SINAMICS S120

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System overview

Overview

With its separate power unit and Control Unit, 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 DP, CU320 and SIMOTION D Control Units

CU310 DP and CU310 PN Control Unit

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

CU320 Control Unit

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

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

The CU320 Control Unit can be used to create links between individual drives and implement simple technology functions.

SIMOTION D425, D435, D445 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:

- A SIMOTION D425 Control Unit can control up to 16 axes,
- A SIMOTION D435 Control Unit can control up to 32 axes,
- A SIMOTION D445 Control Unit can control up to 64 axes.

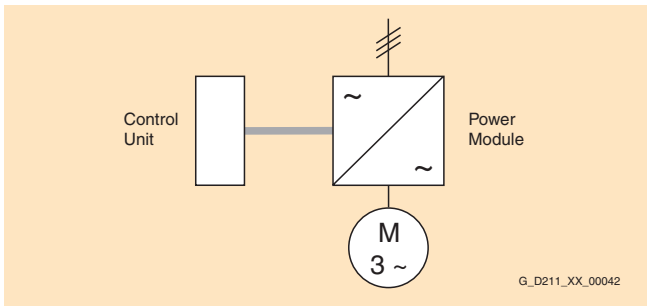
The STARTER commissioning tool is used to commission and diagnose the various types of Control Units. The SCOUT engineering system, which includes the STARTER tool, is required for SIMOTION D Control Units.

For further information about STARTER and SCOUT, see Engineering Software.

Power Modules

The stand alone version of a SINAMICS S120 drive system consists of a CU310 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 DP Control Unit



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

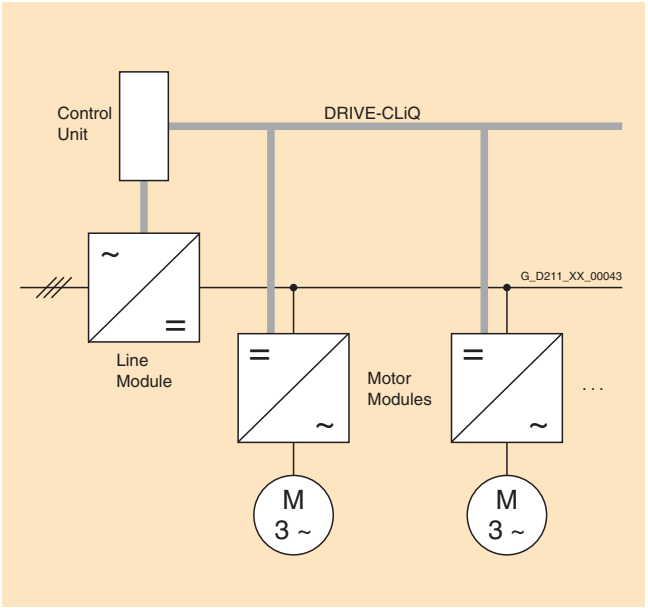
Power Modules can also be operated by a CU320 or a SIMOTION D Control Unit, e.g. in configurations where a single drive has been added to a multi-axis drive grouping. In this case, the Power Modules in blocksize format must be equipped with the CUA31 Control Unit Adapter. This is connected with the CU320 or SIMOTION D Control Unit using DRIVE-CLiQ. Power Modules in chassis format can be directly connected to the multi-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 Control Unit, Line Module and two Motor Modules in booksize format



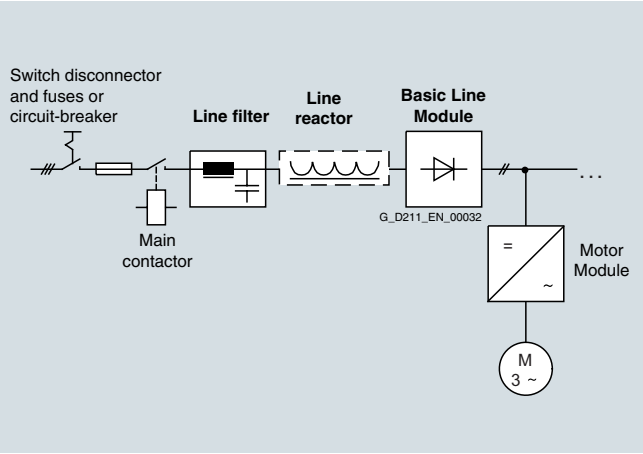
Motor Modules are designed for multi-axis drive systems and are controlled by either a CU320 or a SIMOTION D Control Unit. Motor Modules are interconnected by means of a shared DC busbar. Since the Motor Modules share the same DC link, they can exchange energy with one another, i.e. if one Motor Module 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 suppied with mains 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.

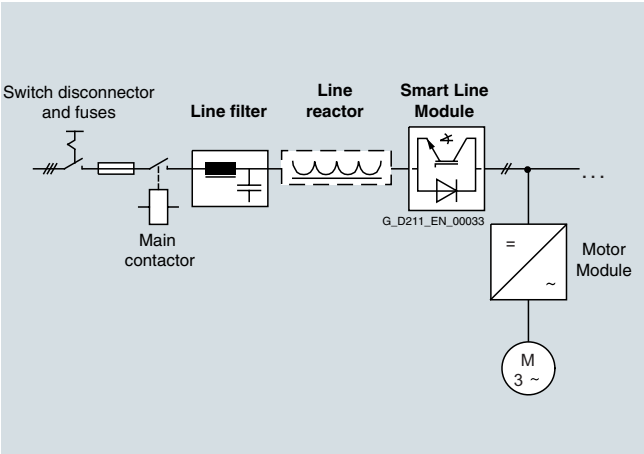
Basic Line Modules

Basic Line Modules are designed only for infeed operation, i.e. they are not capable of recovering regenerative energy to 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 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 (i.e. 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 to restrict conducted interference to Class C2 limits (EN 61800-3).



System overview

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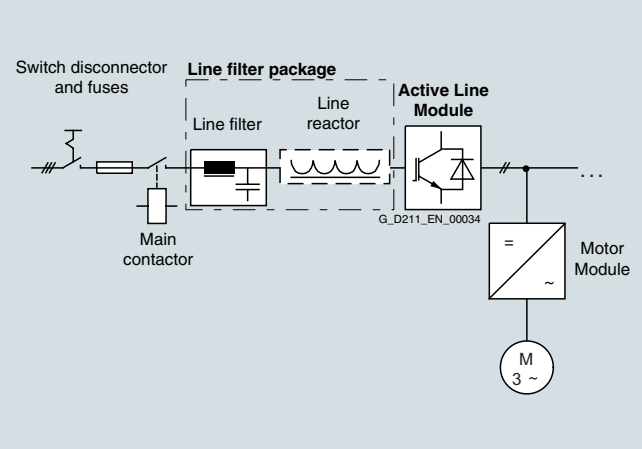
Overview (continued)

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 (i.e. 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.

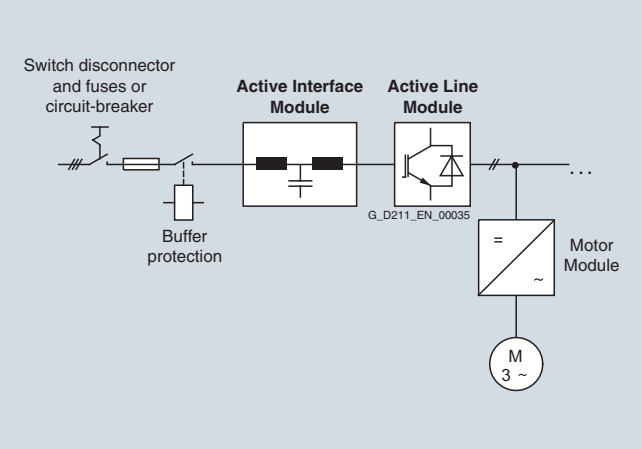
- Active Line Modules in booksize format

When an Active Line Module is used as the infeed, the matching line reactor must be installed. To minimize interference emission, the Active Line Module should always be operated with a combination of line filter and line reactor.



- Active Line Modules in chassis format

All the components required to operate an Active Line Module are integrated in the Active Interface Module. An external bypass contactor is required in addition for sizes HX and JX.



Please refer to the System Description for more information about designing a drive system with SINAMICS S120.

Power Modules, Motor Modules and Line Modules are available in formats "booksize", "blocksize" and "chassis"

- Power Modules in blocksize and chassis formats for single axis,
- Motor Modules and Line Modules for multi axis in booksize and chassis formats.

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 a greater range of 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

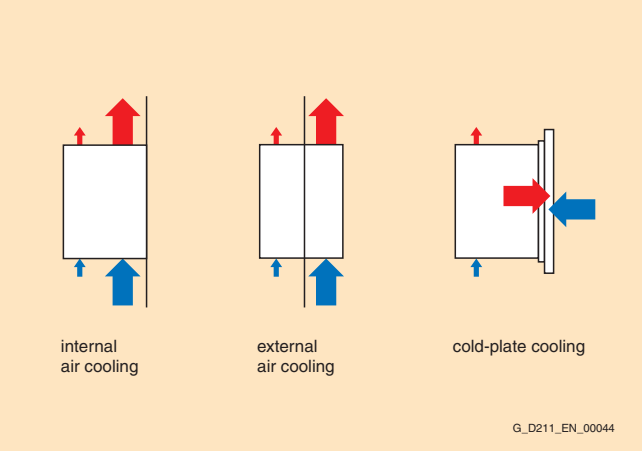
External air cooling uses the "through-hole" method. The components' power unit heat sinks pass through the mounting surface in the control cabinet and can thus release the heat losses of the power circuit to a separate external cooling circuit. The only heat loss that remains in the cabinet is emitted by the electronics. Degree of protection IP54 can be achieved at this "mechanical interface". 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 area, which can also open outwards.

Overview (continued)

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. For further information about cold-plate cooling, please contact:

Siemens A&D
TCC Cabinet Cooling
E-mail: cc.cabinetcooling@siemens.com



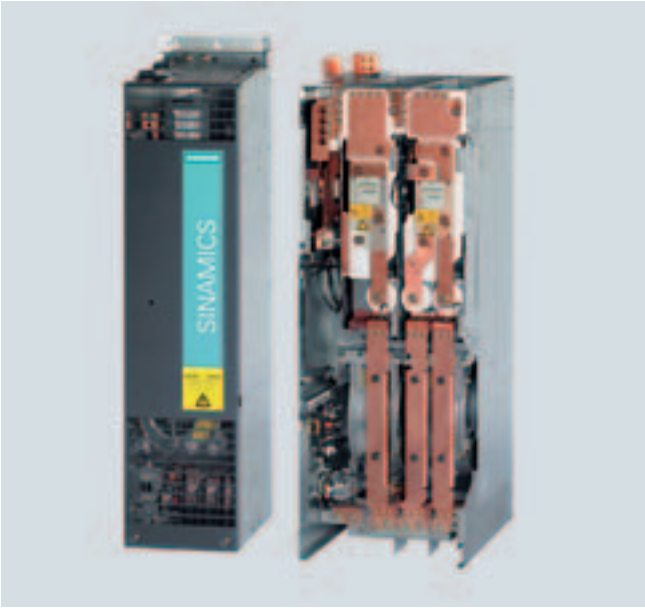
Blocksize format

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

The CU310 Control Unit can be snapped onto them directly. The units are cooled by an internal air cooling circuit.

Chassis format

Higher-output units (approximately 100 kW (150 HP) 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. The CU310 Control Unit can be integrated in the Power Modules.



Varnished modules

The following units are equipped as standard with varnished coating:

- Blocksize format units
- Booksize format units for external air cooling
- Booksize format units with cold-plate cooling
- Control Units (SIMOTION D345 and SIMOTION D445 in preparation)
- Sensor Modules
- Terminal modules

All booksize format units for internal air cooling are available with varnished modules.

The varnish coating protects the sensitive SMD components against corrosive gases, chemically active dust and moisture.

The selection of Control Unit and Power section defines the structure of the drive system. The range of system components provided allows optimum adaptation of the drive system to the application.

System components are divided into the following categories:

- ***DC link components***
  e.g. Braking Modules and braking resistors,
- ***Load-side power components***
  e.g. motor reactors,
- ***Supplementary system components***
  e.g. Terminal Modules, operator panels and communication boards
- ***Encoder system interface***
  for connecting various types of encoder to SINAMICS S120.

General technical data

Technical data

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

Electrical data	
Electronics power supply	24 V DC, 15/+ 20%
Mechanical data	
Vibratory load	
• Transport [1]	
- All units and components except for chassis format	Class 2M3 to EN 60721-3-2
- Chassis format units	Class 2M2 to EN 60721-3-2
• Operation	Test values in accordance with EN 60068-2-6 test Fc: 10 Hz to 58 Hz: Constant deflection 0.075 mm (0.003 in) 58 Hz to 150 Hz: Constant acceleration = 9.81 m/s^2 (3.2 ft/s^2) (1 × *g*)
Shock stressing	
• Transport [1]	
- All units and components except for chassis format	Class 2M3 to EN 60721-3-2
- Chassis format units	Class 2M2 to EN 60721-3-2
• Operation	Test values in accordance with EN 60068-2-27 test Ea:
- Booksize and blocksize formats FSA to FSC	147 m/s^2 (482 ft/s^2) (15 x *g*)/11 ms
- Blocksize format FSD to FSF	49 m/s^2 (161 ft/s^2) (5 × *g*)/30 ms
- Chassis format	98 m/s^2 (321 ft/s^2) (10 × *g*)/20 ms
Ambient conditions	
Protection Class	Class I (with protective conductor system) and class III (PELV) to EN 61800-5-1
Shock protection	DIN VDE 0106 Part 100 and BGV A 3 when used properly
Permissible ambient/coolant temperature (air) during operation	
• for line-side components, Power Modules, Line Modules and Motor Modules	0 °C to + 40 °C (32 °F to +104 °F) without derating, >40 °C to + 55 °C (>104 °F to +131 °F) see derating characteristics
• for Control Units, additional system components, DC link components and Sensor Modules	0 °C to + 55 °C (32 °F to +131 °F) up to 2000 m (6562 ft) above sea level
Climatic ambient conditions	
• Storage [1]	Class 1K3 to EN 60721-3-1 Temperature: – 40 °C to + 70 °C (– 40 °F to + 158 °F)
• Transport [1]	Class 2K4 to EN 60721-3-2 Temperature – 40 °C to + 70 °C (– 40 °F to + 158 °F) Max. air humidity 95% at 40 °C (104 °F)
• Operation	Class 3K3 to EN 60721-3-3 Condensation, splashwater and ice formation are not permitted (EN 60204, Part 1)
Environmental class/harmful chemical substances	
• Storage [1]	Class 1C2 to EN 60721-3-1
• Transport [1]	Class 2C2 to EN 60721-3-2
• Operation	Class 3C2 to EN 60721-3-3
Organic/biological influences	
• Storage [1]	Class 1B1 to EN 60721-3-1
• Transport [1]	Class 2B1 to EN 60721-3-2
• Operation	Class 3B1 to EN 60721-3-3
Degree of contamination	2 to EN 61800-5-1

[1] In transport packaging

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: Emissions
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) http://www.ul.com according to UL and CSA standards