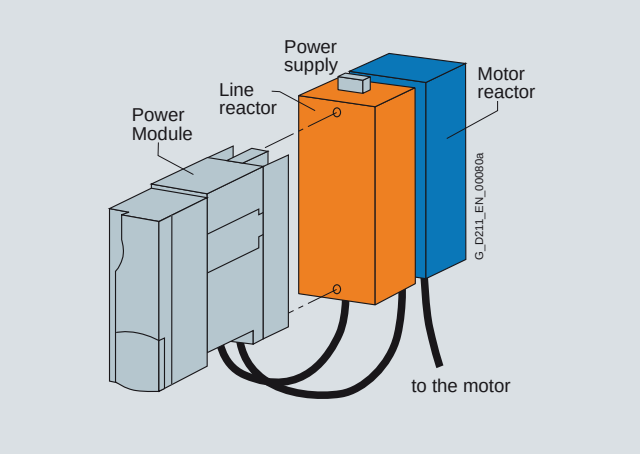
Basic layout of a PM340 Power Module with line reactor as base component

The line-side reactors are equipped with terminals on the line side and with a pre-assembled cable on the Power Module side. When installed, the mains terminals are at the top on frame sizes FSA to FSC, and at the bottom on frame sizes FSD and FSE.



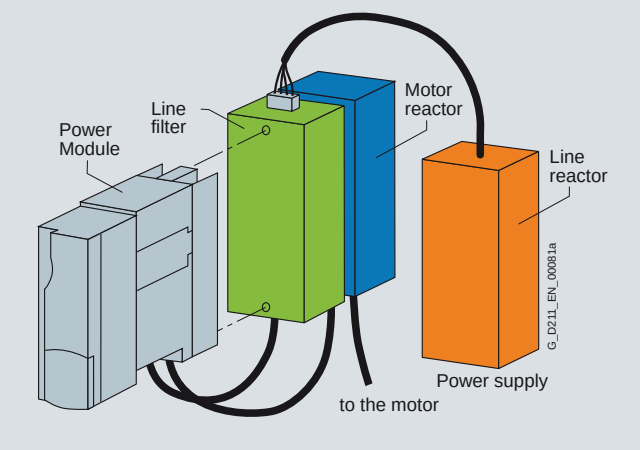
PM340 Power Module in frame size FSA with line reactor and line filter

If a line filter is installed in addition to the line reactor on frame size FSA, the components must be arranged as shown in the diagram above. In this case, the line connection is at the bottom.



PM340 Power Module in frame size FSA with line reactor and motor reactor

Power Modules of frame size FSB and higher are available with integrated line filters, alleviating the need for an external line filter in this case.



PM340 Power Module in frame size FSA with line filter, line reactor and motor reactor

For configurations involving more than two base-type system components, e.g. line reactor + motor reactor + braking resistor, individual components must be mounted to the side of the Power Module. In this instance, the line and motor reactors must be installed behind the Power Module and the braking resistor to the side.