

# SINAMICS S120 Chassis Format Units and Cabinet Modules

# SINAMICS S150 Converter Cabinet Units

Catalog D 21.3 · 2011










## SINAMICS Drives

Answers for industry.

**SIEMENS**

## Related Catalogs

<p><b>SINAMICS Drives</b> D 11</p> <p>SINAMICS G130 Drive Converter Chassis Units SINAMICS G150 Drive Converter Cabinet Units E86060-K5511-A101-A5-7600</p>	
<p><b>SINAMICS G110/SINAMICS G120</b> D 11.1</p> <p>Standard Inverters <b>SINAMICS G120D</b> Distributed Inverters</p> <p>E86060-K5511-A111-A6-7600</p>	
<p><b>Motion Control</b> PM 21</p> <p>SIMOTION, SINAMICS S120 and Motors for Production Machines</p> <p>E86060-K4921-A101-A2-7600</p>	
<p><b>Industrial Controls</b> IC 10</p> <p>SIRIUS</p> <p>E86060-K1010-A101-A1-7600</p>	
<p><b>SIMOTICS Low-Voltage Motors</b> D 81.1</p> <p>Frame sizes 63 to 450 Power range 0.09 to 1250 kW</p> <p>E86060-K5581-A111-A4-7600</p>	
<p><b>SINAMICS GM150/SINAMICS SM150</b> D 12</p> <p>Medium-Voltage Converters</p> <p>E86060-K5512-A101-A2-7600</p>	
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<p><b>Products for Automation and Drives</b> CA 01</p> <p>Interactive Catalog, DVD</p> <p>E86060-D4001-A510-D1-7600</p>	
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## The Engineering Manual

### SINAMICS Low Voltage Engineering Manual

Engineering Manual for SINAMICS G130 Drive Converter Chassis Units, SINAMICS G150 Drive Converter Cabinet Units, SINAMICS S120 Chassis Format Units, SINAMICS S120 Cabinet Modules, SINAMICS S150 Converter Cabinet Units



The engineering manual is divided into the following chapters:

- Fundamental Principles and System Description
- EMC Installation Guideline
- General Engineering Information for SINAMICS
- SINAMICS G130 Converter Chassis Units
- SINAMICS G150 Converter Cabinet Units
- SINAMICS S120 Chassis Format Units and Cabinet Modules
- SINAMICS S150 Converter Cabinet Units
- Drive Dimensioning
- Motors

This manual offers users comprehensive support with the configuring of drives and associated system components.

The first three chapters are devoted primarily to the fundamental physical principles of variable-speed electric drives and include EMC Installation Guidelines as well as general system descriptions and planning information which relate to all products in the SINAMICS range.

The other chapters then discuss in detail questions relating to the dimensioning of drives with converters of specific types as well as the selection of suitable motors.

**The Engineering Manual SINAMICS Low Voltage is stored as a PDF file on the CD-ROM supplied with the catalog.**

**Note:**

**The manual is not available in hard copy form, but only as an electronic file in PDF format.**

<sup>1)</sup> Language: German

# SINAMICS Drives


## SINAMICS S120

### Chassis Format Units and Cabinet Modules

## SINAMICS S150

### Converter Cabinet Units

Catalog D 21.3 · 2011

The products and systems described in this catalog are distributed under application of a certified quality management system in accordance with DIN EN ISO 9001 and DIN EN ISO 14001 (Certified Registration No. 001258 QM) and DIN EN ISO 14001 (Certified Registration No. 002241 QM UM). The certificate is recognized by all IQNet countries.

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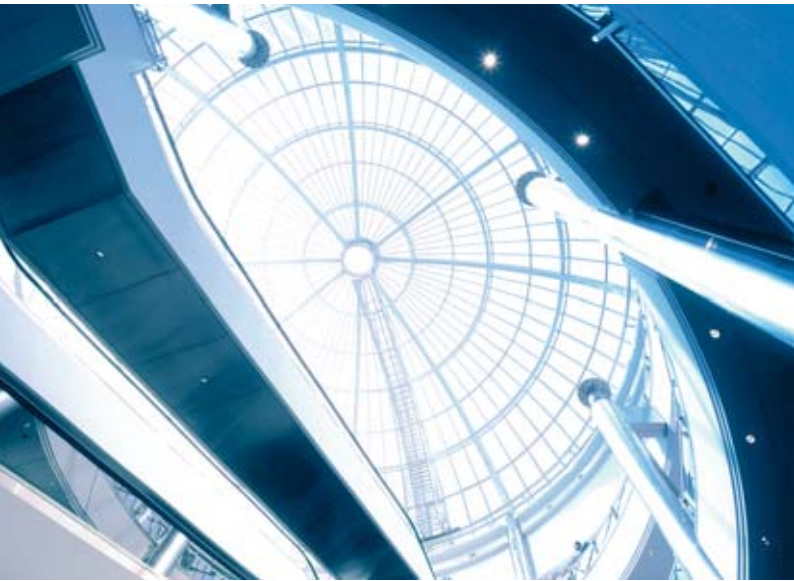
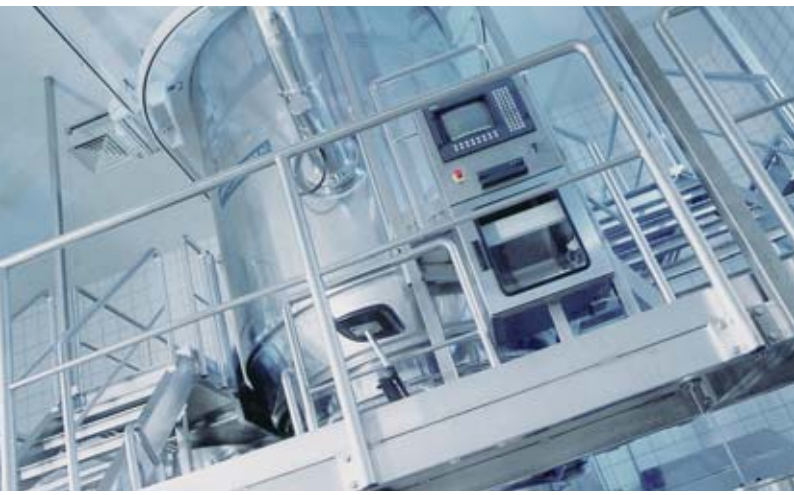
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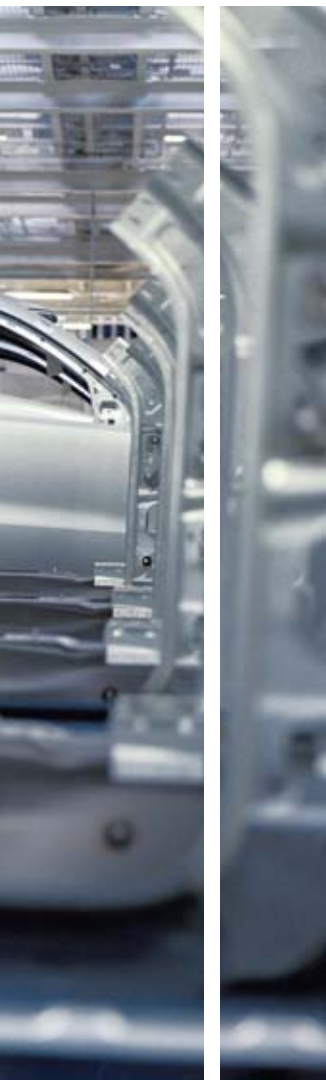


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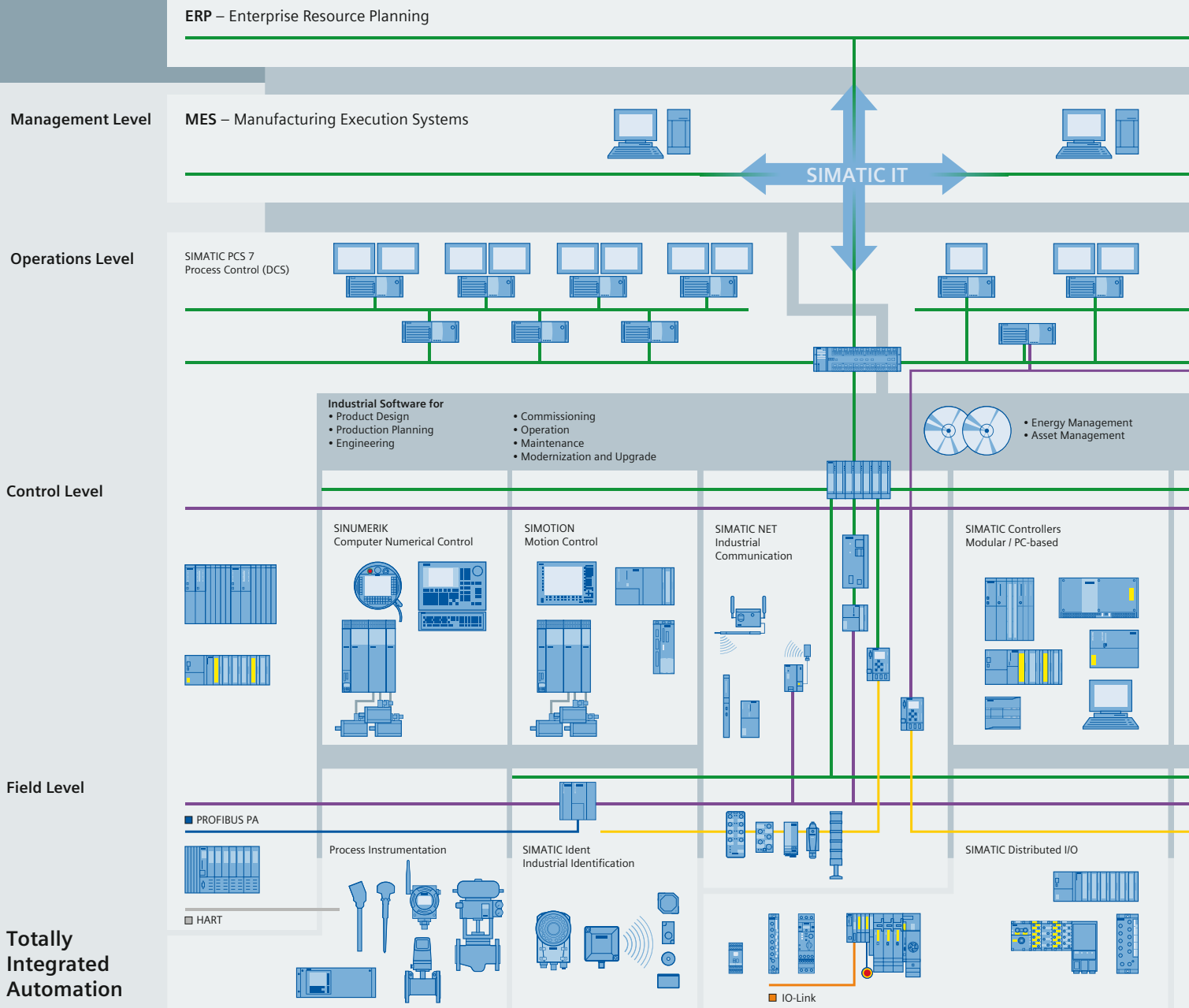
## Answers for industry.

Siemens Industry answers the challenges in the manufacturing and the process industry as well as in the building automation business. Our drive and automation solutions based on Totally Integrated Automation (TIA) and Totally Integrated Power (TIP) are employed in all kinds of industry. In the manufacturing and the process industry. In industrial as well as in functional buildings.

Siemens offers automation, drive, and low-voltage switching technology as well as industrial software from standard products up to entire industry solutions. The industry software enables our industry customers to optimize the entire value chain – from product design and development through manufacture and sales up to after-sales service. Our electrical and mechanical components offer integrated technologies for the entire drive train – from couplings to gear units, from motors to control and drive solutions for all engineering industries. Our technology platform TIP offers robust solutions for power distribution.

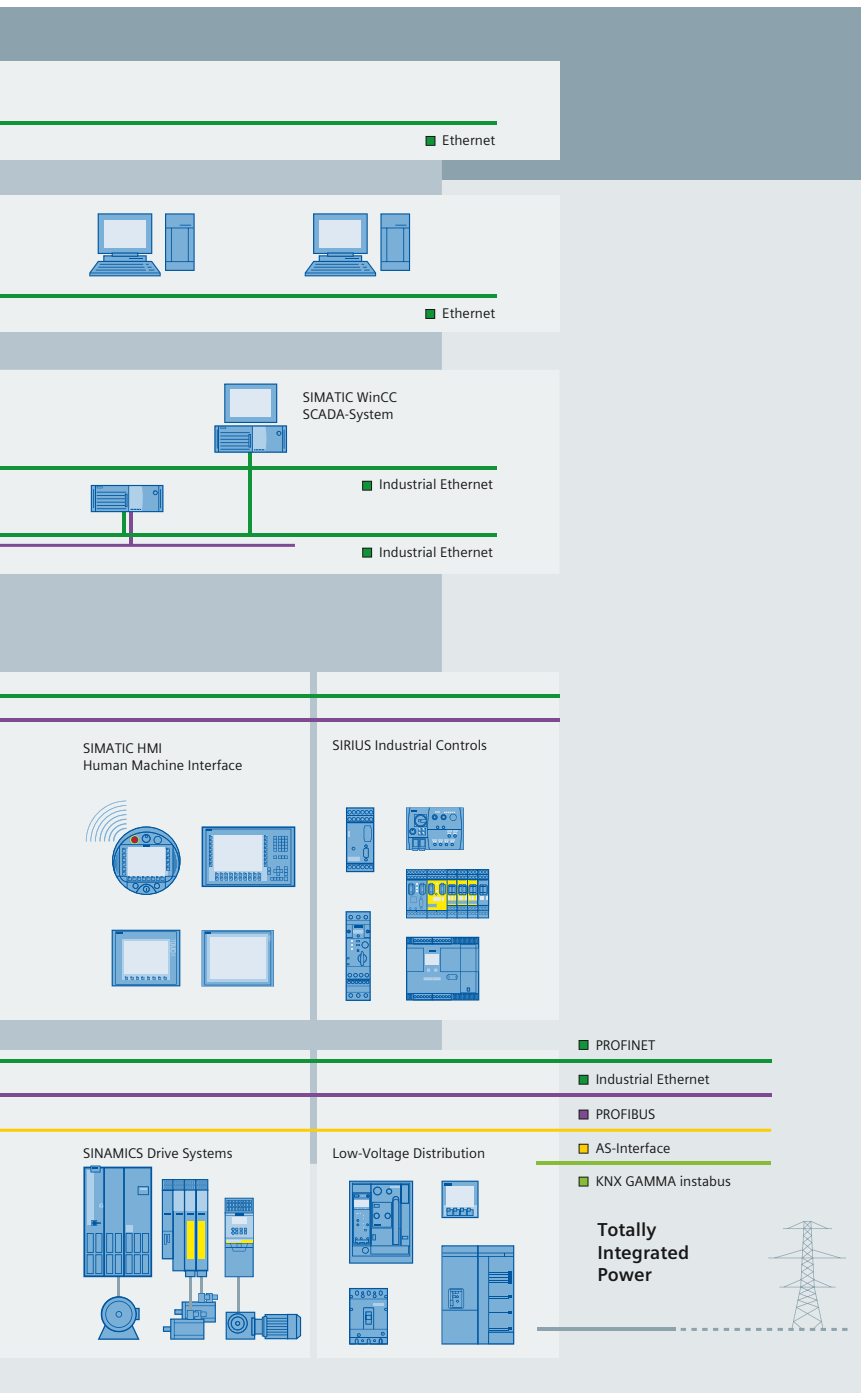
The high quality of our products sets industry-wide benchmarks. High environmental aims are part of our eco-management, and we implement these aims consistently. Right from product design, possible effects on the environment are examined. Hence many of our products and systems are RoHS compliant (Restriction of Hazardous Substances). As a matter of course, our production sites are certified according to DIN EN ISO 14001, but to us, environmental protection also means most efficient utilization of valuable resources. The best example are our energy-efficient drives with energy savings up to 60 %.

Check out the opportunities our automation and drive solutions provide. And discover how you can sustainably enhance your competitive edge with us.



# Setting standards in productivity and competitiveness.

**Totally Integrated Automation.**



**TIA is characterized by its unique continuity.**

It provides maximum transparency at all levels with reduced interfacing requirements – covering the field level, production control level, up to the corporate management level. With TIA you also profit throughout the complete life cycle of your plant – starting with the initial planning steps through operation up to modernization, where we offer a high measure of investment security resulting from continuity in the further development of our products and from reducing the number of interfaces to a minimum.

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The result: maximum interoperability – covering the controller, HMI, drives, up to the process control system. This reduces the complexity of the automation solution in your plant. You will experience this, for example, in the engineering phase of the automation solution in the form of reduced time requirements and cost, or during operation using the continuous diagnostics facilities of Totally Integrated Automation for increasing the availability of your plant.

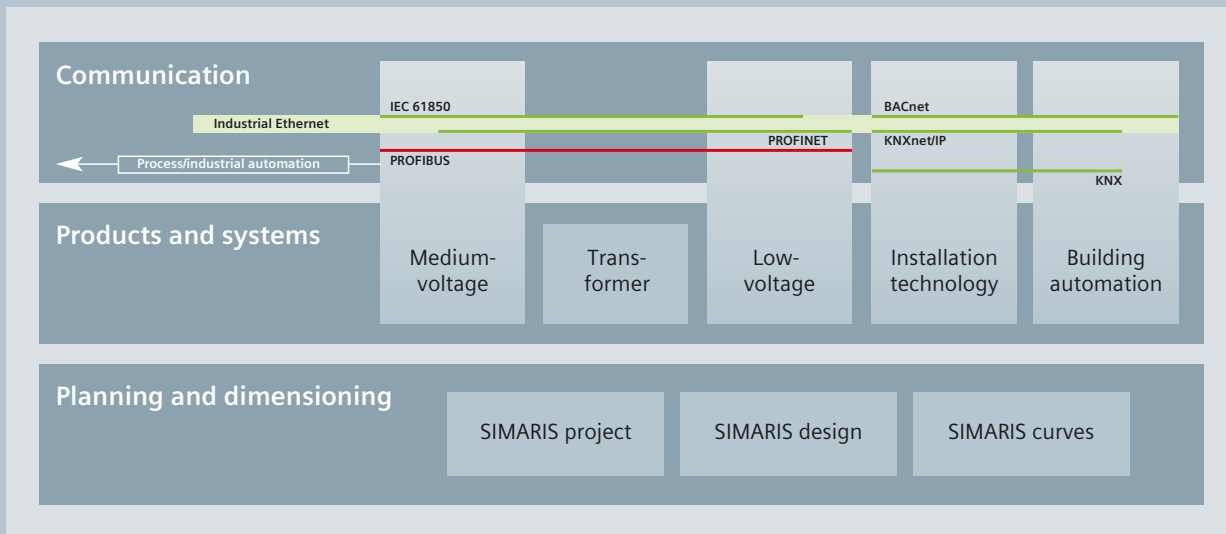
Thanks to Totally Integrated Automation, Siemens provides an integrated basis for the implementation of customized automation solutions – in all industries from inbound to outbound.



## Integrated power distribution from one source.

**Totally Integrated Power.**





Electrical power distribution requires integrated solutions. Our answer: Totally Integrated Power (TIP). This includes tools and support for planning and configuration and a complete, optimally harmonized product and system portfolio for integrated power distribution from medium-voltage switchgear right to socket outlets.

The power distribution products and systems can be interfaced to building or industrial automation systems (as part of Total Building Solutions or Totally Integrated Automation) via communication capable circuit breakers and modules, allowing the full potential for optimization that an integrated solution offers to be exploited throughout the product cycle – from planning right through to installation and operation.

Thanks to a comprehensive energy management system, power flows can be made transparent and the energy consumption of individual loads can be calculated and allocated. Building operators can thus identify power-intensive loads and implement effective optimization measures. With its products and systems, Totally Integrated Power forms the basis for this functionality and guarantees greater cost-efficiency in industrial applications, infrastructure and buildings.



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### Selecting

Find your products in the structure tree, in the new "Bread-crum" navigation or with the integral search machine with expert functions. Electronic configurators are also integrated into the Mall. Enter the various characteristic values and the appropriate product will be displayed with the relevant order numbers. You can save configurations, load them and reset them to their initial status.

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### Added value due to additional information

So you have found your product and want more information about it? In just a few clicks of the mouse, you will arrive at the image data base, manuals and operating instructions. Create your own user documentation with My Documentation Manager. Also available are FAQs, software downloads, certificates and technical data sheets as well as our training programs. In the image database you will find, depending on the product, 2D/3D graphics, dimension drawings and exploded drawings, characteristic curves or circuit diagrams which you can download.

Convinced? We look forward to your visit!

# Introduction



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# Introduction

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## The SINAMICS drive family



Mixers/mills



Plastics



Converting



Machine tools

Pumps/fans/  
compressors

Textiles



Packaging



Conveyor systems



Printing machines



Woodworking



Renewable energies

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### Application

SINAMICS is the family of drives from Siemens designed for industrial machine and plant construction. SINAMICS offers solutions for all drive tasks:

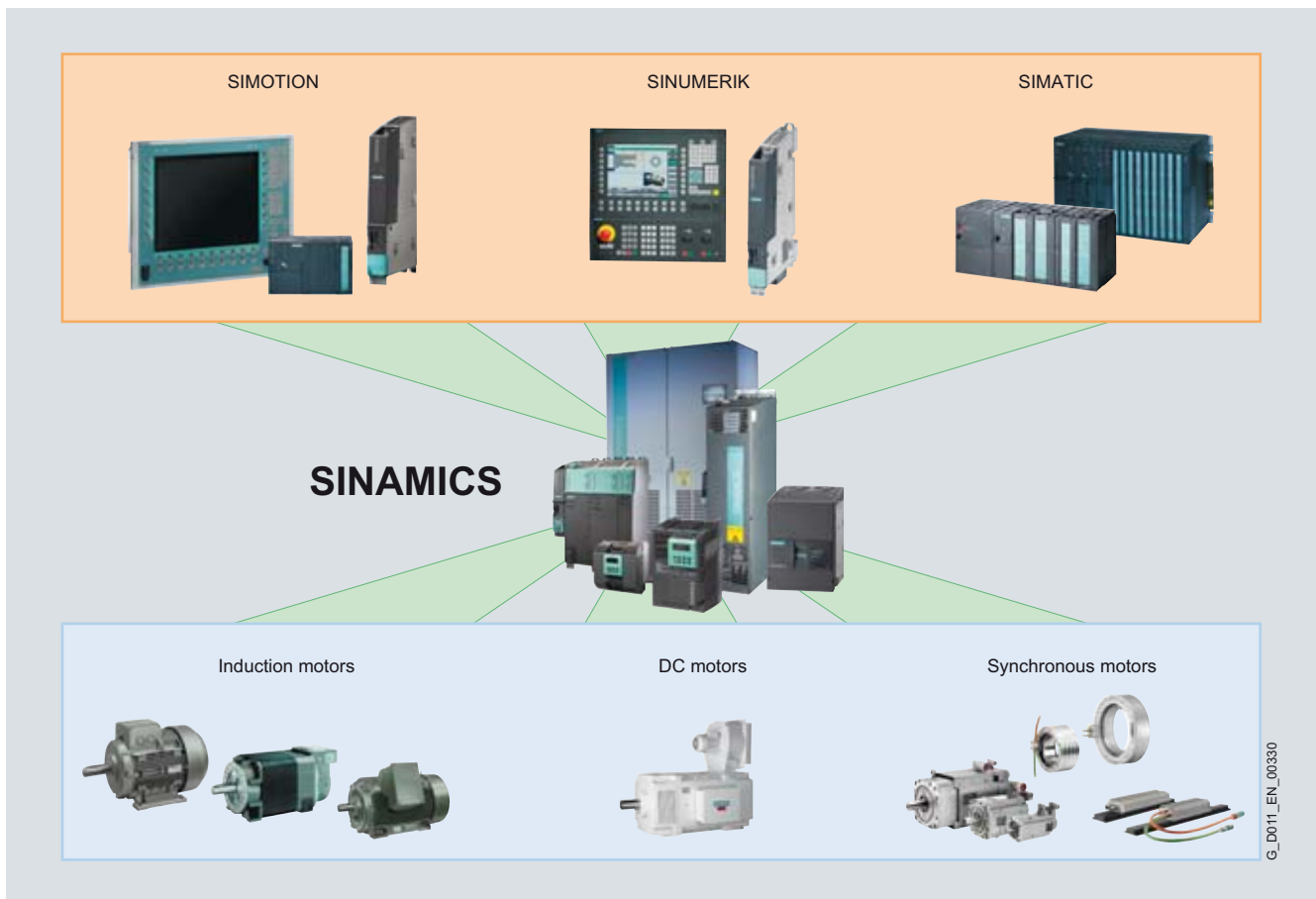
- Simple pump and fan applications in the process industry.
- Complex single-motor drives in centrifuges, presses, extruders, elevators, as well as conveyor and transport systems
- Drive line-ups in textile, plastic film, and paper machines, as well as in rolling mill plants
- High precision servo drives for manufacture of wind turbines
- Highly dynamic servo drives for machine tools, as well as packaging and printing machines

### Product variants

Depending on the application, the SINAMICS range offers the ideal variant for any drive task.

- SINAMICS G is designed for standard applications with induction motors. These applications have less stringent requirements regarding dynamic response of the motor speed.
- SINAMICS S handles complex drive tasks with synchronous/induction motors and fulfills stringent requirements regarding
  - the dynamic performance and accuracy
  - integration of extensive technological functions in the drive control system.
- SINAMICS DCM is the DC drive belonging to the SINAMICS family. As a result of its expandability across the board, it addresses both basic as well as demanding applications in drive technology and in complementary markets.





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SINAMICS as part of the Siemens modular automation system

#### **Platform concept and Totally Integrated Automation**

All SINAMICS versions are based on a platform concept. Common hardware and software components, as well as standardized tools for design, configuration, and commissioning tasks ensure high-level integration across all components. SINAMICS handles a wide variety of drive tasks without system gaps. The different SINAMICS versions can be easily combined with each other.

SINAMICS is part of the Siemens "Totally Integrated Automation" concept. Integrated SINAMICS systems covering engineering, data management and communication at the automation level, result in extremely cost-effective solutions based on SIMOTION, SINUMERIK and SIMATIC control systems.

#### **Quality management to DIN EN ISO 9001**


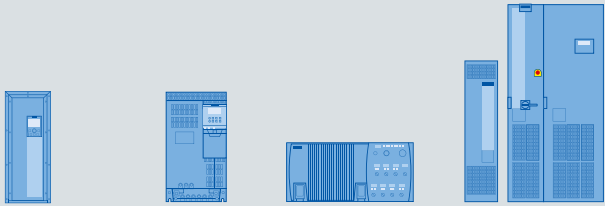

SINAMICS is able to meet the highest quality requirements. Comprehensive quality assurance measures in all development and production processes ensure a consistently high level of quality.

Of course, our quality management system is certified by an independent authority in accordance with DIN EN ISO 9001.

# Introduction

## The SINAMICS drive family

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Low-Voltage AC Converters									
For basic applications		For high-quality applications				For basic servo drives			
									
SINAMICS G110		SINAMICS G110D		SINAMICS G120P	SINAMICS G120	SINAMICS G120D	SINAMICS G130/G150	SINAMICS S110	
V/f Control		V/f Control/FCC		V/f Control / Vector Control			Servo Control		
0.12 ... 3 kW		0.75 ... 7.5 kW		0.37 ... 90 kW	0.37 ... 250 kW	0.75 ... 7.5 kW	75 ... 2700 kW		0.12 ... 90 kW
Pumps, fans, conveyor belts		Conveyor technology		Pumps, fans, conveyor belts, compressors, mixers, mills, extruders					Single-axis positioning applications for machine and plant engineering
Common Engineering Tools									
SIZER for Siemens Drives – for simple planning and configuration					STARTER – for fast commissioning, optimization and diagnostics				

### System properties

The SINAMICS range is characterized by the following system properties:

- Standard functionality based on a single platform concept
- Standardized engineering
- High degree of flexibility and combination capability
- Broad power range
- Designed for global use
- SINAMICS Safety Integrated
- Higher efficiency and effectiveness
- High energy efficiency
- Versatile interfacing facilities to higher-level controllers
- Totally Integrated Automation

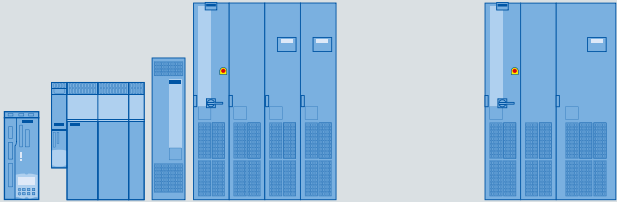
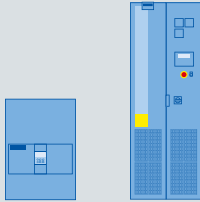
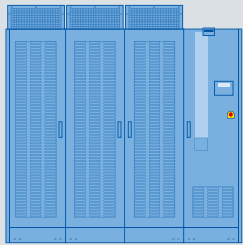
### Application areas

Tailored to suit different application areas, SINAMICS encompasses the following products:

#### AC low-voltage converters (line supply < 1000 V)

- **SINAMICS G110**  
- the versatile single-motor drive for low power ratings
- **SINAMICS G120P**  
- the specialist for pumps, fans, and compressors
- **SINAMICS G120**  
- the modular single-motor drive for low up to medium power ratings
- **SINAMICS G110D**  
- the distributed single-motor drive for basic solutions
- **SINAMICS G120D**  
- the distributed single-motor drive for high-performance solutions
- **SINAMICS G130 and SINAMICS G150**  
- the universal drive solution for motor drives with a high power rating
- **SINAMICS S110**  
- the basic positioning drive for single-axis applications

## The SINAMICS drive family

Low-Voltage AC Converters		DC Converters	Medium-Voltage AC Converters
For demanding applications		For basic and demanding applications	For high-power applications
			
SINAMICS S120		SINAMICS DCM	SINAMICS GM150/SM150/GL150/SL150
V/f Control / Vector Control / Servo Control		Closed-loop speed control / torque control	V/f Control / Vector Control
0.12 ... 4500 kW	75 ... 1200 kW	6 kW ... 30 MW	0.8 ... 120 MW
Motion Control applications in production machines (packaging, textile, printing, paper, plastic), machine tools, plants and process lines, metal forming technology, renewable energies	Test stands, cross cutters, centrifuges	Rolling mills, cross cutters and shears, wire-drawing machines, extruders and kneaders, presses, elevator and crane installations, cableways and lifts, mining hoists, test stand drives	Pumps, fans, compressors, mixers, extruders, mills, rolling mills, mining hoist drives, excavators, test stands

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## Common Engineering Tools

SIZER for Siemens Drives – for simple planning and configuration

STARTER – for fast commissioning, optimization and diagnostics

*Application areas (continued)*AC low-voltage converters (line supply < 1000 V)

- **SINAMICS S120**  
- the flexible, modular drive system for demanding drive tasks
- **SINAMICS S150**  
- the drive solution for demanding single-motor drives with a high power rating

DC converters (line supply < 1000 V)

- **SINAMICS DCM**  
- the scalable drive system for basic and demanding applications

AC medium-voltage converters (line supply > 1000 V)

- **SINAMICS GM150**  
- the universal drive solution for single-motor drives
- **SINAMICS SM150**  
- the drive solution for demanding single-motor and multi-motor drives
- **SINAMICS GL150**  
- the drive solution for synchronous motors up to 120 MW
- **SINAMICS SL150**  
- the drive solution for slow speed motors with the highest torques and overloads

# Introduction

1

## The members of the SINAMICS drive family

### Overview

#### SINAMICS low-voltage converters

##### SINAMICS G110



*The versatile single-motor drive for low power ratings*

#### Main applications

- Machines and plants for industrial and commercial applications

#### Application examples

- Simple pumps and fans
- Auxiliary drives
- Conveyor systems
- Billboards
- Door/gate operating mechanisms

#### Highlights

- Compact
- Can be flexibly adapted to different applications
- Simple and fast commissioning
- Clear terminal layout
- Optimum interaction with SIMATIC and LOGO!

Catalog D 11.1

##### SINAMICS G120P



*The specialist for pumps, fans, and compressors*

- In applications, for instance closed loop speed control of fans for ventilation and extraction, circulating pumps for heating and cooling systems or for pumps to boost the pressure and control levels

- Pumps
- Fans
- Compressors

- High degree of protection IP54
- Integrated pumping, ventilating and compressing functions
- Reduced line harmonic distortions
- Optimum energy management through innovative technology
- Easy-to-use application wizards
- Flexible and modular

Catalog D 11.1 N

##### SINAMICS G120



*The modular single-motor drive for low up to medium power ratings*

- Machines and plants for industrial and commercial applications (machinery construction, automotive, textiles, chemical industry, printing, steel)

- Pumps and fans
- Compressors
- Centrifuges
- Conveyor systems

- Modular
- Can be flexibly expanded
- Safety Integrated
- Simple and fast commissioning
- Regenerative feedback
- Innovative cooling concept
- Optimum interaction with SIMOTION and SIMATIC

Catalog D 11.1



## Overview

## SINAMICS low-voltage converters

## SINAMICS G110D



*The distributed single-motor drive for basic solutions*

## SINAMICS G120D



*The distributed single-motor drive for high-performance solutions*

## SINAMICS G130, SINAMICS G150



*The universal drive solution for motor drives with a high power rating*

## Main applications

- Horizontal conveyor applications in the industrial environmental, with the main focus on distribution and logistics in airports; generally suitable for basic conveyor-related tasks with local control or connected to a bus via AS-Interface
- Conveyor drive applications in industrial environments, main focus on the automotive industry; also suitable for high-performance applications e.g. at airports and in the food, beverage and tobacco industry (without tenside)
- Machines and plants in the process and production industry, water/waste, power stations, oil and gas, petrochemicals, chemical raw materials, paper, cement, stone, steel

## Application examples

- Conveyor systems
- Airports
- Distribution logistics
- Conveyor systems
- Electric monorail system in distribution logistics
- Pumps and fans
- Compressors
- Extruders and mixers
- Mills

## Highlights

- Low profile design with standard drilling dimensions (standard footprint) in IP65 degree of protection
- Simple and fast commissioning
- Optional key-operated switch
- AS-Interface with bus parameterization
- Quick stop function
- Integrated brake control, 180 V DC
- Optimum interaction with SIMATIC and LOGO!
- Low profile design with standard drilling dimensions (standard footprint) in IP65 degree of protection
- Modular
- Can be flexibly expanded
- Simple and fast commissioning
- Regenerative feedback
- Optimum interaction with SIMOTION and SIMATIC
- SINAMICS Safety Integrated
- Space-saving
- Low noise
- Simple and fast commissioning
- SINAMICS G130: Modular components
- SINAMICS G150: Ready-to-connect cabinet unit
- Optimum interaction with SIMATIC
- SINAMICS Safety Integrated

## Catalog D 11.1

## Catalog D 11.1

## Catalog D 11

# Introduction

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## The members of the SINAMICS drive family

### Overview

#### SINAMICS low-voltage converters

##### SINAMICS S110



*The basic positioning drive for single-axis applications*

##### SINAMICS S120



*The flexible, modular drive system for demanding drive tasks*

##### SINAMICS S150



*The drive solution for demanding single-motor drives with a high power rating*

#### Main applications

- Machine and plants in the industrial environment, where machine axes should be quickly and precisely positioned in the simplest possible way.
- Machines and plants for industrial applications (packaging, plastics, textile, printing, wood, glass, ceramics, presses, paper, lifting equipment, semiconductors, automated assembly and testing equipment, handling, machine tools)
- Machines and plants in the process and production industry, food, beverages and tobacco, automotive and steel industry, mining/open-cast mining, shipbuilding, lifting equipment, conveyors (dynamic single drives with energy recovery)

#### Application examples

- Handling equipment
- Feed and withdrawal devices
- Stacking units
- Automatic assembly machines
- Laboratory automation
- Metalworking
- Woodworking, glass and ceramic industries
- Printing machines
- Plastics processing machines
- Motion Control applications (positioning, synchronous operation)
- Numerical control, interpolating motion control
- Production machines: Machines, plants and process lines in packaging, textiles, printing, paper, wood, glass, ceramics and plastics
- Presses
- Converting applications
- Handling equipment
- Paper machines, rolling mills, marine applications
- Test bays
- Centrifuges
- Elevators and cranes
- Cross cutters and shears
- Conveyor belts with a high power demand and energy recovery
- Presses
- Cable winches

#### Highlights

- For universal use
- Flexible and modular
- Scalable in terms of power rating, functionality, number of axes, performance
- Simple and fast commissioning, auto-configuration
- Innovative system architecture fit for the future
- Graded infeed/regenerative feedback concepts
- Wide range of motors
- Optimum interaction with SIMOTION, SIMATIC and SINUMERIK
- SINAMICS Safety Integrated
- For universal use
- Flexible and modular
- Scalable in terms of power rating, functionality, number of axes, performance
- Simple and fast commissioning, auto-configuration
- Innovative system architecture fit for the future
- Graded infeed/regenerative feedback concepts
- Wide range of motors
- Optimum interaction with SIMOTION, SIMATIC and SINUMERIK
- SINAMICS Safety Integrated
- Air and liquid-cooled versions
- Four-quadrant operation as standard
- High control accuracy and dynamic response
- Minimum harmonic effects on the supply system, considerably lower than the limits specified in IEEE 519 THD
- Tolerant to line voltage fluctuations
- Reactive power compensation option
- Simple and fast commissioning
- Ready-to-connect cabinet unit
- Optimum interaction with SIMATIC
- SINAMICS Safety Integrated

#### Catalog PM 22

#### Catalogs PM 21 and D 21.3

#### Catalog D 21.3

## The members of the SINAMICS drive family

1

## Overview

## SINAMICS medium-voltage converters

## SINAMICS GM150



*The universal drive solution for single-motor drives*

## SINAMICS SM150



*The drive solution for demanding single-motor and multi-motor drives*

## SINAMICS GL150



*The drive solution for synchronous motors up to 120 MW*

## SINAMICS SL150



*The drive solution for slow speed motors with the highest torques and overloads*

## Main applications

- Machines and plants in the process industry
- Machines and plants in the steel sector (rolling mills) and in mining
- Plants and machines in the process industry, especially in the oil, gas and petrochemicals sectors
- Machines and plants in the basic materials industry, especially in the steel and mining sectors

## Application examples

- Pumps and fans
- Compressors
- Extruders and mixers
- Mills
- Marine drives
- Hot and cold rolling stands
- Mine hoists
- Test stand drives
- Conveyor belts for ores
- Compressors
- Pumps and fans
- Extruders and kneaders
- Marine drives
- Blast furnace blowers
- Hot rolling mill roughing stands
- Mine hoists
- Ore and cement mills
- Excavators

## Highlights

- Space-saving
- Simple and fast commissioning
- Ready-to-connect cabinet unit
- Optimum interaction with SIMATIC
- Air and liquid-cooled versions
- Four-quadrant operation as standard
- High degree of efficiency and operation that reduces the stress on the motor
- High control accuracy and dynamic response
- Almost no line harmonics
- Reactive power compensation option
- Simple and fast commissioning
- Ready-to-connect cabinet unit
- Optimum interaction with SIMATIC
- Air and liquid-cooled versions
- Compact design and high power density
- Simple operator control and monitoring
- Extremely rugged, reliable in operation and almost maintenance-free
- Two directions of rotation by reversing the rotating field
- Can be seamlessly integrated into higher level automation systems
- Air and liquid-cooled versions
- Low output frequency/motor speed
- High short-time overload capability
- Four-quadrant operation as standard
- Extremely rugged, reliable in operation and almost maintenance-free
- High efficiency
- Can be seamlessly integrated into higher level automation systems
- Air and liquid-cooled versions

## Catalog D 12

## Catalog D 12

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# Introduction

1

## The members of the SINAMICS drive family

### Overview

#### SINAMICS DC converters

#### SINAMICS DCM



*The scalable drive system for basic and demanding applications*

#### Main applications

- Machines and plants in the industrial environment (steel/aluminum, plastics, printing, paper, cranes, mining, oil and gas, excitation equipment) in the new plant and retrofit businesses

#### Application examples

- Rolling mills
- Cross cutters and shears
- Wire-drawing machines
- Extruders and kneaders
- Presses
- Elevators and cranes
- Cableways and lifts
- Mine hoists
- Test stand drives

#### Highlights

- PROFIBUS as standard, PROFINET optional
- Variance of the Control Units
- Field power supply in-line with requirements
- Electronics power supply for connection to 24 V DC
- Power unit isolated with respect to ground
- Free function blocks and Drive Control Chart
- Expandable functionality using SINAMICS components
- Single-phase connection possible
- Varnished PCBs and nickel-plated copper busbars
- Wide temperature range

#### Catalog D 23.1



## Overview

## Drive units for single-axis applications



Blocksize format

Catalog PM 21

Chassis format

This Catalog, Chapter 2

## Drive units for multi-axis applications



Booksize compact format

Catalog PM 21

Chassis format

This Catalog, Chapter 2

Cabinet Modules

This Catalog, Chapter 3

SINAMICS S120 is the modular drive system with vector and servo control that is ideal for sophisticated drive tasks in plant and machine construction.

Multi-axis drive solutions with higher-level motion control can be implemented with the modular SINAMICS S120 system just the same as solutions for single-axis drives.

Covering a power range from 0.12 kW to 4500 kW and various control modules with a graduated range of functions, the modular SINAMICS S120 system can be used to simply and quickly create a precisely tailored drive configuration – for almost any sophisticated drive application.

On the SINAMICS S120, the drive intelligence is combined with closed-loop control functions into Control Units.

These units are capable of controlling drives in the vector, servo and  $V/f$  modes. They also perform the speed and torque control

functions plus other intelligent drive functions for all axes on the drive.

Using the available closed-loop control techniques, both synchronous as well as induction motors can be operated, and therefore the complete range of low-voltage motors from Siemens.

Integrated PROFIBUS DP and PROFINET interfaces are available.

These interfaces ensure easy integration into complete automation solutions.

SINAMICS S120 Cabinet Modules are available as a cabinet system specifically for use in plant construction. These can be combined to form drive cabinet line-ups with a total power rating of up to 4500 kW. Standardized interfaces enable the modules to be linked quickly to create a ready-to-connect drive solution for multi-motor applications.

## Benefits

SINAMICS S120 is characterized by the following properties:

- Can be universally used in high-performance single and multi-axis applications
- Can be freely combined to create customized solutions
- Wide range of power ratings
- Wide range of functions
- SINAMICS Safety Integrated functions
- Supports various cooling types (air/liquid-cooled)
- Supports various infeed concepts
- Can be simply integrated into higher-level automation and IT environments
- User-friendly engineering
- Ease of handling
- Simple installation
- Practical connection system

## Applications

SINAMICS S120 vector control is recommended for drive solutions with continuous material webs, for example, wire-drawing machines, film and paper machines, as well as for hoisting gear, centrifuges and marine drives with harmonic, circular motion.

SINAMICS S120 with servo control and servo motors is employed for cyclic processes with both precise and highly dynamic closed-loop position control.

With SINAMICS S120, more performance is integrated into machines that are used in many sectors, for instance in:

- Packaging machines
- Plastics processing machines
- Textile machines
- Presses and punches
- Printing and paper machines
- Machines used in the woodworking, glass and ceramics industries
- Hoisting gear
- Handling and assembly systems
- Machine tools
- Rolling mill drives
- Vehicle and gearbox test stands
- Test stand applications
- Marine applications

# Introduction

## SINAMICS S120

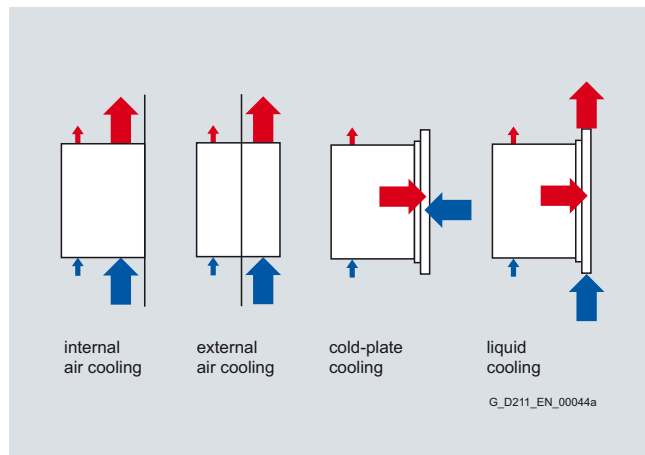
The flexible, modular drive system  
for demanding drive tasks

1

### Design

#### Cooling types

Regarding cooling, there are several options depending on the type of construction:



#### 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 dissipated to the environment.

#### External air cooling

External air cooling uses the through-hole technology. The components' power unit heat sinks pass through the mounting surface in the control cabinet and can thus dissipate the heat losses of the power circuit to a separate external cooling circuit.

The only power 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 be open to the outside.

#### Cold plate cooling

Drive units using cold plate cooling are designed so that the power loss of the power unit can be dissipated to an external heat sink at the rear of the drive unit through a thermal interface. This external heat sink is water-cooled, for example.

#### Liquid cooling

For liquid cooling, the power semiconductors are mounted on a heat sink, through which cooling medium flows. The power loss of the device is, to large extent, absorbed by the cooling medium and can be dissipated outside the cabinet.

#### Types of construction

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

Catalog PM 21 provides precise details and ordering data for the booksize, booksize compact and blocksize formats.

#### Booksize format

Booksize format units are optimized for multi-axis applications and are mounted adjacent to one another. The connection for the common DC link is an integral feature.



Several cooling possibilities are available for the booksize format:

Internal air cooling, external air cooling, cold plate cooling and liquid cooling.

#### 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 requiring a high dynamic performance and where installation space is restricted.



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

**Design****Blocksize format**

Blocksize format units are optimized for single-axis applications and are supplied only as Power Modules. The units are cooled by an internal air cooling circuit.

**Chassis format, air-cooled**

Higher-output units (approximately 100 kW and above) are constructed in chassis format. These drive units are available as:

- Power Modules
- Basic Line Modules
- Smart Line Modules
- Active Line Modules
- Active Interface Modules
- Motor Modules

Chassis format units are cooled by an internal air cooling circuit as standard.



Power Module in chassis format, air-cooled

**Chassis format, liquid-cooled**

In addition to the air-cooled drive units, liquid-cooled units are also available:

- Power Modules
- Basic Line Modules
- Active Line Modules
- Motor Modules

These drive units provide excellent solutions for applications where a low space requirement is important (up to a 60 % smaller footprint when compared to air cooling), or low noise levels (< 56 dB). They are also admirably suited for applications in tough ambient conditions.



Power Module in chassis format, liquid-cooled

**Cabinet Modules**

SINAMICS S120 Cabinet Modules are a modular cabinet system for multi-motor drives with a central supply infeed and a common DC busbar, for example, as used in paper machines, rolling mills, test bays, and hoisting gear/cranes. The main components of the system are as follows:

- Line Connection Modules
- Basic Line Modules
- Smart Line Modules
- Active Line Modules
- Central Braking Modules
- Motor Modules
- Auxiliary Power Supply Modules



Cabinet Modules

# Introduction

## SINAMICS S150

The drive solution for demanding high-rating single-motor drives

1

### Overview



SINAMICS S150 cabinet units are designed for variable-speed drives in plant and machinery construction.

They are especially suitable where high demands are placed on the dynamic performance and speed precision, as well as for frequent braking cycles with high braking energies and four-quadrant operation. The drive converter cabinet units provide high performance speed control with a high precision and dynamic performance, and are available for a power range extending from 75 kW up to 1200 kW.

### Benefits

- Regenerative feedback into the mains supply as standard permits four-quadrant operation without any restrictions
- Significant energy saving, particularly with frequent braking cycles
- Highly accurate and dynamic line infeed thanks to IGBTs – rugged to withstand the effects of line fluctuations
- Almost sinusoidal line currents are impressed as a result of the fast current control
- The innovative Clean Power Filter ensures almost negligible low-frequency line harmonics that are well below the limit of the stringent THD limit values according to IEEE 519. As a consequence, the losses in the low-voltage distribution and/or line transformers and in the line feeder cables, caused by harmonic currents, are avoided
- Reactive power compensation is possible (inductive or capacitive)
- Can be easily integrated in automation solutions thanks to the PROFIBUS and PROFINET interfaces (incorporated as standard), as well as a range of analog and digital interfaces.
- Increased plant availability thanks to quick and easy replaceability of individual modules and power components.
- Simple commissioning and parameterization using interactive menus on the AOP30 Advanced Operator Panel with graphic LCD and plain-text display.
- The drive system can be optimally adapted to specific requirements thanks to the wide range of electrical and mechanical options.
- Comprehensive range of protection functions → Safety Integrated

### Applications

SINAMICS S150 is predestined for use in all applications that place the highest demands on process operations with dynamic, reproducible processes. These include, for example:

- Test bays
- Centrifuges
- Elevators and cranes
- Cross cutters and shears
- Conveyor belts with a high power demand and energy recovery
- Presses
- Cable winches

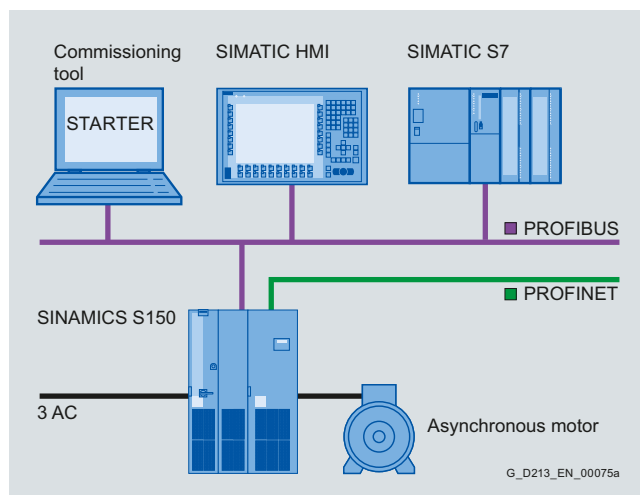
### Design

SINAMICS S150 systems are ready-to-connect converters accommodated in a standard control cabinet.

They can be optimally adapted to specific requirements as a result of a wide range of options.

Different variants allow the line and the motor connection to be made at the top or bottom. This ensures a high degree of flexibility regarding how the drive is installed.

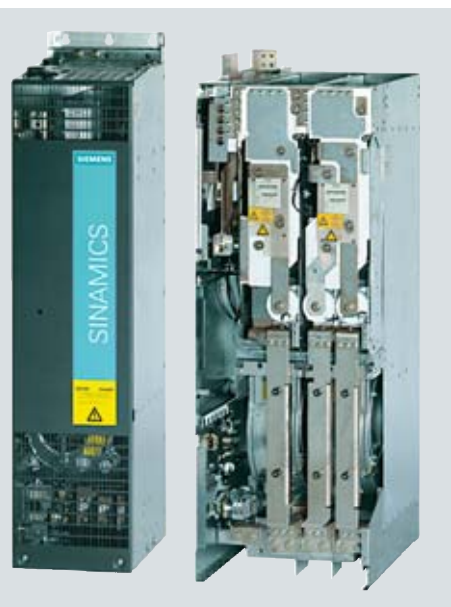
The drive units are available with cabinet widths starting from 1400 mm in grid dimension increments of 200 mm. As standard, the cabinets have degree of protection IP20, and can be optionally increased up to IP54. The AOP30 Advanced Operator Panel is fitted as standard in the cabinet door.



Configuration example, SINAMICS S150 with SIMATIC S7

# SINAMICS S120

## Chassis Format Units



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# SINAMICS S120 Chassis Format Units

## System overview

### SINAMICS S120 Chassis Format Units

#### Overview



With its separate power unit and control module (Control Unit), the SINAMICS S120 drive system can be perfectly adapted to a wide variety of different drive tasks.

The control module 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 requirements regarding regenerative feedback capability or energy exchange. The connection between the Control Unit and power unit is made very simply using the digital system interface DRIVE-CLiQ.

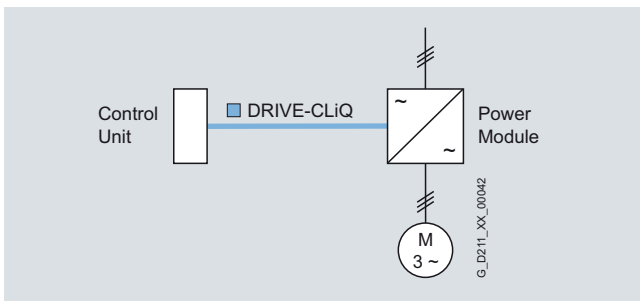
The following drive units are available in the chassis format:

- Power Modules
- Basic Line Modules
- Smart Line Modules (only available in the air-cooled version)
- Active Line Modules
- Active Interface Modules (only available in the air-cooled version)
- Motor Modules

#### Power Modules

The simplest variant of a SINAMICS S120 drive system comprises a CU310 Control Unit and a Power Module.

In Power Modules specifically designed for single drives without regenerative feedback into the line supply, the line-side infeed and the motor-side power unit are combined in one unit.



Generated energy produced during braking is converted to heat via braking resistors.

The Control Unit is plugged onto the Power Module; in addition to the complete control intelligence, the Control Unit also has all the drive interfaces for communication with higher-level systems and interfacing of add-on components.

#### Line Modules

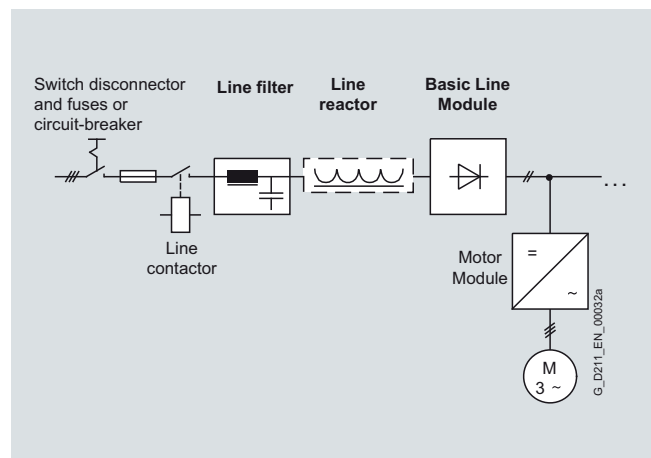
Line Modules contain the central line infeed for the DC link. Various Line Modules can be selected to address the various application profiles:

- Basic Line Modules
- Smart Line Modules
- Active Line Modules

#### Basic Line Modules

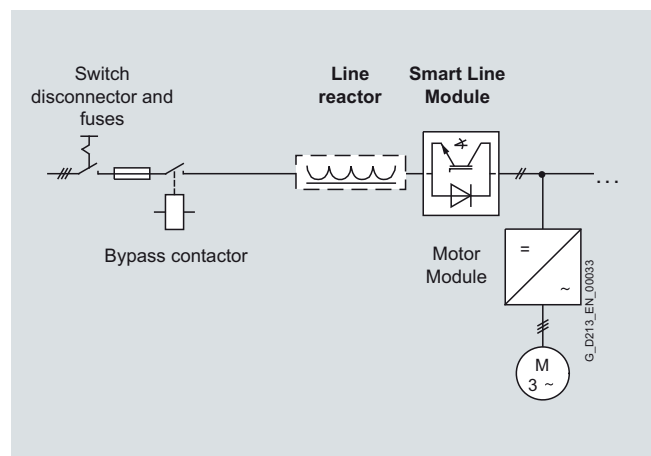
Basic Line Modules are designed only for infeed operation, i.e. they are not capable of recovering energy to the mains supply. If regenerative energy is produced, e.g. when drives brake, it must be converted to heat by means of a Braking Module and a braking resistor.

A line filter can be optionally installed in order to maintain the limit values according to EN 61800-3, Class C2.



#### Smart Line Modules

Smart Line Modules can supply energy and recover energy to the mains supply. Braking Module and braking resistor are only required, if, also for a power failure – without energy recovery option – it is necessary to brake the drives in a controlled fashion. When a Smart Line Module is used as the infeed, the matching line reactor must be installed.

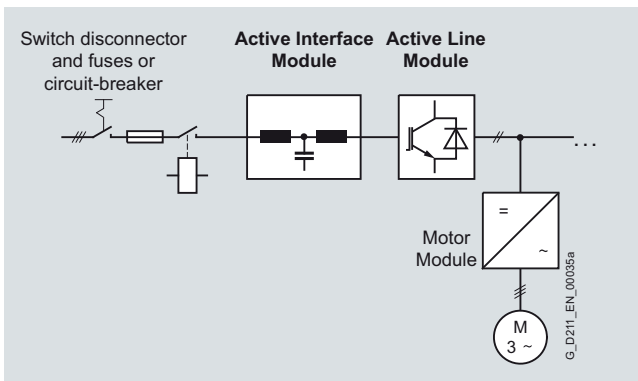


## Overview

### Active Line Modules

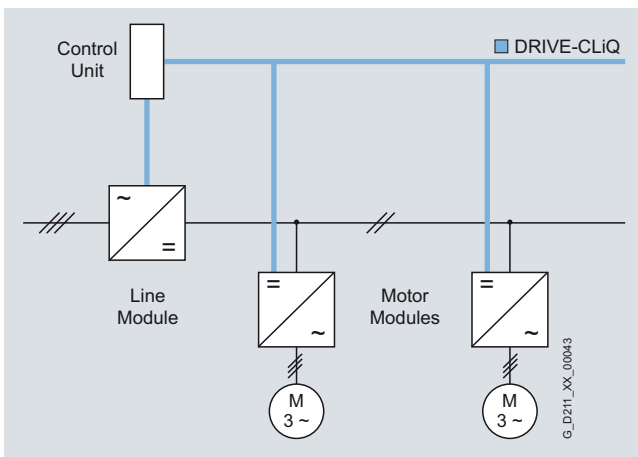
Active Line Modules can supply energy and return regenerative energy to the supply system. Braking Module and braking resistor are only required, if, also for a power failure – without energy recovery option – it is necessary to brake the drives in a controlled fashion.

Contrary to the Basic Line Modules and Smart Line Modules, Active Line Modules generate a controlled DC voltage. This is kept constant, independent of any line voltage fluctuations, assuming that the line voltage fluctuates within the permitted tolerances. Active Line Modules draw a virtually sinusoidal current from the supply which limits any harmful harmonics. All the components required to operate an Active Line Module are integrated in the Active Interface Module.



### Motor Modules

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



Motor Modules are designed for multi-axis drive systems and are controlled by either a CU320-2 or a SIMOTION D Control Unit. Motor Modules are interconnected through a common DC bus.

One or several Motor Modules are supplied with energy for the motors via the DC link. Both synchronous and induction motors can be operated.

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 DC link is supplied with line supply voltage by a Line Module.

### Control Units

The control intelligence for all the drive axes integrated in the multi-axis group is combined in the Control Units. They also feature drive-related inputs/outputs and interfaces for communicating with higher-level controllers. Control Units are available with different ranges of functions and with different performance levels.

### System components

The structure of the drive system is defined by selecting the Control Unit and Power Module or Line Module and Motor Modules. The additional components provided allow optimum adaptation of the drive system to the application.

These components are subdivided into:

- **Line-side components**, e.g. line reactors and line filters
- **DC link components** e.g. Braking Modules and braking resistors
- **Motor-side components**, e.g. motor reactors and dv/dt filters plus VPL, sine-wave filters
- **Supplementary system components**, e.g. Terminal Modules, operator panels and Communication Boards
- **Encoder system interface** for connecting various types of encoders to SINAMICS S120

### DRIVE-CLiQ system interface

All SINAMICS S120 components are equipped with the high-performance DRIVE-CLiQ system interface. Line and Motor Modules are connected to the Control Unit and Terminal and Sensor Modules to the drive system via DRIVE-CLiQ – simply and efficiently. Motors that also have this interface can be directly connected to the drive system.

### Varnished PCBs

The following drive units are equipped as standard with varnished PCBs:

- Blocksize format units
- Booksize format units
- Chassis format units
- Control Units
- Sensor Modules
- Terminal Modules
- Advanced Operator Panel (AOP30)

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

### Nickel-plated busbars

All of the copper busbars used are nickel-plated in order to achieve the best possible immunity to environmental effects. Further, the bare copper connections do not have to be cleaned for customer connections.

# SINAMICS S120 Chassis Format Units

## System overview

### SINAMICS S120 Chassis Format Units

#### Function

##### Communication with higher-level control and customer terminal block

As customer interface to a higher-level control, as standard there is a PROFIBUS or PROFINET communication interface on the CU320-2 Control Unit; there are also expansions such as the TM31 Terminal Module, the TB30 Terminal Board and modules to support CANopen.

This customer terminal block can be used to connect the system to the higher-level controller using analog and digital signals, or to connect additional units.

For additional information, please refer to the [SINAMICS Low Voltage Engineering Manual](#).

##### Open-loop and closed-loop control functions

SINAMICS S120 has a high-dynamic vector control with speed and current control – with and without speed actual value feedback.

##### Software and protective functions

The software functions available as standard are described below:

Software and protective functions	Description
<b>Setpoint input</b>	The setpoint can be input both internally and externally. It is applied internally as a fixed setpoint, motorized potentiometer setpoint or jog setpoint, and externally via the communications interface or an analog input – when using the TB30 Terminal Board or the TM 31 Terminal Module. The internal fixed setpoint and the motorized potentiometer setpoint can be switched over or adjusted using control commands from any interface.
<b>Motor identification</b>	The automatic motor identification function makes commissioning faster and easier and optimizes closed-loop control of the drive.
<b>Ramp-function generator</b>	A user-friendly ramp-function generator with separately adjustable ramp-up and ramp-down times, together with adjustable rounding times in the lower and upper speed ranges, allows the drive to be smoothly accelerated and braked. This results in a good speed control response and plays its role in reducing the stress on the mechanical system. The down ramp can be parameterized separately for a quick stop.
<b>V<sub>dc max</sub> controller</b>	The V <sub>dc max</sub> controller automatically prevents overvoltages in the DC link if the down ramp is too short, for example. This may also extend the set ramp-down time. <i>Comment:</i> This function only makes sense for single-axis applications.
<b>Kinetic buffering (KIP)</b>	For brief line supply failures, the kinetic energy of the rotating drive is used to buffer the DC link and therefore prevents fault trips. The drive converter remains operational as long as the drive can provide regenerative energy as a result of its motion and the DC link voltage does not drop below the shutdown threshold. When the line supply recovers within this time, the drive is again bumplessly accelerated up to its setpoint speed.
<b>Automatic restart</b>	The automatic restart switches the drive on again when the power is restored after a power failure, and ramps up to the current speed setpoint.
<b>Flying restart</b>	The flying restart function allows the converter to be switched to a motor that is still turning.
<b>Technology controller</b>	Using the technology controller (PID controller) function module, level or flow controls and complex tension controls can be implemented, for example. The existing D component can act both on the system deviation as well as on the actual value (factory setting). The P, I, and D components are separately set.
<b>Free function blocks</b>	Using the freely programmable function blocks, it is easy to implement logic and arithmetic functions for controlling the SINAMICS drive. The blocks can be programmed by means of an operator panel or the STARTER commissioning tool.
<b>Drive Control Chart (DCC)</b>	Drive Control Chart (DCC) is an additional tool for the easy configuration of technological functions for SINAMICS. The block library contains a large selection of control, arithmetic and logic blocks as well as extensive open-loop and closed-loop control functions. 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. DCC is an add-on to the STARTER commissioning tool (→ Tools and engineering).
<b>I<sup>2</sup>t detection for motor protection</b>	A motor model stored in the converter software calculates the motor temperature based on the current speed and load. More exact sensing of the temperature, which also takes into account the influence of the ambient temperature, is possible by means of direct temperature sensing using KTY84 sensors in the motor winding.
<b>Motor temperature evaluation</b>	Motor protection by evaluating a KTY84, PTC or Pt100 temperature sensor. When a KTY84 temperature sensor is connected, the limit values can be set for alarm or shutdown. When a PTC thermistor is connected, the system reaction to triggering of the thermistor (alarm or shutdown) can be defined.
<b>Motor blocking protection</b>	A blocked motor is detected and protected against thermal overloading by a fault trip.

#### Power unit protection

Power unit protection	Description
<b>Ground fault monitoring at the output</b>	A ground fault at the output end is detected by an aggregate current monitor and results in shutdown in grounded-neutral systems.
<b>Electronic short-circuit protection at the output</b>	A short-circuit at the output (e.g. at the converter output terminals, in the motor cable or in the motor terminal box) is detected and the converter shuts down with a "fault".
<b>Thermal overload protection</b>	An alarm is issued first when the overtemperature threshold responds. If the temperature continues to rise, the unit either shuts down or independently adjusts the pulse frequency or output current so that thermal load is reduced. Once the cause of the fault has been eliminated (e.g. cooling has been improved), the original operating values are automatically resumed.

### Function

#### *Safety Integrated functions*

The integrated safety functions of SINAMICS provide highly-effective application-oriented protection for personnel and machinery. The Safety Integrated functions are implemented electronically and therefore offer short response times in comparison to solutions with externally implemented monitoring functions.

The trend toward greater complexity and increasing modularity of machines is increasingly seeing a shift in safety functions away from the classical central safety functions (for example, shutdown of the complete machine using a main switch) and into the machine control system and the drives. Frequently, this also significantly increases the productivity. This is because, for instance, equipping times can be reduced and during these equipping times, depending on the machine type, other parts can still continue to produce.

Integrated safety functions act much faster than those of a conventional design. The safety of a machine is increased further with Safety Integrated. Furthermore, thanks to the faster method of operation, safety measures controlled by integrated safety systems are perceived as less of a hindrance by the machine operator, therefore significantly reducing the motivation to consciously bypass safety functions.

The safety functions in the device and communication via PROFIsafe have already been certified. This simplifies configuring the safety functions and especially the acceptance of the plant or system by an authorized testing body when compared to safety solutions made up of individual safety components.

#### Legal framework

Machine and plant builders must ensure that their machines or plants neither present risks due to electric shock, heat or radiation nor due to functional faults. In Europe, for example, compliance with the machinery directive is legally stipulated by the EU industrial safety directive.

In order to ensure compliance with this directive, it is recommended that the corresponding harmonized European standards are applied. This initiates the assumption of conformity and gives manufacturers and operators the legal security when complying with both national regulations and EU directives. The machine manufacturer uses the CE marking to document the compliance with all relevant directives and regulations in the free movement of goods.

#### Safety-related standards

Functional safety is specified in various standards. EN ISO 12100 and EN ISO 14121-1, for example, are concerned with the design and risk assessment of machines. EN 62061 (only applicable for electrical and electronic control systems) and EN ISO 13849-1 (previously EN 954-1) define the functional and safety-related requirements of control systems with relevance to safety.

The above-mentioned standards define different safety requirements that the machine has to satisfy in accordance with the risk, frequency of a dangerous situation, probability of occurrence and the opportunities for recognizing impending danger.

- EN 954-1: Categories B, 1 ... 4 (from the end of 2011 will be replaced by EN ISO 13849-1)
- EN ISO 13849-1: Performance Level PL a ... e
- EN 62061: Safety Integrity Level SIL 1 ... 3

#### Safety functions integrated in the drive with SINAMICS

The safety functions integrated in SINAMICS satisfy the requirements of

- Category 3 according to EN 954-1 (from the end of 2011 will be replaced by EN ISO 13849-1)
- Safety Integrity Level (SIL) 2 according to EN 61508
- Performance Level (PL) d according to EN ISO 13849-1

In addition, the Safety Integrated functions of SINAMICS are generally certified by independent institutes. An up-to-date list of certified components is available on request from your local Siemens office.

# SINAMICS S120 Chassis Format Units

## System overview

### SINAMICS S120 Chassis Format Units

#### Function

##### Safety Basic Functions and Safety Extended Functions

The Safety Integrated functions of the SINAMICS drive system are subdivided into what are known as Safety Basic Functions and Safety Extended Functions (terminology according to IEC 61800-5-2):

##### • **Basic Functions**

- Safe Torque Off (STO)
- Safe Stop 1 (SS1, time-controlled)
- Safe Brake Control (SBC)

The Safety Basic functions are included in the standard scope of delivery of the drive and can be used without requiring any additional license. The user can activate these functions at any time. An encoder is not required for their use.

The Safety Basic Functions are controlled as follows:

- Via terminals at the Control Unit and at the power unit
- Via PROFIBUS or PROFINET with PROFIsafe profile (from version 3 (last position of the Order No.  $\geq$  3) and Drives SW Version V2.6 SP2)

##### • **Extended Functions**

- Safe Torque Off (STO)
- Safe Stop 1 (SS1, time-controlled and acceleration controlled)
- Safe Stop 2 (SS2)
- Safe Operating Stop (SOS)
- Safely-Limited Speed (SLS)
- Safe Speed Monitor (SSM)
- Safe Direction (SDI)

Safety Extended Functions require a safety license depending on the axes. Depending on the control, additional DRIVE-CLiQ components are required.

**Note:** For Chassis format units (chassis units and Cabinet Modules), Extended Functions require a sine-cosine encoder and therefore a SMC20 Sensor Module Cabinet-Mounted to evaluate the encoder signals (option **K48** for SINAMICS S120 Cabinet Modules).

The Safety Extended Functions are controlled as follows:

- Via the TM54F Terminal Module
- Via PROFIBUS or PROFINET with the PROFIsafe profile

Extended Functions are available for SINAMICS S120 Motor Modules, booksize and chassis formats from version 3 (last position of the Order No.  $\geq$  3).

The Safety Integrated functions currently available in SINAMICS S120 are subsequently described in more detail (terms as defined in IEC 61800-5-2):

##### **Safe Torque Off (STO)**

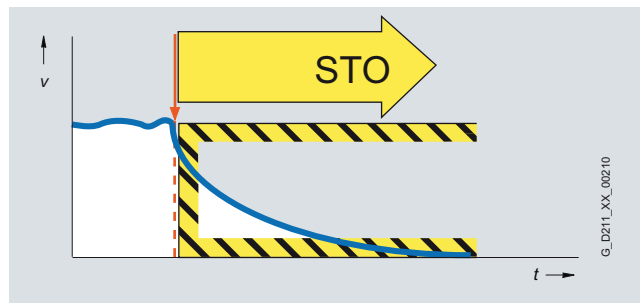
##### Function description

This function prevents unexpected starting according to EN 60204-1 Section 5.4. Safe Torque Off disables the control of the power unit, preventing a potentially hazardous torque (corresponds to Stop Category 0 according to EN 60204-1). The drive is reliably torque-free. This state is monitored internally in the drive.

Under Extended Functions, STO can also be controlled via the TM54F Terminal Module or PROFIsafe.

##### Application, customer benefits

STO has the immediate effect that the drive cannot supply any torque-generating energy. STO can be used wherever the drive will naturally reach a standstill due to load torque or friction in a sufficiently short time or when "coasting down" of the drive will not have any relevance for safety.



### Function

#### Safe Brake Control (SBC)

##### Function description

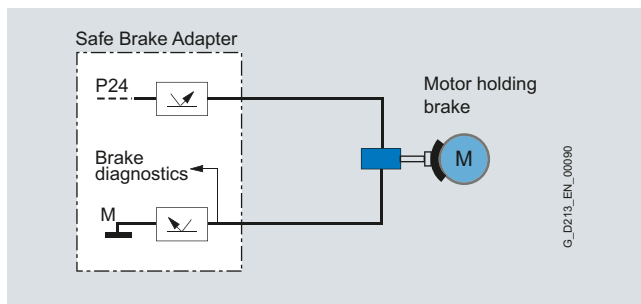
The Safe Brake Control SBC is used to control holding brakes, which are active in the no-current state, e.g. motor holding brakes (actuated using spring force). The brake is controlled through two channels in a safety-relevant fashion.

Safe Brake Control is executed when activating the operational brake control, Safe Torque Off function and when safety monitoring functions respond, which cause the power unit to be safely inhibited.

- **Note 1:** The Safe Brake Control does not detect mechanical faults in the brake, for example worn brake pads.
- **Note 2:** For Motor Modules, Booksize format, the terminals for the motor brake are integrated. For the chassis format, an additional Safe Brake Adapter (SBA) is required (see SINAMICS S120 Chassis Format Units, Supplementary system components).

##### Application, customer benefits

In conjunction with STO and SS1, SBC can also be activated. After switching off the torque-generating energy, SBC offers the possibility to safely control a holding brake at the motor; for example, to prevent hanging/suspended axes from sagging.



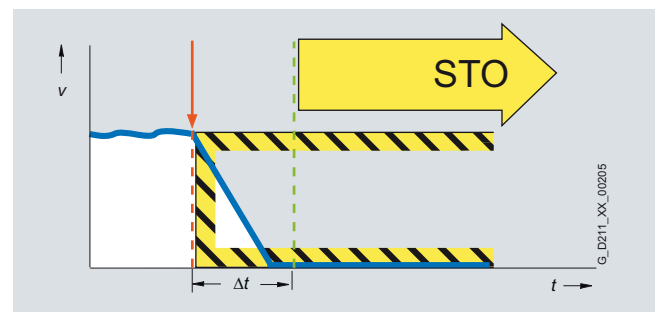
#### Safe Stop 1 (SS1, time-controlled, without encoder; Basic Safety Function)

##### Function description

The Safe Stop 1 function can safely stop the drive in accordance with EN 60204-1, Stop Category 1. When the SS1 function is selected, the drive independently brakes along a quick stop ramp (OFF3) and Safe Torque Off and Safe Brake Control (if enabled) are activated when the selected safety delay time has expired.

##### Application, customer benefits

When activating the stop function, if the drive does not come quickly enough to a standstill as a result of the load torque, then it can be actively braked by the converter. As a result of this integrated fast brake function, frequently it is possible to eliminate mechanical brakes which wear, or to reduce the load on them. This means that maintenance costs and stress on the machine can be reduced.



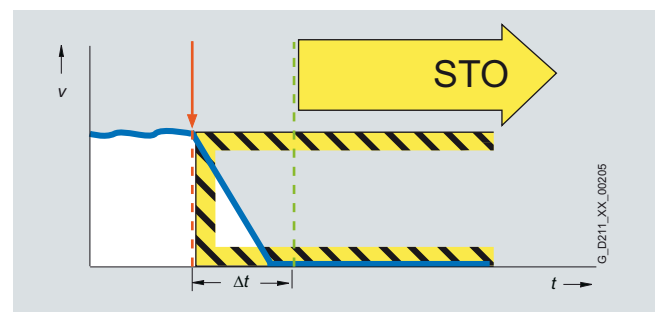
#### Safe Stop 1 (SS1, time and acceleration controlled, with sine-cosine encoder; Extended Safety Function)

##### Function description

The Safe Stop 1 function can safely stop the drive in accordance with EN 60204-1, Stop Category 1. When the SS1 function is selected, the drive independently brakes along a quick stop ramp, the deceleration is monitored (OFF3) and Safe Torque Off and Safe Brake Control (if enabled) are automatically activated when the selected safety delay time has expired.

##### Application, customer benefits

When activating the stop function, if the drive does not come quickly enough to a standstill as a result of the load torque, then it can be actively braked by the converter. As a result of this integrated fast brake function, frequently it is possible to eliminate mechanical brakes which wear, or to reduce the load on them. This means that maintenance costs and stress on the machine can be reduced.





# SINAMICS S120 Chassis Format Units

## System overview

### SINAMICS S120 Chassis Format Units

#### Function

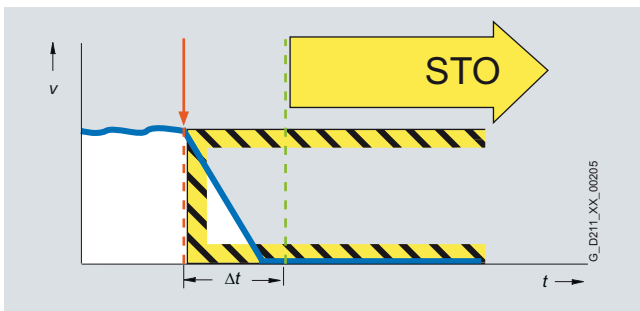
##### *Safe Stop 2 (SS2, with sine-cosine encoder)*

###### Function description

The Safe Stop 2 function can safely stop the drive in accordance with EN 60204-1, Stop Category 2. When the SS2 function is selected, the drive brakes autonomously along a quick stop ramp (OFF3). In contrast to SS1, the drive control remains operational afterwards, i.e. the motor can supply the full torque required to maintain the actual position. Standstill is safely monitored (Safe Operating Stop function, SOS).

###### Application, customer benefits

Just the same as for SS1, the drive is independently braked when the stop function is selected. Contrary to SS1, also at standstill, the drive can provide the full torque.



##### *Safe Stop 1 (SS1) and Safe Stop 2 (SS2) with Safe Acceleration Monitor (SAM, with sine-cosine encoder)*

For the Extended Functions Safe Stop 1 (SS1) and Safe Stop 2 (SS2) with SAM, during braking, the acceleration is safely monitored (SAM) in order to identify faults already during the braking phase.

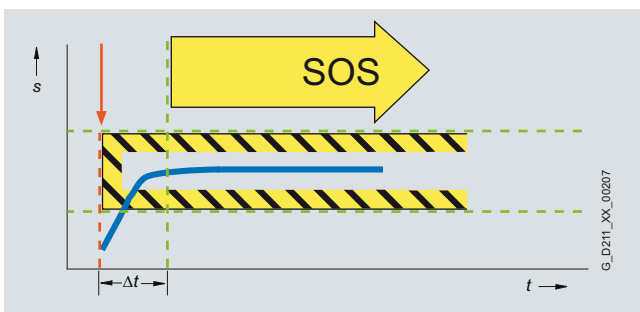
##### *Safe Operating Stop (SOS, with sine-cosine encoder)*

###### Function description

The Safe Operating Stop function constitutes safe standstill monitoring. The drive control remains in operation. The motor can therefore deliver the full torque to hold the current position. The actual position is reliably monitored. In contrast to safety functions SS1 and SS2, the speed setpoint is not influenced autonomously. After SOS has been selected, the higher-level control must bring the drive to a standstill within a parameterized safe time  $\Delta t$  and then hold the position setpoint. After the time  $\Delta t$  has expired, SOS is activated and monitored to ensure that the actual standstill position is not left.

###### Application, customer benefits

SOS is the ideal function for all those applications for which the machine or parts of the machine must be at a safe standstill for certain machining steps, but where the drive must also supply a holding torque.



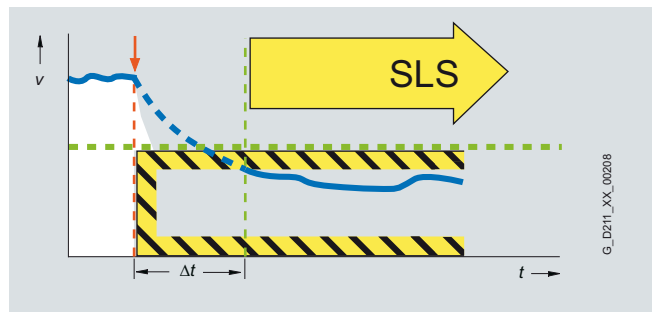
##### *Safely-Limited Speed (SLS, with sine-cosine encoder)*

###### Function description

Using the Safely-Limited Speed function, the drive is monitored against a parameterizable maximum velocity. Four different limit values can be activated. Just the same as for SOS, the speed setpoint is not independently influenced. After SLS has been selected, the higher-level control must bring the drive to below the selected velocity limit within a parameterizable time  $\Delta t$ .

###### Application, customer benefits

When setting-up many machines operating personnel must work on the machine as it rotates. This must either be done in steps, because the dangerous area must always be exited at each start, or alternatively, the operator works at the machine while it moves and is therefore exposed to an increased risk. When using the SLS function, a considerable amount of time can be saved – and it is still guaranteed that the operating personnel are safe. For this purpose, the drive velocity can be safely limited to a safe low level. The selectable wait time until SLS is activated allows the drive control to run-down the coordinated axes in a controlled fashion.



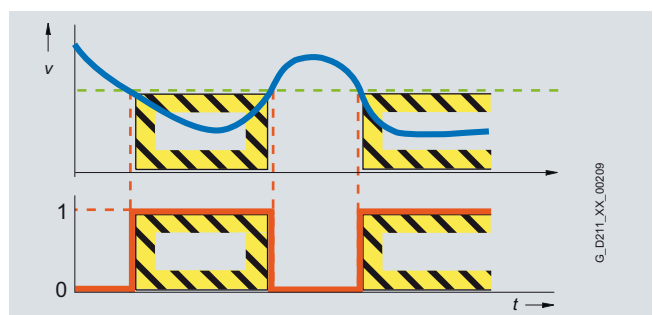
##### *Safe Speed Monitor (SSM, with sine-cosine encoder)*

###### Function description

The Safe Speed Monitor function supplies a safety feedback signal (high active) if the drive falls below a selectable velocity limit value. Contrary to the functions described above, there is no drive-based fault response when the limit value is exceeded.

###### Application, customer benefits

The safety SSM feedback signal can be used in a higher-level control for safety-relevant responses. The higher-level safety control can flexibly respond to the signal, depending on the particular situation, as there is no drive-based response when the limit value is exceeded. For example, using the SSM signal, a protective door can be released after a non-hazardous velocity is reached.



**Function****Safe Direction (SDI, with sine-cosine encoder)**Function description

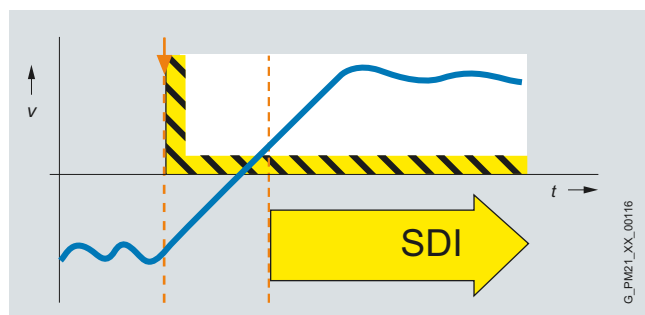
The SDI function ensures that the drive can only rotate in the selected direction.

Deviation from the direction of rotation currently being monitored is detected reliably and the configured drive-integrated fault reaction is initiated. It is possible to select which direction of rotation is to be monitored.

Application, customer benefits

The SDI function is used when the drive may only move in one direction. A typical application is to permit the operator access to a danger zone, as long as the machine is rotating in the safe direction, i.e. away from the operator. In this state, the operator can feed material into the work zone/remove material from the work zone without danger.

The function saves the use of external components e.g. speed monitors and the associated wiring. The release of a danger zone, while the machine is moving away from the operator, increases productivity. Without the SDI function, the machine must be safely stopped during material loading and removal.

**PROFIsafe**

PROFIsafe is an open communication standard, that facilitates standard and safety-relevant communication along one communication path (hard-wired or wireless). As a consequence, a second, separate bus system is not required. The telegrams that are sent are continually monitored to ensure safety-relevant communication. Possible errors such as telegrams that have been lost, repeated or received in the incorrect sequence etc. are avoided. This is done by consecutively numbering the telegrams in a safety-relevant fashion, monitoring their reception within a defined time and transferring an ID for transmitter and receiver of a telegram. Further, a cyclic redundancy check CRC (cyclic redundancy check) is performed.

SINAMICS 120 supports the PROFIsafe profile, based on PROFIBUS as well as on PROFINET.

**Licensing**

The Safety Integrated Basic Functions do not require a license.

A license is, however, required for each axis with safety functions in the case of Safety Integrated Extended Functions. It is irrelevant which safety functions are used and how many.

Licenses required for the SINAMICS S120 chassis format can be ordered, depending on the axes, as Z option **F01** to **F05** for the CompactFlash card. For SINAMICS S120 Cabinet Modules, depending on the axes, they can be ordered with safety options **K01** to **K05** for Motor Modules.

Refer to the section, [Supplementary system components for the order numbers of the CompactFlash cards](#).

Note: Presently, a maximum of 5 safety axes with Extended Functions are possible on a CU320-2. CU310/D410 Control Units are intended for the control of a single axis only. This means that only one license is required for the Extended Safety functions for these Control Units (option **F01**).

# SINAMICS S120 Chassis Format Units

## System overview

### SINAMICS S120 Chassis Format Units

#### Function

An overview of the SINAMICS Safety Integrated functions plus their boundary conditions is shown in the following table:

Function	Control	Underlying function	Reaction to limit overshoot	Encoder required	License required
<b>Safety Basic Functions</b>					
<b>STO</b>	<ul style="list-style-type: none"> <li>• EP terminals on the power unit and digital input at the CU3xx/D4xx/CX32</li> <li>• PROFIsafe</li> <li>• Terminal module (24 V to 230 V), option <b>K82</b><sup>1)</sup></li> </ul>	SBC (if activated)	–	No	No
<b>SS1</b>	<ul style="list-style-type: none"> <li>• EP terminals on the power unit and digital input at the CU3xx/D4xx/CX32</li> <li>• PROFIsafe</li> <li>• Terminal module (24 V to 230 V), option <b>K82</b><sup>1)</sup></li> </ul>	STO, after a parameterized delay time has expired	STO	No	No
<b>SBC</b>	<ul style="list-style-type: none"> <li>• Via Safe Brake Adapter<sup>2)</sup></li> </ul>	–	–	No	No
<b>Safety Extended Functions</b>					
<b>STO</b>	<ul style="list-style-type: none"> <li>• Terminals on the TM54F<sup>3)</sup></li> <li>• PROFIsafe</li> </ul>	SBC (if activated)	–	Yes <sup>4)</sup>	Yes (each safety axis)
<b>SS1</b>	<ul style="list-style-type: none"> <li>• Terminals on the TM54F<sup>3)</sup></li> <li>• PROFIsafe</li> </ul>	STO is activated after the shutdown conditions have been fulfilled	STO	Yes <sup>4)</sup>	Yes (each safety axis)
<b>SBC</b>	<ul style="list-style-type: none"> <li>• Via Safe Brake Adapter</li> </ul>	–	–	Yes <sup>4)</sup>	Yes (each safety axis)
<b>SS2</b>	<ul style="list-style-type: none"> <li>• Terminals on the TM54F<sup>3)</sup></li> <li>• PROFIsafe</li> </ul>	STO is activated after the shutdown conditions have been fulfilled	STO	Yes <sup>4)</sup>	Yes (each safety axis)
<b>SLS</b>	<ul style="list-style-type: none"> <li>• Terminals on the TM54F<sup>3)</sup></li> <li>• PROFIsafe</li> </ul>	Up to four maximum speeds for operation can be parameterized	STO, SS1 or SOS (can be parameterized)	Yes <sup>4)</sup>	Yes (each safety axis)
<b>SOS</b>	<ul style="list-style-type: none"> <li>• Terminals on the TM54F<sup>3)</sup></li> <li>• PROFIsafe</li> </ul>	For closed-loop speed control: The position is monitored from standstill	STO or SS1 (can be parameterized)	Yes <sup>4)</sup>	Yes (each safety axis)
<b>SSM</b>	<ul style="list-style-type: none"> <li>• Terminals on the TM54F<sup>3)</sup></li> <li>• PROFIsafe</li> </ul>	Safe limit value monitoring in both directions of rotation, no independent drive response. A safety-relevant signal for further operation is generated.	–	Yes <sup>4)</sup>	Yes (each safety axis)
<b>SDI</b>	<ul style="list-style-type: none"> <li>• Terminals on the TM54F<sup>3)</sup></li> <li>• PROFIsafe</li> </ul>	–	STO, SS1 or SOS (can be parameterized)	Yes <sup>4)</sup>	Yes (each safety axis)

<sup>1)</sup> In addition for SINAMICS S120 Cabinet Modules and SINAMICS S150 Converter Cabinet Units.

<sup>2)</sup> Safe Brake Adapter has been released from firmware version 4.4.

<sup>3)</sup> For SINAMICS S120 Cabinet Modules and SINAMICS S150 Converter Cabinet Units as option **K87**.

<sup>4)</sup> The Safety Integrated Extended Functions require a sine-cosine encoder to sense the motor speed. Possible encoder evaluation units SMC20, SMI20, SME20/25/120/125.

**Function***The principle of operation of Safety Integrated*Two independent shutdown paths

There are two shutdown paths that are independent of one another.

All shutdown paths are low active. This therefore ensures that when a component fails or there is a wire break, then the system always goes into the safe state. When a fault is detected in the shutdown paths, the Safe Torque Off or Safe Stop 1 function (depending on the parameterization, also refer to the table on Page 2/10) is activated and a restart is prevented.

Two-channel monitoring structure

All of the hardware and software functions important for Safety Integrated are implemented in two independent monitoring channels (e.g. shutdown paths, data management, data comparison). The safety-relevant data in the two monitoring channels is cyclically compared crosswise.

The monitoring functions in each monitoring channel are based on the principle that before a particular action, there must be a defined state, and after the action there must be a specific feedback. If this expectation is not fulfilled in a monitoring channel, then the drive is shutdown through two channels and the appropriate signal output.

Forced checking procedure using a test stop

In order to fulfill the requirements of EN ISO 13849-1 (previously EN 954-1) and IEC 61508 regarding early fault detection, the functions and the shutdown paths must be tested within a specific time period at least once to ensure that they are operating correctly. This must be realized either cyclically and manually or the test stop must be automatically initiated as part of the process. The test stop cycle is monitored, and after a specific time has been exceeded, an alarm is output.

A test stop does not require a power on. The acknowledgment is realized when deselecting the test stop request.

When the machine is operational, it can be assumed that there is no risk for personnel as a result of the appropriate safety equipment (e.g. protective doors). As a consequence, the user is only made aware of the forced checking procedure that is required using an alarm, and is requested to perform the forced checking procedure at the next possible opportunity.

Examples for performing the forced checking procedure:

- When the drives are stationary after switching-on the system
- Before opening the protective door
- In a specified rhythm (e.g. every 8 hours)
- In the automatic mode, time and event-triggered

# SINAMICS S120 Chassis Format Units

## System overview

### SINAMICS S120 Chassis Format Units

#### Technical data

The most important directives and standards are listed below. These are used as basis for the SINAMICS S120 Chassis Format Units drive system and they must be carefully observed to achieve an EMC-compliant configuration that is safe both functionally and in operation.

##### European directives

<b>2006/95/EC</b>	Low-voltage directive: Legal guidelines of the EU member states concerning electrical equipment for use within specified voltage limits
<b>2004/108/EC</b>	EMC directive: Legal guidelines of the EU member states for electromagnetic compatibility

##### European standards

<b>EN 954-1<sup>1)</sup></b>	Safety of machinery – safety-related parts of control systems; Part 1: General design principles
<b>EN ISO 13849-1</b>	Safety of machinery – safety-related parts of control systems; Part 1: General design guidelines (ISO 13849-1: 2006) (replaces EN 954-1)
<b>EN 60146-1-1</b>	Semiconductor converters – General requirements and line-commutated converters Part 1-1: Specification of basic requirements
<b>EN 60204-1</b>	Safety of machinery – Electrical equipment of machines; Part 1: General requirements
<b>EN 60529</b>	Degrees of protection provided by enclosures (IP code)
<b>EN 61508-1</b>	Functional safety of electrical/electronic/programmable electronic safety-related systems Part 1: General requirements
<b>EN 61800-2</b>	Variable-speed electric drives Part 2: General requirements – Rating specifications for low-voltage adjustable frequency AC power drive systems
<b>EN 61800-3</b>	Variable-speed electric drives Part 3: EMC requirements including specific test methods
<b>EN 61800-5-1</b>	Adjustable-speed electrical power drive systems Part 5: Safety requirements Main section 1: Electrical and thermal requirements
<b>EN 61800-5-2</b>	Adjustable speed electrical power drive systems Part 5-2: Safety requirements – Functional safety (IEC 61800-5-2:) 2007)

##### North American standards

<b>UL 508A</b>	Industrial Control Panels
<b>UL 508C</b>	Power Conversion Equipment
<b>CSA C22.2 No. 14</b>	Industrial Control Equipment

##### Approvals

<b>cULus, cURus</b>	Testing by UL (Underwriters Laboratories, <a href="http://www.ul.com">www.ul.com</a> ) according to UL and CSA standards
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Test symbols and UL files, refer to the approvals in the appendix.

<sup>1)</sup> Will be replaced by EN ISO 13849-1 at the end of 2011.

**Technical data***General technical specifications*

Unless clearly specified otherwise, the following technical data are valid for all the following components of the air-cooled SINAMICS S120 drive system in the chassis format.

Electrical specifications	
<b>Rated voltages</b>	380 ... 480 V 3 AC, $\pm 10\%$ (-15% < 1 min) 500 ... 690 V 3 AC, $\pm 10\%$ (-15% < 1 min)
<b>Line supply types</b>	Grounded TN/TT systems and non-grounded IT systems
<b>Line frequency</b>	47 ... 63 Hz
<b>Overvoltage category</b>	III to EN 61800-5-1
<b>Electronics power supply</b>	24 V DC, -15% +20% implemented as PELV circuit in accordance with EN 61800-5-1 Ground = negative pole grounded via the electronics
<b>Rated short-circuit current SCCR (Short Circuit Current Rating)</b> according to UL508C (up to 600 V), in conjunction with the specified fuses or circuit breakers	
Rated power	
• 1.1 ... 447 kW	65 kA
• 448 ... 671 kW	84 kA
• 672 ... 1193 kW	170 kA
• > 1194 kW	200 kA
<b>Control method</b>	Vector/servo control with and without encoder or V/f control
<b>Fixed speeds</b>	15 fixed speeds plus 1 minimum speed, parameterizable (in the default setting, 3 fixed setpoints plus 1 minimum speed are selectable using terminal block/PROFIBUS/PROFINET)
<b>Skipped speed ranges</b>	4, parameterizable
<b>Setpoint resolution</b>	0.001 rpm digital (14 bits + sign) 12 bit analog
<b>Braking operation</b>	With Active Line Modules and Smart Line Modules, four-quadrant operation as standard (energy recovery). With Basic Line Modules, single-quadrant operation as standard. Braking when the power fails using an optional braking module.
Mechanical specifications	
<b>Degree of protection</b>	IP00 or IP20 dependent on type
<b>Protection class</b>	I acc. to EN 61800-5-1
<b>Touch protection</b>	EN 50274/BGV A3 for the intended purpose
<b>Type of cooling</b>	Forced air cooling AF to EN 60146



# SINAMICS S120 Chassis Format Units

## Air-cooled units

### Air-cooled units

#### Technical data

Ambient conditions	Storage <sup>1)</sup>	Transport <sup>1)</sup>	Operation
<b>Ambient temperature</b>	-40 ... +70 °C Class 1K3 acc. to EN 60721-3-1	-40 ... +70 °C Class 2K4 acc. to EN 60721-3-2	<u>Line-side components, Power Modules, Line Modules and Motor Modules:</u> 0 ... 40 °C without derating Up to +55 °C, see derating data <u>Control Units, supplementary system components, DC link components and Sensor Modules</u> 0 ... 50 °C
<b>Relative humidity</b> Condensation, splashwater, and ice formation not permitted (EN 60204, Part 1)	5 ... 95 % <sup>2)</sup> Class 1K4 acc. to EN 60721-3-1	5 ... 95 % at 40 °C Class 2K3 acc. to EN 60721-3-2	5 ... 95 % <sup>2)</sup> Class 3K3 acc. to EN 60721-3-3
<b>Environmental class/ harmful chemical substances</b>	Class 1C2 acc. to EN 60721-3-1	Class 2C2 acc. to EN 60721-3-2	Class 3C2 acc. to EN 60721-3-3
<b>Organic/ biological influences</b>	Class 1B1 acc. to EN 60721-3-1	Class 2B1 acc. to EN 60721-3-2	Class 3B1 acc. to EN 60721-3-3
<b>Degree of pollution</b>	2 acc. to EN 61800-5-1	2 acc. to EN 61800-5-1	2 acc. to EN 61800-5-1
<b>Installation altitude</b>	Up to 2000 m above sea level without derating > 2000 m above sea level, see derating data		
Mechanical stability	Storage <sup>1)</sup>	Transport <sup>1)</sup>	Operation
<b>Vibration load</b>	–	Class 2M2 acc. to EN 60721-3-2	Test values acc. to EN 60068-2-6 test Fc: • 10 ... 58 Hz with constant deflection 0.075 mm • 58 ... 150 Hz with the constant acceleration 9.81 m/s <sup>2</sup> (1 × g)
<b>Shock load</b>	–	Class 2M2 acc. to EN 60721-3-2	Test values acc. to EN 60068-2-27 test Ea: 98 m/s <sup>2</sup> (10 × g)/20 ms
Compliance with standards			
<b>Conformances/ approvals, according to</b>	CE (EMC Directive No. 2004/108/EC and Low-Voltage Directive No. 2006/95/EC) cULus (only for devices connected to line supply voltages 380 ... 480 V 3 AC and 500 ... 600 V 3 AC)		
<b>Radio interference suppression</b>	SINAMICS drive converter systems are not designed for connection to the public network (first environment). Radio interference suppression is compliant with the EMC product standard for variable-speed drives EN 61800-3, "Second environment" (industrial line supplies). The equipment can cause electromagnetic interference when it is connected to the public network. However, if supplementary measures are taken (e.g. → line filter), it can also be operated in the "first environment".		

<sup>1)</sup> In transport packaging.

<sup>2)</sup> Deviations with respect to the specified class are underlined.

## Characteristic curves

### Derating data, chassis format

SINAMICS S120 Chassis Format Units and the associated system components are rated for an ambient temperature of 40 °C and installation altitudes up to 2000 m above sea level.

For ambient temperatures > 40 °C the output current must be reduced. Ambient temperatures above 55 °C are not permissible.

At installation altitudes > 2000 m above sea level, it must be taken into consideration that with increasing height, the air pressure decreases and therefore the air density. As a consequence, the cooling efficiency and the insulation capacity of the air also decrease.

Due to the reduced cooling efficiency, it is necessary, on one hand, to reduce the ambient temperature and on the other hand, to lower heat loss in the chassis unit by reducing the output current, whereby ambient temperatures lower than 40 °C may be offset to compensate.

The following table lists the permissible output currents as a function of the installation altitude and ambient temperature. The specified values already include a permitted compensation in respect of installation altitude and ambient temperatures < 40 °C – temperature at the air intake of the chassis unit.

The values apply under the precondition that a cooling air flow through the units is guaranteed as stated in the technical specifications.

As additional measure for installation altitudes from 2000 m up to 5000 m, an isolating transformer is required in order to reduce transient overvoltages according to EN 60664-1. [For additional information, please refer to the SINAMICS Low Voltage Engineering Manual.](#)

Installation altitude above sea level m	Current derating factor (as a % of the rated current) for an ambient/air intake temperature of							
	20 °C	25 °C	30 °C	35 °C	40 °C	45 °C	50 °C	55 °C
0 ... 2000	100 %	100 %	100 %	100 %	100 %	<b>93.3 %</b>	<b>86.7 %</b>	<b>80.0 %</b>
2001 ... 2500	100 %	100 %	100 %	100 %	<b>96.3 %</b>			
2501 ... 3000	100 %	100 %	100 %	<b>98.7 %</b>				
3001 ... 3500	100 %	100 %	100 %					
3501 ... 4000	100 %	100 %	<b>96.3 %</b>					
4001 ... 4500	100 %	<b>97.5 %</b>						
4501 ... 5000	<b>98.2 %</b>							

Current-derating factors for SINAMICS S120 chassis units as a function of the ambient/air intake temperature and the installation altitude

# SINAMICS S120 Chassis Format Units

## Air-cooled units

### Air-cooled units

#### Characteristic curves

Current derating for Motors Modules, chassis format as a function of the pulse frequency

To reduce motor noise or to increase output frequency, the pulse frequency can be increased relative to the factory setting (1.25 kHz or 2 kHz). When the pulse frequency is increased, the derating factor of the output current must be taken into account. This derating factor must be applied to the currents specified in the technical data.

For additional information, please refer to the [SINAMICS Low Voltage Engineering Manual](#).

The following table lists the rated output currents of the SINAMICS S120 Motor Modules with pulse frequency set in the factory as well as the current derating factors (permissible output currents referred to the rated output current) for higher pulse frequencies.

Motor Module	Type rating at 400 V kW	Output current at 2 kHz A	Derating factor at the pulse frequency				
			2.5 kHz	4 kHz	5 kHz	7.5 kHz	8 kHz
<b>380 ... 480 V 3 AC</b>							
1TE32-1AA3	110	210	95 %	82 %	74 %	54 %	50 %
1TE32-6AA3	132	260	95 %	83 %	74 %	54 %	50 %
1TE33-1AA3	160	310	97 %	88 %	78 %	54 %	50 %
1TE33-8AA3	200	380	96 %	87 %	77 %	54 %	50 %
1TE35-0AA3	250	490	94 %	78 %	71 %	53 %	50 %

Derating factor of the output current as a function of the pulse frequency for units with a rated pulse frequency of 2 kHz

Motor Module	Type rating at 400 V or 690 V kW	Output current at 1.25 kHz A	Derating factor at the pulse frequency					
			2.0 kHz	2.5 kHz	4 kHz	5 kHz	7.5 kHz	8 kHz
<b>380 ... 480 V 3 AC</b>								
1TE36-1AA3	315	605	83 %	72 %	64 %	60 %	40 %	
1TE37-5AA3	400	745	83 %	72 %	64 %	60 %	40 %	
1TE38-4AA3	450	840	87 %	79 %	64 %	55 %	40 %	
1TE41-0AA3	560	985	92 %	87 %	70 %	60 %	50 %	
1TE41-2AA3	710	1260	92 %	87 %	70 %	60 %	50 %	
1TE41-4AA3	800	1405	97 %	95 %	74 %	64 %	50 %	
<b>500 ... 690 V 3 AC</b>								
1TG28-5AA3	75	85	93 %	89 %	71 %	60 %	40 %	
1TG31-0AA3	90	100	92 %	88 %	71 %	60 %	40 %	
1TG31-2AA3	110	120	92 %	88 %	71 %	60 %	40 %	
1TG31-5AA3	132	150	90 %	84 %	66 %	55 %	35 %	
1TG31-8AA3	160	175	92 %	87 %	70 %	60 %	40 %	
1TG32-2AA3	200	215	92 %	87 %	70 %	60 %	40 %	
1TG32-6AA3	250	260	92 %	88 %	71 %	60 %	40 %	
1TG33-3AA3	315	330	89 %	82 %	65 %	55 %	40 %	
1TG34-1AA3	400	410	89 %	82 %	65 %	55 %	35 %	
1TG34-7AA3	450	465	92 %	87 %	67 %	55 %	35 %	
1TG35-8AA3	560	575	91 %	85 %	64 %	50 %	35 %	
1TG37-4AA3	710	735	87 %	79 %	64 %	55 %	35 %	
1TG38-1AA3	800	810	97 %	95 %	71 %	55 %	35 %	
1TG38-8AA3	900	910	92 %	87 %	67 %	55 %	33 %	
1TG41-0AA3	1000	1025	91 %	86 %	64 %	50 %	30 %	
1TG41-3AA3	1200	1270	87 %	79 %	55 %	40 %	25 %	

Derating factor of the output current as a function of the pulse frequency for units with a rated pulse frequency of 1.25 kHz

The following table lists the maximum achievable output frequency as a function of the pulse frequency:

Pulse frequency	Max. achievable output frequency
1.25 kHz	100 Hz
2.00 kHz	160 Hz
2.50 kHz	200 Hz
≥ 4.00 kHz	300 Hz

### Characteristic curves

#### Overload capability

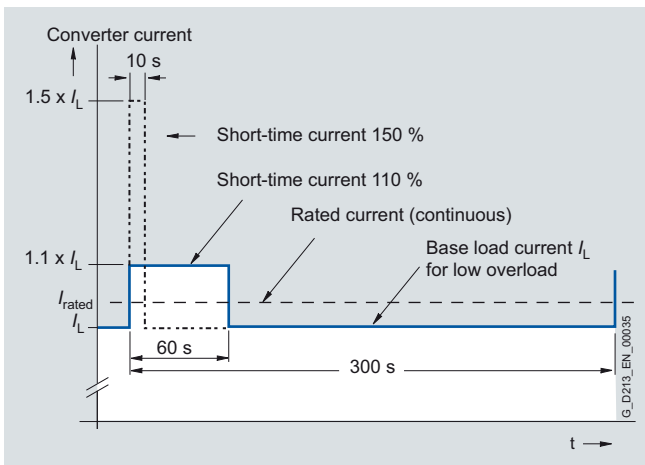
SINAMICS S120 chassis units have an overload reserve, e.g. to handle breakaway torques. If larger surge loads occur, this must be taken into account when configuring. In drives with overload requirements, the appropriate base load current must, therefore, be used as a basis for the required load.

The permissible overload levels are valid under the prerequisite that the drive units are operated with their base load current before and after the overload condition based on a duty cycle duration of 300 s.

For short, repeating load cycles with significant load fluctuations within the load cycle, the appropriate sections in the SINAMICS Low Voltage Engineering Manual must be observed (as PDF file on the CD-ROM provided with the catalog).

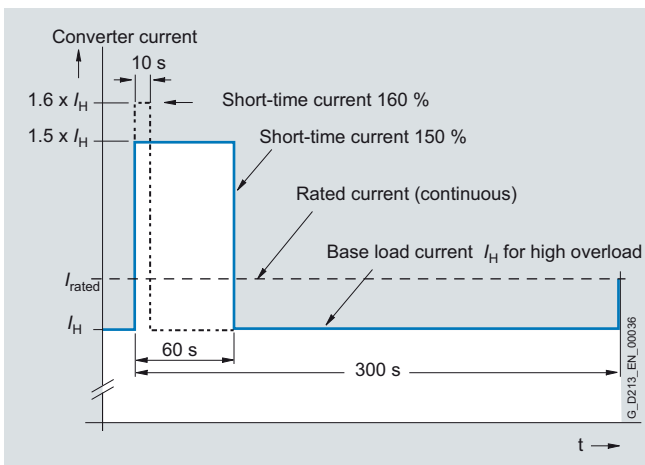
#### Power Modules and Motor Modules

The base load current for a low overload  $I_L$  is the basis for a duty cycle of 110 % for 60 s or 150 % for 10 s.



Low overload

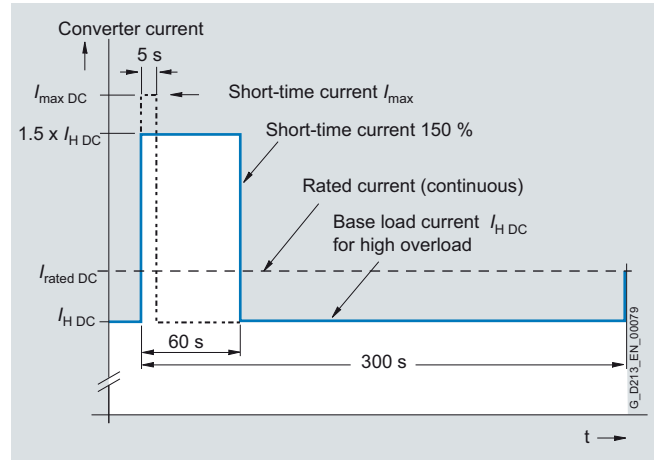
The base load current for a high overload  $I_H$  is the basis for a duty cycle of 150 % for 60 s or 160 % for 10 s.



High overload

#### Line Modules

The base load current for a high overload  $I_{HDC}$  is the basis for a duty cycle of 150 % for 60s or  $I_{max DC}$  for 5 s.



High overload

# SINAMICS S120 Chassis Format Units

## Air-cooled units

### Power Modules

#### Overview



The Power Module comprises a line rectifier, a DC link and an inverter to supply the motor.

Power Modules are designed for drives that are not capable of regenerating energy to the mains supply. Regenerative energy produced while braking is converted to heat using braking resistors.

Power Modules in the chassis format can be connected to grounded TN/TT systems and non-grounded IT systems.

#### Design

The Power Modules have the following interfaces as standard:

- 1 line supply connection
- 2 DC link connections for options, e.g. Braking Modules
- 3 DRIVE-CLiQ sockets
- 1 connection for Safety Integrated
- 1 temperature sensor input (KTY84-130, PTC or Pt100)
- 1 connection for the 24 V DC electronics power supply
- 1 motor connection
- 2 PE/protective conductor connections

The Power Modules are controlled by the CU310 Control Unit that can be integrated into the Power Module.

The scope of supply of the Power Modules includes:

- 1 DRIVE-CLiQ cable for connection to the CU310/SIMOTION D410 Control Unit
- 1 24 V DC connecting cable for the power supply to the CU310/SIMOTION D410 Control Unit
- 1 mounting plate for attaching the CU310/SIMOTION D410 Control Unit

#### Selection and ordering data

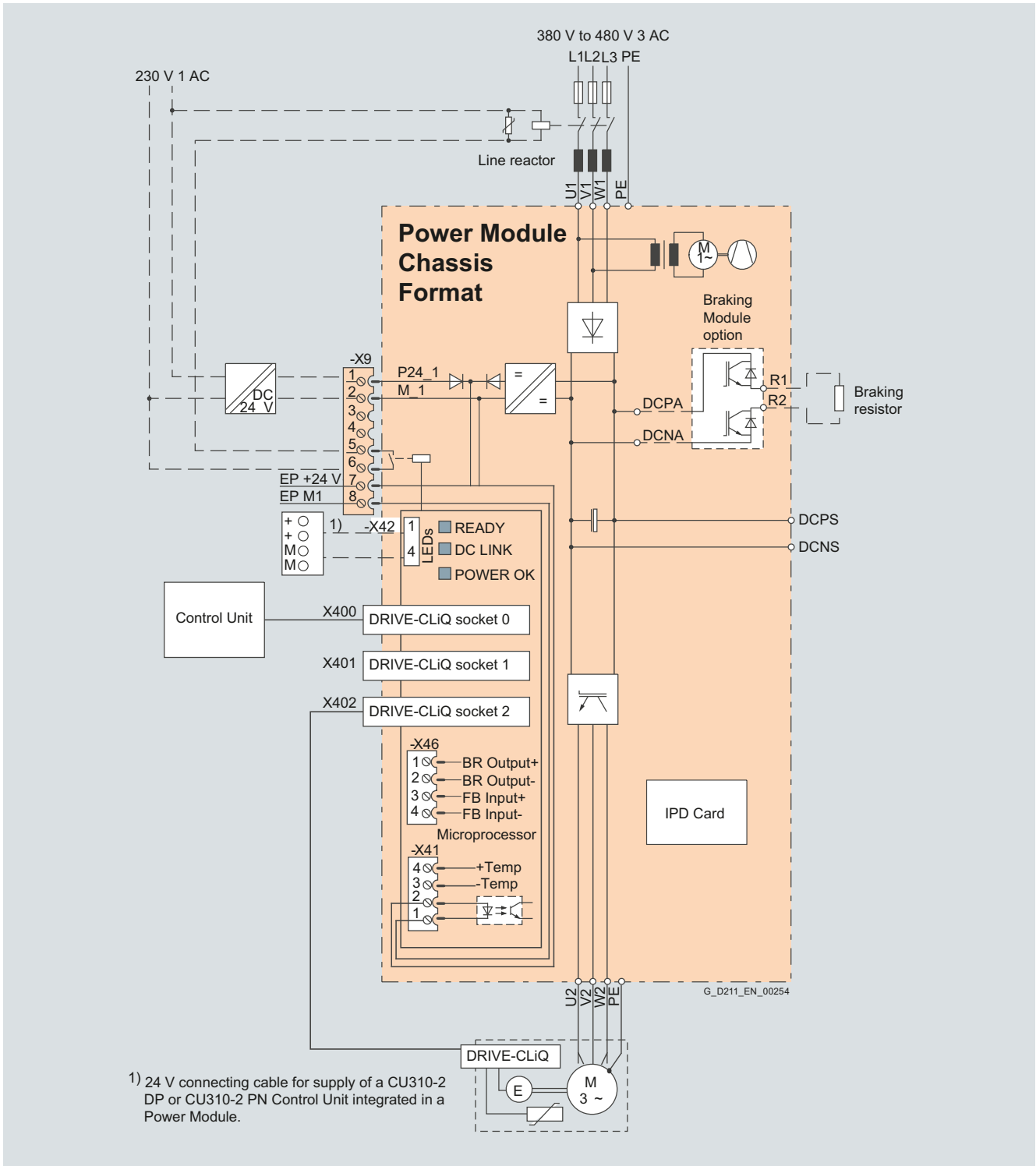
Type rating at 400 V kW	Rated output current A	Power Module Order No.
<b>Line voltage 380 ... 480 V 3 AC</b>		
110	210	<b>6SL3310-1TE32-1AA3</b>
132	260	<b>6SL3310-1TE32-6AA3</b>
160	310	<b>6SL3310-1TE33-1AA3</b>
200	380	<b>6SL3310-1TE33-8AA3</b>
250	490	<b>6SL3310-1TE35-0AA3</b>

Description	Order No.
<b>Accessories for re-ordering</b>	
<b>Warning labels in 16 languages</b> Using this set of labels, another language can be placed over the German or English labels available as standard. A set of labels is provided with the devices. The following languages are available once in the set of labels: Chinese (simplified), Danish, Finnish, French, Greek, Italian, Japanese, Korean, Dutch, Polish, Portuguese/Brazilian, Russian, Swedish, Spanish, Czech, Turkish	<b>6SL3166-3AB00-0AA0</b>
<b>Dust protection blanking plugs</b> (50 units) For DRIVE-CLiQ port	<b>6SL3066-4CA00-0AA0</b>

[Line and motor-side components, Braking Modules as well as recommended line-side system components \(→ System components\).](#)

#### Integration

The Power Modules communicate with the higher-level control module via DRIVE-CLiQ. The control module in this case can be a CU310, CU320-2 or a SIMOTION D Control Unit.



Connection example of a Power Module

**Note:** The integrated 24 V power supply at connector X42 can have a maximum load of 2 A. When the Control Unit is supplied from the integrated power supply, the total load of the digital outputs must be carefully observed in order that the 2 A is not exceeded.



# SINAMICS S120 Chassis Format Units

## Air-cooled units

### Power Modules

#### Technical data

##### General technical specifications

Electrical specifications	
<b>Line supply voltage</b> up to 2000 m above sea level	380 ... 480 V 3 AC $\pm 10\%$ (-15 % < 1 min)
<b>Line power factor</b> for a three-phase AC line supply voltage and output power	
• Basic fundamental ( $\cos \varphi_1$ )	> 0.96
• Total ( $\lambda$ )	0.75 ... 0.93
<b>DC link voltage, approx. <sup>1)</sup></b>	$1.35 \times$ line voltage
<b>Output voltage, approx.</b>	$0.97 \times U_{line}$
<b>Output frequency <sup>2)</sup></b>	
• Control type Servo	0 ... 650 Hz
• Control type Vector	0 ... 600 Hz
• Control type $V/f$	0 ... 600 Hz
<b>Main contactor control</b>	
• Terminal block -X9/5-6	240 V AC, max. 8 A 30 V DC, max. 1 A
<b>Conformity</b>	CE (EMC Directive No. 2004/108/EC and Low-Voltage Directive No. 2006/95/EC)
<b>Approvals, according to</b>	cULus
<b>Safety Integrated</b>	Safety Integrity Level 2 (SIL2) acc. to IEC 61508, Performance Level d (PLd) acc. to EN ISO 13849-1 and Control Category 3 acc. to EN ISO 13849-1 (previously EN 954-1).

<sup>1)</sup> The DC link voltage is unregulated and load-dependent. For additional information, please refer to the [SINAMICS Low Voltage Engineering Manual](#).

<sup>2)</sup> Please note:

- The correlation between the maximum output frequency, pulse frequency and current derating. Higher output frequencies for specific configurations are available on request.
- The correlation between the minimum output frequency and permissible output current (current derating). Information is provided in the [SINAMICS Low Voltage Engineering Manual](#).

## Technical data

Line voltage 380 ... 480 V 3 AC		Power Modules				
		6SL3310-1TE32-1AA3	6SL3310-1TE32-6AA3	6SL3310-1TE33-1AA3	6SL3310-1TE33-8AA3	6SL3310-1TE35-0AA3
<b>Type rating</b>						
• For $I_L$ (50 Hz 400 V) <sup>1)</sup>	kW	<b>110</b>	<b>132</b>	<b>160</b>	<b>200</b>	<b>250</b>
• For $I_H$ (50 Hz 400 V) <sup>1)</sup>	kW	90	110	132	160	200
• For $I_L$ (60 Hz 460 V) <sup>2)</sup>	hp	150	200	250	300	400
• For $I_H$ (60 Hz 460 V) <sup>2)</sup>	hp	150	200	200	250	350
<b>Output current</b>						
• Rated current $I_{NA}$	A	210	260	310	380	490
• Base load current $I_L$ <sup>3)</sup>	A	205	250	302	370	477
• Base load current $I_H$ <sup>4)</sup>	A	178	233	277	340	438
• Maximum current $I_{max A}$	A	307	375	453	555	715
<b>Input current</b>						
• Rated input current $I_{NE}$	A	229	284	338	395	509
• Maximum input current $I_{max E}$	A	335	410	495	606	781
<b>Current demand</b>						
• 24 V DC auxiliary power supply	A	0.8	0.8	0.9	0.9	0.9
<b>Pulse frequency <sup>5)</sup></b>						
• Rated frequency	kHz	2	2	2	2	2
• Pulse frequency, max.						
- Without current derating	kHz	2	2	2	2	2
- With current derating	kHz	8	8	8	8	8
<b>Power loss, max. <sup>6)</sup></b>						
• At 50 Hz 400 V	kW	2.46	3.27	4	4.54	5.78
• At 60 Hz 460 V	kW	2.54	3.36	4.07	4.67	5.96
<b>Cooling air requirement</b>		m <sup>3</sup> /s	0.17	0.23	0.36	0.36
<b>Sound pressure level <math>L_{pA}</math></b> (1 m) at 50/60 Hz		dB	64/67	64/67	69/73	69/73
<b>Line supply connection</b> U1, V1, W1			M10 screw	M10 screw	M10 screw	M10 screw
• Conductor cross-section, max. (IEC)	mm <sup>2</sup>	2 × 185	2 × 185	2 × 240	2 × 240	2 × 240
<b>Motor connection</b> U2/T1, V2/T2, W2/T3			M10 screw	M10 screw	M10 screw	M10 screw
• Conductor cross-section, max. (IEC)	mm <sup>2</sup>	2 × 185	2 × 185	2 × 240	2 × 240	2 × 240
<b>Cable length, max. <sup>7)</sup></b>						
• Shielded	m	300	300	300	300	300
• Unshielded	m	450	450	450	450	450
<b>PE1/GND connection</b>			M10 screw	M10 screw	M10 screw	M10 screw
• Conductor cross-section, max. (IEC)	mm <sup>2</sup>	2 × 185	2 × 185	2 × 240	2 × 240	2 × 240
<b>PE2/GND connection</b>			M10 screw	M10 screw	M10 screw	M10 screw
• Conductor cross-section, max. (IEC)	mm <sup>2</sup>	2 × 185	2 × 185	2 × 240	2 × 240	2 × 240
<b>Degree of protection</b>			IP20	IP20	IP20	IP20
<b>Dimensions</b>						
• Width	mm	326	326	326	326	326
• Height	mm	1400	1400	1533	1533	1533
• Depth	mm	356 <sup>8)</sup>	356 <sup>8)</sup>	549	549	549
<b>Weight, approx.</b>		kg	104	104	162	162
<b>Frame size</b>			FX	FX	GX	GX

<sup>1)</sup> Rated power of a typ. 6-pole standard induction motor based on  $I_L$  or  $I_H$  with 400 V 3 AC 50 Hz.

<sup>2)</sup> Rated power of a typ. 6-pole standard induction motor based on  $I_L$  or  $I_H$  with 460 V 3 AC 60 Hz.

<sup>3)</sup> The base load current  $I_L$  is the basis for a duty cycle of 110 % for 60 s or 150 % for 10 s with a duty cycle duration of 300 s.

<sup>4)</sup> The base load current  $I_H$  is the basis for a duty cycle of 150 % for 60 s or 160 % for 10 s with a duty cycle duration of 300 s.

<sup>5)</sup> Information regarding the correlation between the pulse frequency and maximum output current/output frequency is provided in the SINAMICS Low Voltage Engineering Manual.

<sup>6)</sup> The specified power loss represents the maximum value at 100 % utilization. The value is lower under normal operating conditions.

<sup>7)</sup> Longer cable lengths depending on the configuration on request. Additional information is provided in the SINAMICS Low Voltage Engineering Manual.

<sup>8)</sup> Depth = 421 mm including front cover when the CU 310 Control Unit is installed.

# SINAMICS S120 Chassis Format Units

## Air-cooled units

### Basic Line Modules

#### Overview



Basic Line Modules are available for applications in which no energy is returned to the supply or where the energy exchange between motor and generator axes takes place in the DC link. The connected Motor Modules are pre-charged via the thyristor gate control. Basic Line Modules are designed for connection to grounded TN/TT and non-grounded IT supply systems.

A Braking Module of the appropriate frame size can be integrated into a Basic Line Module in order to permit, in conjunction with an external braking resistor, regenerative operation of the drive system ([→ DC link components](#)).

#### Design

The Basic Line Modules have the following interfaces as standard:

- 1 line supply connection
- 1 connection for the 24 V DC electronics power supply
- 1 DC link connection (DCP, DCN) for supplying the connected Motor Modules
- 1 DC link connection (DCPA, DCNA) for connecting a Braking Module
- 3 DRIVE-CLiQ sockets
- 1 temperature sensor input (KTY84-130, PTC or Pt100)
- 1 PE/protective conductor connection

The status of the Basic Line Modules is indicated via two multi-color LEDs.

The scope of supply of the Basic Line Modules includes:

- DRIVE-CLiQ cable for connecting to a CU320-2 or SIMOTION D4x5 Control Unit
- DRIVE-CLiQ cable to connect the Control Unit to the first Motor Module

#### Selection and ordering data

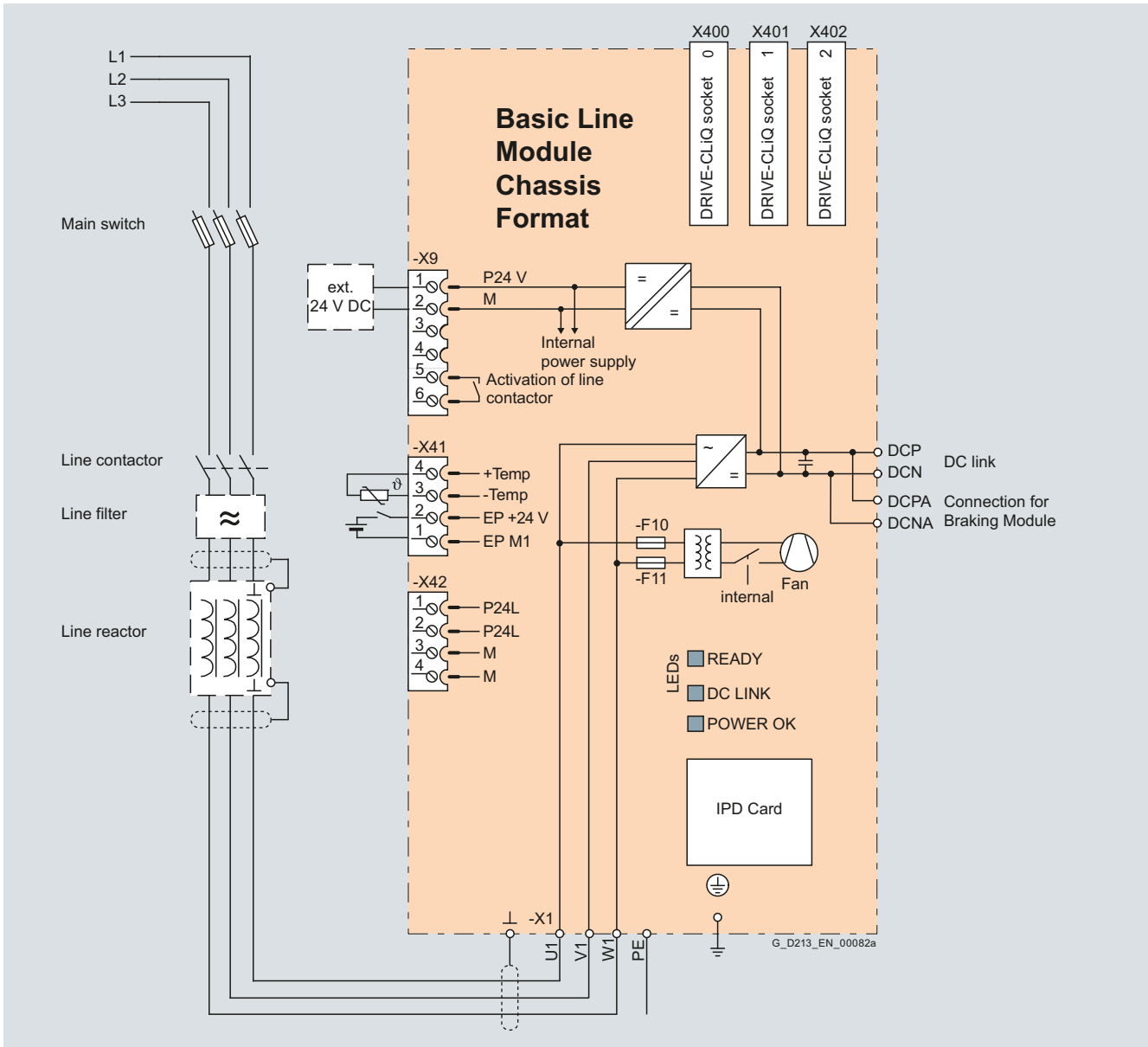
Rated power at 400 V or 690 V kW	Rated DC link current A	Basic Line Module Order No.
<b>Line voltage 380 ... 480 V 3 AC</b>		
200	420	<b>6SL3330-1TE34-2AA3</b>
250	530	<b>6SL3330-1TE35-3AA3</b>
400	820	<b>6SL3330-1TE38-2AA3</b>
560	1200	<b>6SL3330-1TE41-2AA3</b>
710	1500	<b>6SL3330-1TE41-5AA3</b>
<b>Line voltage 500 ... 690 V 3 AC</b>		
250	300	<b>6SL3330-1TG33-0AA3</b>
355	430	<b>6SL3330-1TG34-3AA3</b>
560	680	<b>6SL3330-1TG36-8AA3</b>
900	1100	<b>6SL3330-1TG41-1AA3</b>
1100	1400	<b>6SL3330-1TG41-4AA3</b>

Description	Order No.
<b>Accessories for re-ordering</b>	
<b>Warning labels in 16 languages</b> Using this set of labels, another language can be placed over the German or English labels available as standard. A set of labels is provided with the devices. The following languages are available once in the set of labels: Chinese (simplified), Danish, Finnish, French, Greek, Italian, Japanese, Korean, Dutch, Polish, Portuguese/Brazilian, Russian, Swedish, Spanish, Czech, Turkish	<b>6SL3166-3AB00-0AA0</b>
<b>Dust protection blanking plugs</b> (50 units) For DRIVE-CLiQ port	<b>6SL3066-4CA00-0AA0</b>

[Line-side components as well as recommended line-side system components \(\[→ System components\]\(#\)\).](#)

#### Integration

The Basic Line Modules communicate with the higher-level control module via DRIVE-CLiQ. The control module in this case can be a CU320-2 or a SIMOTION D Control Unit. An external 24 V DC power supply is required to operate Basic Line Modules.



Connection example of a Basic Line Module

# SINAMICS S120 Chassis Format Units

## Air-cooled units

### Basic Line Modules

#### Technical data

##### General technical specifications

Electrical specifications	
<b>Line power factor</b> with rated power	
• Basic fundamental ( $\cos \varphi_1$ )	> 0.96
• Total ( $\lambda$ )	0.75 ... 0.93
<b>Efficiency</b>	> 99 %
<b>DC link voltage, approx. <sup>1)</sup></b>	1.35 × line voltage under partial load 1.32 × line voltage under full load
<b>Main contactor control</b>	
• Terminal block -X9/5-6	240 V AC, max. 8 A 30 V DC, max. 1 A
<b>Conformity</b>	CE (EMC Directive No. 2004/108/EC and Low-Voltage Directive No. 2006/95/EC)
<b>Approvals, according to</b>	cULus (only for drive units connected to line voltages 380 ... 480 V 3 AC and 500 ... 600 V 3 AC)

<sup>1)</sup> The DC link voltage is unregulated and load-dependent. For additional information, please refer to the [SINAMICS Low Voltage Engineering Manual](#).

## Technical data

Line voltage 380 ... 480 V 3 AC		Basic Line Modules				
		6SL3330-1TE34-2AA3	6SL3330-1TE35-3AA3	6SL3330-1TE38-2AA3	6SL3330-1TE41-2AA3	6SL3330-1TE41-5AA3
<b>Rated power</b>						
• For $I_{N DC}$ (50 Hz 400 V)	kW	200	250	400	560	710
• For $I_{H DC}$ (50 Hz 400 V)	kW	160	200	315	450	560
• For $I_{N DC}$ (60 Hz 460 V)	hp	305	385	615	860	1090
• For $I_{H DC}$ (60 Hz 460 V)	hp	245	305	485	690	860
<b>DC link current</b>						
• Rated current $I_{N DC}$	A	420	530	820	1200	1500
• Base load current $I_{H DC}^{1)}$	A	328	413	640	936	1170
• Maximum current $I_{max DC}$	A	630	795	1230	1800	2250
<b>Input current</b>						
• Rated current $I_{N E}$	A	365	460	710	1010	1265
• Maximum current $I_{max E}$	A	547	690	1065	1515	1897
<b>Current demand</b>						
• 24 V DC auxiliary power supply	A	1.1	1.1	1.1	1.1	1.1
<b>DC link capacitance</b>						
• Basic Line Module	μF	7200	9600	14600	23200	29000
• Drive line-up, max.	μF	57600	76800	116800	185600	232000
<b>Power loss, max. <sup>2)</sup></b>						
• At 50 Hz 400 V	kW	1.9	2.1	3.2	4.6	5.5
• At 60 Hz 460 V	kW	1.9	2.1	3.2	4.6	5.5
<b>Cooling air requirement</b>						
	m <sup>3</sup> /s	0.17	0.17	0.17	0.36	0.36
<b>Sound pressure level <math>L_{pA}</math></b> (1 m) at 50/60 Hz						
	dB	66/68	66/68	66/68	71/73	71/73
<b>Line supply connection</b> U1, V1, W1						
		M10 screw	M10 screw	M10 screw	3 × M12 screw	3 × M12 screw
• Conductor cross-section, max. (IEC)	mm <sup>2</sup>	2 × 240	2 × 240	2 × 240	6 × 185	6 × 185
<b>DC link connection</b> DCP, DCN						
		M10 screw	M10 screw	M10 screw	3 × hole for M12	3 × hole for M12
• Conductor cross-section, max. (IEC)	mm <sup>2</sup>	2 × 240	2 × 240	2 × 240	6 × 185	6 × 185
<b>PE/GND connection</b>						
		2 × hole for M10	2 × hole for M10	2 × hole for M10	2 × hole for M12	2 × hole for M12
• Conductor cross-section, max. (IEC)	mm <sup>2</sup>	2 × 240	2 × 240	2 × 240	4 × 240	4 × 240
<b>Cable length, max. <sup>3)</sup></b>						
• Shielded	m	2600	2600	2600	4000	4000
• Unshielded	m	3900	3900	3900	6000	6000
<b>Degree of protection</b>						
		IP00	IP00	IP00	IP00	IP00
<b>Dimensions</b>						
• Width	mm	310	310	310	310	310
• Height	mm	1164	1164	1164	1653	1653
• Depth	mm	352	352	352	550	550
<b>Weight, approx.</b>						
	kg	96	96	96	214	214
<b>Frame size</b>						
		FB	FB	FB	GB	GB

<sup>1)</sup> The base load current  $I_{H DC}$  is the basis for a duty cycle of 150 % for 60 s or  $I_{max DC}$  for 5 s with a duty cycle duration of 300 s.

<sup>2)</sup> The specified power loss represents the maximum value at 100 % utilization. The value is lower under normal operating conditions.

<sup>3)</sup> Sum of all motor cables and DC link. Longer cable lengths for specific configurations are available on request. For additional information, please refer to the SINAMICS Low Voltage Engineering Manual.



# SINAMICS S120 Chassis Format Units

## Air-cooled units

### Basic Line Modules

#### Technical data

Line voltage 500 ... 690 V 3 AC		Basic Line Modules				
		6SL3330-1TG33-0AA3	6SL3330-1TG34-3AA3	6SL3330-1TG36-8AA3	6SL3330-1TG41-1AA3	6SL3330-1TG41-4AA3
<b>Rated power</b>						
• For $I_{N DC}$ (50 Hz 690 V)	kW	<b>250</b>	<b>355</b>	<b>560</b>	<b>900</b>	<b>1100</b>
• For $I_{H DC}$ (50 Hz 690 V)	kW	195	280	440	710	910
• For $I_{N DC}$ (50 Hz 500 V)	kW	175	250	390	635	810
• For $I_{H DC}$ (50 Hz 500 V)	kW	165	235	365	595	755
• For $I_{N DC}$ (60 Hz 575 V)	hp	250	350	600	900	1250
• For $I_{H DC}$ (60 Hz 575 V)	hp	200	300	450	800	1000
<b>DC link current</b>						
• Rated current $I_{N DC}$	A	300	430	680	1100	1400
• Base load current $I_{H DC}^{1)}$	A	234	335	530	858	1092
• Maximum current $I_{max DC}$	A	450	645	1020	1650	2100
<b>Input current</b>						
• Rated current $I_{N E}$	A	260	375	575	925	1180
• Maximum current $I_{max E}$	A	390	563	863	1388	1770
<b>Current demand</b>						
• 24 V DC auxiliary power supply	A	1.1	1.1	1.1	1.1	1.1
<b>DC link capacitance</b>						
• Basic Line Module	μF	3200	4800	7300	11600	15470
• Drive line-up, max.	μF	25600	38400	58400	92800	123760
<b>Power loss, max. <sup>2)</sup></b>						
• At 50 Hz 690 V	kW	1.5	2.1	3.0	5.4	5.8
• At 60 Hz 575 V	kW	1.5	2.1	3.0	5.4	5.8
<b>Cooling air requirement</b>						
	m <sup>3</sup> /s	0.17	0.17	0.17	0.36	0.36
<b>Sound pressure level <math>L_{pA}</math></b> (1 m) at 50/60 Hz						
	dB	66/68	66/68	66/68	71/73	71/73
<b>Line supply connection</b> U1, V1, W1						
• Conductor cross-section, max. (IEC)	mm <sup>2</sup>	2 × 240	2 × 240	2 × 240	6 × 185	6 × 185
<b>DC link connection</b> DCP, DCN						
• Conductor cross-section, max. (IEC)	mm <sup>2</sup>	2 × 240	2 × 240	2 × 240	6 × 185	6 × 185
<b>PE/GND connection</b>						
• Conductor cross-section, max. (IEC)	mm <sup>2</sup>	2 × hole M10 2 × 240	2 × hole M10 2 × 240	2 × hole M10 2 × 240	2 × hole for M12 4 × 240	2 × hole for M12 4 × 240
<b>Cable length, max. <sup>3)</sup></b>						
• Shielded	m	1500	1500	1500	2250	2250
• Unshielded	m	2250	2250	2250	3375	3375
<b>Degree of protection</b>						
		IP00	IP00	IP00	IP00	IP00
<b>Dimensions</b>						
• Width	mm	310	310	310	310	310
• Height	mm	1164	1164	1164	1653	1653
• Depth	mm	352	352	352	550	550
<b>Weight, approx.</b>						
	kg	96	96	96	214	214
<b>Frame size</b>						
		FB	FB	FB	GB	GB

<sup>1)</sup> The base load current  $I_{H DC}$  is the basis for a duty cycle of 150 % for 60 s or  $I_{max DC}$  for 5 s with a duty cycle duration of 300 s.

<sup>2)</sup> The specified power loss represents the maximum value at 100 % utilization. The value is lower under normal operating conditions.

<sup>3)</sup> Sum of all motor cables and DC link. Longer cable lengths for specific configurations are available on request. For additional information, please refer to the SINAMICS Low Voltage Engineering Manual.

## Overview



Smart Line Modules are line-commutated infeed/regenerative units with 100 % continuous regenerative power that are immune to inverter commutation faults. The regenerative capability of the modules can be deactivated by means of parameterization.

Smart Line Modules are designed for connection to grounded TN/TT and non-grounded IT supply systems.

The DC link is pre-charged by means of integrated pre-charging resistors.

To operate the Smart Line Module, the associated line reactor or a suitable transformer is required.

## Design

The Smart Line Modules have the following interfaces as standard:

- 1 line supply connection
- 1 connection for the 24 V DC electronics power supply
- 1 DC link connection (DCP, DCN) for supplying the connected Motor Modules
- 1 DC link connection (DCPA, DCNA) for connecting a Braking Module
- 3 DRIVE-CLiQ sockets
- 1 temperature sensor input (KTY84-130, PTC or Pt100)
- 1 PE/protective conductor connection (2 connections for sizes HX and JX)

The status of the Smart Line Modules is indicated via two multi-color LEDs.

The scope of supply of the Smart Line Modules includes:

- DRIVE-CLiQ cable to connect to a CU320-2 or SIMOTION D4x5 Control Unit
- DRIVE-CLiQ cable to connect the Control Unit to the first Motor Module

## Selection and ordering data

Rated power at 400 V or 690 V kW	Rated DC link current A	Smart Line Module Order No.
<b>Line voltage 380 ... 480 V 3 AC</b>		
250	550	<b>6SL3330-6TE35-5AA3</b>
355	730	<b>6SL3330-6TE37-3AA3</b>
500	1060	<b>6SL3330-6TE41-1AA3</b>
630	1300	<b>6SL3330-6TE41-3AA3</b>
800	1700	<b>6SL3330-6TE41-7AA3</b>
<b>Line voltage 500 ... 690 V 3 AC</b>		
450	550	<b>6SL3330-6TG35-5AA3</b>
710	900	<b>6SL3330-6TG38-8AA3</b>
1000	1200	<b>6SL3330-6TG41-2AA3</b>
1400	1700	<b>6SL3330-6TG41-7AA3</b>

Description	Order No.
<b>Accessories for re-ordering</b>	
<b>Warning labels in 16 languages</b> Using this set of labels, another language can be placed over the German or English labels available as standard. A set of labels is provided with the devices. The following languages are available once in the set of labels: Chinese (simplified), Danish, Finnish, French, Greek, Italian, Japanese, Korean, Dutch, Polish, Portuguese/Brazilian, Russian, Swedish, Spanish, Czech, Turkish	<b>6SL3166-3AB00-0AA0</b>
<b>Dust protection blanking plugs</b> (50 units) For DRIVE-CLiQ port	<b>6SL3066-4CA00-0AA0</b>

[Line-side components, Braking Modules and recommended system components \(→ System components\).](#)

# SINAMICS S120 Chassis Format Units

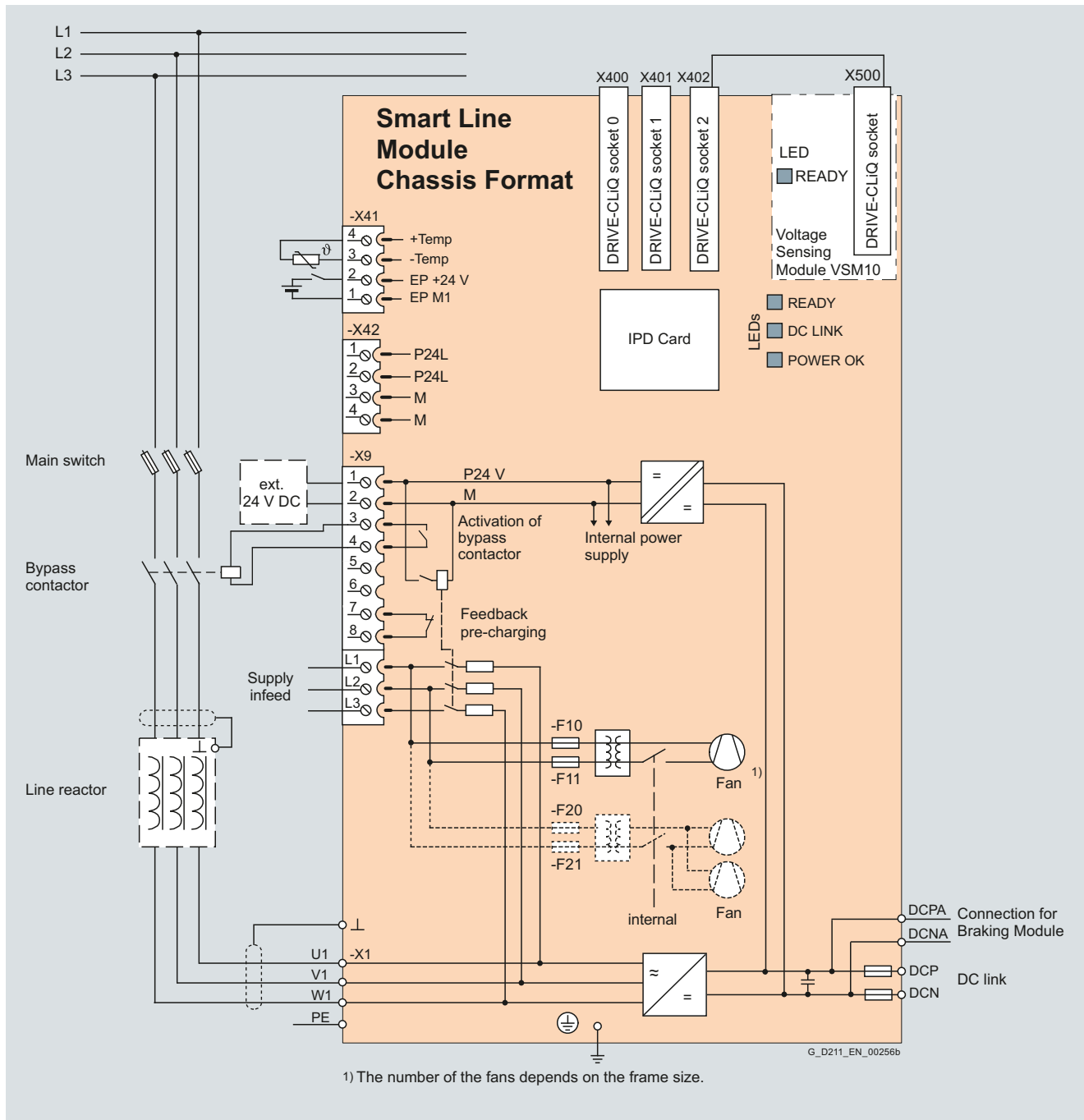
## Air-cooled units

### Smart Line Modules

#### Integration

The Smart Line Modules communicate with the higher-level control module via DRIVE-CLiQ. The control module in this case can be a CU320-2 or a SIMOTION D Control Unit.

2



Connection example of a Smart Line Module

**Technical data***General technical specifications*

Electrical specifications	
<b>Line power factor at rated power</b>	
• Basic fundamental ( $\cos \varphi_1$ )	> 0.96
• Total ( $\lambda$ )	0.75 ... 0.93
<b>Efficiency</b>	> 98.5 %
<b>DC link voltage, approx. <sup>1)</sup></b>	1.32 × line voltage under partial load 1.30 × line voltage under full load
<b>Bypass contactor control</b>	
• Terminal block -X9/3-4	240 V AC, max. 8 A 30 V DC, max. 1 A
<b>Conformity</b>	CE (EMC Directive No. 2004/108/EC and Low-Voltage Directive No. 2006/95/EC)
<b>Approvals, according to</b>	cULus (only for drive units connected to line voltages 380 ... 480 V 3 AC and 500 ... 600 V 3 AC)

<sup>1)</sup> The DC link voltage is unregulated and load-dependent. For additional information, please refer to the [SINAMICS Low Voltage Engineering Manual](#).

# SINAMICS S120 Chassis Format Units

## Air-cooled units

### Smart Line Modules

#### Technical data

Line voltage 380 ... 480 V 3 AC		Smart Line Modules				
		6SL3330-6TE35-5AA3	6SL3330-6TE37-3AA3	6SL3330-6TE41-1AA3	6SL3330-6TE41-3AA3	6SL3330-6TE41-7AA3
<b>Rated power</b>						
• For $I_{NDC}$ (50 Hz 400 V)	kW	<b>250</b>	<b>355</b>	<b>500</b>	<b>630</b>	<b>800</b>
• For $I_{HDC}$ (50 Hz 400 V)	kW	235	315	450	555	730
• For $I_{NDC}$ (60 Hz 460 V)	hp	385	545	770	970	1230
• For $I_{HDC}$ (60 Hz 460 V)	hp	360	485	695	855	1125
<b>DC link current</b>						
• Rated current $I_{NDC}$	A	550	730	1050	1300	1700
• Base load current $I_{HDC}^{1)}$	A	490	650	934	1157	1513
• Maximum current $I_{maxDC}$	A	825	1095	1575	1950	2550
<b>Infeed/regenerative feedback current</b>						
• Rated current $I_{NE}$	A	463	614	883	1093	1430
• Maximum current $I_{maxE}$	A	694	921	1324	1639	2145
<b>Current demand</b>						
• 24 V DC auxiliary power supply	A	1.35	1.35	1.4	1.5	1.7
• 400 V AC	A	1.8	1.8	3.6	5.4	5.4
<b>DC link capacitance</b>						
• Smart Line Module	μF	8400	12000	16800	18900	28800
• Drive line-up, max.	μF	42000	60000	67200	75600	115200
<b>Power loss, max. <sup>2)</sup></b>						
• At 50 Hz 400 V	kW	3.7	4.7	7.1	11	11.5
• At 60 Hz 460 V	kW	3.7	4.7	7.1	11	11.5
<b>Cooling air requirement</b>		m <sup>3</sup> /s	0.36	0.36	0.78	1.08
<b>Sound pressure level <math>L_{pA}</math></b> (1 m) at 50/60 Hz		dB	69/73	69/73	70/73	70/73
<b>Line supply connection</b> U1, V1, W1			M10 screw	M10 screw	2 × M12 screw	3 × M12 screw
• Conductor cross-section, max. (IEC)	mm <sup>2</sup>	2 × 240	2 × 240	4 × 240	6 × 240	6 × 240
<b>DC link connection</b> DCP, DCN			M10 screw	M10 screw	4 × hole for M12	4 × hole for M12
• Conductor cross-section, max. (IEC)	mm <sup>2</sup>	2 × 240	2 × 240	Busbar	Busbar	Busbar
<b>PE/GND connection</b>			Hole for M10	Hole for M10	–	–
• Conductor cross-section, max. (IEC)	mm <sup>2</sup>	2 × 240	2 × 240	–	–	–
<b>PE1/GND connection</b>			–	–	M12 screw	M12 screw
• Conductor cross-section, max. (IEC)	mm <sup>2</sup>	–	–	240	240	240
<b>PE2/GND connection</b>			–	–	2 × M12 screw	2 × M12 screw
• Conductor cross-section, max. (IEC)	mm <sup>2</sup>	–	–	2 × 240	2 × 240	2 × 240
<b>Cable length, max. <sup>3)</sup></b>						
• Shielded	m	4000	4000	4800	4800	4800
• Unshielded	m	6000	6000	7200	7200	7200
<b>Degree of protection</b>			IP00	IP00	IP00	IP00
<b>Dimensions</b>						
• Width	mm	310	310	503	704	704
• Height	mm	1413	1413	1475	1480	1480
• Depth	mm	550	550	548	550	550
<b>Weight, approx.</b>		kg	150	150	294	458
<b>Frame size</b>			GX	GX	HX	JX

<sup>1)</sup> The base load current  $I_{HDC}$  is the basis for a duty cycle of 150 % for 60 s or  $I_{maxDC}$  for 5 s with a duty cycle duration of 300 s.

<sup>2)</sup> The specified power loss represents the maximum value at 100% utilization. The value is lower under normal operating conditions.

<sup>3)</sup> Sum of all motor cables and DC link. Longer cable lengths for specific configurations are available on request. For additional information, please refer to the SINAMICS Low Voltage Engineering Manual.

## Technical data

Line voltage 500 ... 690 V 3 AC		Smart Line Modules				
		6SL3330-6TG35-5AA3	6SL3330-6TG38-8AA3	6SL3330-6TG41-2AA3	6SL3330-6TG41-7AA3	
<b>Rated power</b>						
• For $I_{N\ DC}$ (50 Hz 690 V)	kW	<b>450</b>	<b>710</b>	<b>1000</b>	<b>1400</b>	
• For $I_{H\ DC}$ (50 Hz 690 V)	kW	405	665	885	1255	
• For $I_{N\ DC}$ (50 Hz 500 V)	kW	320	525	705	995	
• For $I_{H\ DC}$ (50 Hz 500 V)	kW	295	480	640	910	
• For $I_{N\ DC}$ (60 Hz 575 V)	hp	500	790	1115	1465	
• For $I_{H\ DC}$ (60 Hz 575 V)	hp	450	740	990	1400	
<b>DC link current</b>						
• Rated current $I_{N\ DC}$	A	550	900	1200	1700	
• Base load current $I_{H\ DC}^{1)}$	A	490	800	1068	1513	
• Maximum current $I_{max\ DC}$	A	825	1350	1800	2550	
<b>Infeed/regenerative feedback current</b>						
• Rated current $I_{N\ E}$	A	463	757	1009	1430	
• Maximum current $I_{max\ E}$	A	694	1135	1513	2145	
<b>Current demand</b>						
• 24 V DC auxiliary power supply	A	1.35	1.4	1.5	1.7	
• 500 V AC	A	1.3	2.9	4.3	4.3	
• 690 V AC	A	0.94	2.1	3.1	3.1	
<b>DC link capacitance</b>						
• Smart Line Module	$\mu\text{F}$	5600	7400	11100	14400	
• Drive line-up, max.	$\mu\text{F}$	28000	29600	44400	57600	
<b>Power loss, max. <sup>2)</sup></b>						
• At 50 Hz 690 V	kW	4.3	6.5	12.0	13.8	
• At 60 Hz 575 V	kW	4.3	6.5	12.0	13.8	
<b>Cooling air requirement</b>		$\text{m}^3/\text{s}$	0.36	0.78	1.08	1.08
<b>Sound pressure level <math>L_{pA}</math></b> (1 m) at 50/60 Hz		dB	69/73	70/73	70/73	70/73
<b>Line supply connection</b> U1, V1, W1			M10 screw	2 × M12 screw	3 × M12 screw	3 × M12 screw
• Conductor cross-section, max. (IEC)	$\text{mm}^2$	2 × 240	4 × 240	6 × 240	6 × 240	
<b>DC link connection</b> DCP, DCN			M10 screw	4 × hole for M12	4 × hole for M12	4 × hole for M12
• Conductor cross-section, max. (IEC)	$\text{mm}^2$	2 × 240	Busbar	Busbar	Busbar	
<b>PE connection</b>			Hole for M10	-	-	-
• Conductor cross-section, max. (IEC)	$\text{mm}^2$	2 × 240	-	-	-	
<b>PE1/GND connection</b>			-	M12 screw	M12 screw	M12 screw
• Conductor cross-section, max. (IEC)	$\text{mm}^2$	-	240	240	240	
<b>PE2/GND connection</b>			-	2 × M12 screw	2 × M12 screw	2 × M12 screw
• Conductor cross-section, max. (IEC)	$\text{mm}^2$	-	2 × 240	2 × 240	2 × 240	
<b>Cable length, max. <sup>3)</sup></b>						
• Shielded	m	2250	2750	2750	2750	
• Unshielded	m	3375	4125	4125	4125	
<b>Degree of protection</b>			IP00	IP00	IP00	IP00
<b>Dimensions</b>						
• Width	mm	310	503	704	704	
• Height	mm	1413	1475	1480	1480	
• Depth	mm	550	548	550	550	
<b>Weight, approx.</b>		kg	150	294	458	458
<b>Frame size</b>			GX	HX	JX	JX

<sup>1)</sup> The base load current  $I_{H\ DC}$  is the basis for a duty cycle of 150 % for 60 s or  $I_{max\ DC}$  for 5 s with a duty cycle duration of 300 s.

<sup>2)</sup> The specified power loss represents the maximum value at 100 % utilization. The value is lower under normal operating conditions.

<sup>3)</sup> Sum of all motor cables and DC link. Longer cable lengths for specific configurations are available on request. For additional information, please refer to the SINAMICS Low Voltage Engineering Manual.



# SINAMICS S120 Chassis Format Units

## Air-cooled units

### Active Line Modules

#### Overview



The self-commutated infeed/regenerative feedback units with IGBTs generate a regulated DC link voltage. This means that the connected Motor Modules are decoupled from the line voltage. Line voltage fluctuations within the permissible supply tolerances have no effect on the motor voltage.

If required, the Active Line Modules can also provide reactive power compensation.

Active Line Modules are designed for connection to grounded TN/TT and non-grounded IT supply systems.

Active Line Modules are always operated together with the associated Active Interface Modules. These include the necessary pre-charging circuit as well as a Clean Power Filter.

#### Design

The Active Line Modules have the following interfaces as standard:

- 1 line supply connection
- 1 connection for the 24 V DC electronics power supply
- 1 DC link connection (DCP, DCN) for supplying the connected Motor Modules
- 1 DC link connection (DCPA, DCNA) for connecting a Braking Module
- 3 DRIVE-CLiQ sockets
- 1 temperature sensor input (KTY84-130, PTC or Pt100)
- 2 PE/protective conductor connections

The status of the Active Line Modules is indicated via two multi-color LEDs.

The scope of supply of the Active Line Modules includes:

- DRIVE-CLiQ cable for connecting to a CU320-2 or SIMOTION D4x5 Control Unit
- DRIVE-CLiQ cable to connect the Control Unit to the first Motor Module

#### Selection and ordering data

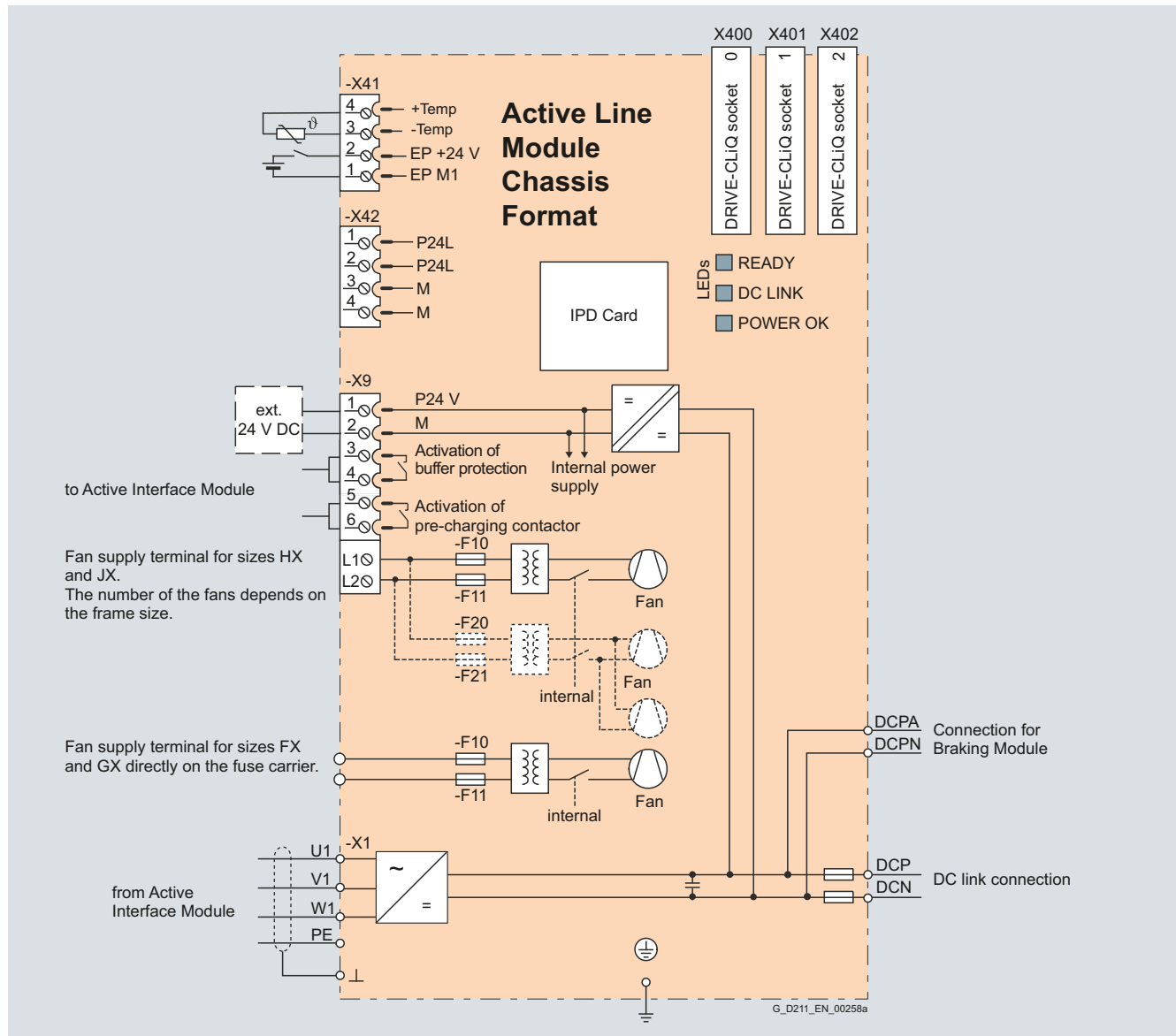
Rated power at 400 V or 690 V kW	Rated DC link current A	Active Line Module Order No.
<b>Line voltage 380 ... 480 V 3 AC</b>		
132	235	<b>6SL3330-7TE32-1AA3</b>
160	291	<b>6SL3330-7TE32-6AA3</b>
235	425	<b>6SL3330-7TE33-8AA3</b>
300	549	<b>6SL3330-7TE35-0AA3</b>
380	678	<b>6SL3330-7TE36-1AA3</b>
450	835	<b>6SL3330-7TE37-5AA3</b>
500	940	<b>6SL3330-7TE38-4AA3</b>
630	1103	<b>6SL3330-7TE41-0AA3</b>
800	1412	<b>6SL3330-7TE41-2AA3</b>
900	1574	<b>6SL3330-7TE41-4AA3</b>
<b>Line voltage 500 ... 690 V 3 AC</b>		
560	644	<b>6SL3330-7TG35-8AA3</b>
800	823	<b>6SL3330-7TG37-4AA3</b>
1100	1148	<b>6SL3330-7TG41-0AA3</b>
1400	1422	<b>6SL3330-7TG41-3AA3</b>

Description	Order No.
<b>Accessories for re-ordering</b>	
<b>Warning labels in 16 languages</b> Using this set of labels, another language can be placed over the German or English labels available as standard. A set of labels is provided with the devices. The following languages are available once in the set of labels: Chinese (simplified), Danish, Finnish, French, Greek, Italian, Japanese, Korean, Dutch, Polish, Portuguese/Brazilian, Russian, Swedish, Spanish, Czech, Turkish	<b>6SL3166-3AB00-0AA0</b>
<b>Dust protection blanking plugs</b> (50 units) For DRIVE-CLiQ port	<b>6SL3066-4CA00-0AA0</b>

[Line-side components, Braking Modules and recommended system components \(→ System components\).](#)

## Integration

The Active Line Modules communicate with the higher-level control module via DRIVE-CLiQ. The control module in this case can be a CU320-2 or a SIMOTION D Control Unit. An external 24 V DC power supply is required to operate the Active Line Modules.



Connection example of an Active Line Module

## Technical data

### General technical specifications

#### Electrical specifications

##### Line power factor

- Basic fundamental ( $\cos \varphi_1$ ) 1.0 (factory setting)  
can be altered by entering a reactive current setpoint
- Total ( $\lambda$ ) 1.0 (factory setting)

**Efficiency** > 97.5 % (including AIM)

**DC link voltage** The DC link voltage is regulated and can be adjusted as a voltage decoupled from the line voltage. Factory setting for DC link voltage:  $1.5 \times$  line voltage

**Radio interference suppression, standard** Category C3 according to EN 61800-3 (with Active Interface Module)

**Conformity** CE (EMC Directive No. 2004/108/EC and Low-Voltage Directive No. 2006/95/EC)

**Approvals, according to** cULus (only for drive units connected to line voltages 380 ... 480 V 3 AC and 500 ... 600 V 3 AC)

# SINAMICS S120 Chassis Format Units

## Air-cooled units

### Active Line Modules

#### Technical data

Line voltage 380 ... 480 V 3 AC		Active Line Modules					
		6SL3330-7TE32-1AA3	6SL3330-7TE32-6AA3	6SL3330-7TE33-8AA3	6SL3330-7TE35-0AA3	6SL3330-7TE36-1AA3	
<b>Rated power</b>							
• For $I_{N\ DC}$ (50 Hz 400 V)	kW	<b>132</b>	<b>160</b>	<b>235</b>	<b>300</b>	<b>380</b>	
• For $I_{H\ DC}$ (50 Hz 400 V)	kW	115	145	210	270	335	
• For $I_{N\ DC}$ (60 Hz 460 V)	hp	200	250	400	500	600	
• For $I_{H\ DC}$ (60 Hz 460 V)	hp	150	200	300	400	500	
<b>DC link current</b>							
• Rated current $I_{N\ DC}$	A	235	291	425	549	678	
• Base load current $I_{H\ DC}^{1)}$	A	209	259	378	489	603	
• Maximum current $I_{max\ DC}$	A	352	436	637	823	1017	
<b>Infeed/regenerative feedback current</b>							
• Rated current $I_{N\ E}$	A	210	260	380	490	605	
• Maximum current $I_{max\ E}$	A	315	390	570	735	907	
<b>Current demand</b>							
• 24 V DC auxiliary power supply	A	1.1	1.1	1.35	1.35	1.4	
• 400 V AC	A	0.63	1.13	1.8	1.8	3.6	
<b>DC link capacitance</b>							
• Active Line Module	μF	4200	5200	7800	9600	12600	
• Drive line-up, max.	μF	41600	41600	76800	76800	134400	
<b>Power loss, max. <sup>2)</sup></b>							
• At 50 Hz 400 V	kW	2.2	2.7	3.9	4.8	6.2	
• At 60 Hz 460 V	kW	2.3	2.9	4.2	5.1	6.6	
<b>Cooling air requirement</b>		m <sup>3</sup> /s	0.17	0.23	0.36	0.36	0.78
<b>Sound pressure level <math>L_{PA}^{3)}</math></b> (1 m) at 50/60 Hz		dB	64/67	64/67	69/73	69/73	70/73
<b>Line supply connection</b> U1, V1, W1			M10 screw	M10 screw	M10 screw	M10 screw	2 × M12 screw
• Conductor cross-section, max. (IEC)	mm <sup>2</sup>	2 × 185	2 × 185	2 × 240	2 × 240	4 × 240	
<b>DC link connection</b> DCP, DCN			M10 screw	M10 screw	M10 screw	M10 screw	4 × hole for M12
• Conductor cross-section, max. (IEC)	mm <sup>2</sup>	2 × 185	2 × 185	2 × 240	2 × 240	Busbar	
<b>PE1/GND connection</b>			M10 screw	M10 screw	M10 screw	M10 screw	M12 screw
• Conductor cross-section, max. (IEC)	mm <sup>2</sup>	2 × 185	2 × 185	2 × 240	2 × 240	240	
<b>PE2/GND connection</b>			M10 screw	M10 screw	M10 screw	M10 screw	2 × M12 screw
• Conductor cross-section, max. (IEC)	mm <sup>2</sup>	2 × 185	2 × 185	2 × 240	2 × 240	2 × 240	
<b>Cable length, max. <sup>4)</sup></b>							
• Shielded	m	2700	2700	2700	2700	3900	
• Unshielded	m	4050	4050	4050	4050	5850	
<b>Degree of protection</b>			IP20	IP20	IP20	IP20	IP00
<b>Dimensions</b>							
• Width	mm	326	326	326	326	503	
• Height	mm	1400	1400	1533	1533	1475	
• Depth	mm	356	356	545	545	540	
<b>Weight, approx.</b>		kg	95	95	136	136	290
<b>Frame size</b>			FX	FX	GX	GX	HX

<sup>1)</sup> The base load current  $I_{H\ DC}$  is the basis for a duty cycle of 150 % for 60 s or  $I_{max\ DC}$  for 5 s with a duty cycle duration of 300 s.

<sup>2)</sup> The specified power loss represents the maximum value at 100 % utilization. The value is lower under normal operating conditions.

<sup>3)</sup> Total sound pressure level of Active Interface Module and Active Line Module.

<sup>4)</sup> Sum of all motor cables and DC link. Longer cable lengths for specific configurations are available on request. For additional information, please refer to the SINAMICS Low Voltage Engineering Manual.

## Technical data

Line voltage 380 ... 480 V 3 AC		Active Line Modules				
		6SL3330-7TE37-5AA3	6SL3330-7TE38-4AA3	6SL3330-7TE41-0AA3	6SL3330-7TE41-2AA3	6SL3330-7TE41-4AA3
<b>Rated power</b>						
• For $I_{N\ DC}$ (50 Hz 400 V)	kW	450	500	630	800	900
• For $I_{H\ DC}$ (50 Hz 400 V)	kW	400	465	545	690	780
• For $I_{N\ DC}$ (60 Hz 460 V)	hp	600	700	900	1000	1250
• For $I_{H\ DC}$ (60 Hz 460 V)	hp	600	700	800	900	1000
<b>DC link current</b>						
• Rated current $I_{N\ DC}$	A	835	940	1103	1412	1574
• Base load current $I_{H\ DC}$ <sup>1)</sup>	A	700	837	982	1255	1401
• Maximum current $I_{max\ DC}$	A	1252	1410	1654	2120	2361
<b>Infeed/regenerative feedback current</b>						
• Rated current $I_{N\ E}$	A	745	840	985	1260	1405
• Maximum current $I_{max\ E}$	A	1117	1260	1477	1890	2107
<b>Current demand</b>						
• 24 V DC auxiliary power supply	A	1.4	1.4	1.5	1.7	1.7
• 400 V AC	A	3.6	3.6	5.4	5.4	5.4
<b>DC link capacitance</b>						
• Active Line Module	μF	15600	16800	18900	26100	28800
• Drive line-up, max.	μF	134400	134400	230400	230400	230400
<b>Power loss, max. <sup>2)</sup></b>						
• At 50 Hz 400 V	kW	7.3	7.7	10.1	12.1	13.3
• At 60 Hz 460 V	kW	7.7	8.2	10.8	13	14.2
<b>Cooling air requirement</b>						
	m <sup>3</sup> /s	0.78	0.78	1.08	1.08	1.08
<b>Sound pressure level <math>L_{pA}</math> <sup>3)</sup></b>						
(1 m) at 50/60 Hz	dB	70/73	70/73	71/73	71/73	71/73
<b>Line supply connection</b>						
U1, V1, W1		2 × M12 screw	2 × M12 screw	3 × M12 screw	3 × M12 screw	3 × M12 screw
• Conductor cross-section, max. (IEC)	mm <sup>2</sup>	4 × 240	4 × 240	6 × 240	6 × 240	6 × 240
<b>DC link connection</b>						
DCP, DCN		4 × hole for M12	4 × hole for M12	4 × hole for M12	4 × hole for M12	4 × hole for M12
• Conductor cross-section, max. (IEC)	mm <sup>2</sup>	Busbar	Busbar	Busbar	Busbar	Busbar
<b>PE1/GND connection</b>						
• Conductor cross-section, max. (IEC)	mm <sup>2</sup>	M12 screw 240	M12 screw 240	M12 screw 240	M12 screw 240	M12 screw 240
<b>PE2/GND connection</b>						
• Conductor cross-section, max. (IEC)	mm <sup>2</sup>	2 × M12 screw 2 × 240	2 × M12 screw 2 × 240	3 × M12 screw 3 × 240	3 × M12 screw 3 × 240	3 × M12 screw 3 × 240
<b>Cable length, max. <sup>4)</sup></b>						
• Shielded	m	3900	3900	3900	3900	3900
• Unshielded	m	5850	5850	5850	5850	5850
<b>Degree of protection</b>						
		IP00	IP00	IP00	IP00	IP00
<b>Dimensions</b>						
• Width	mm	503	503	704	704	704
• Height	mm	1475	1475	1480	1480	1480
• Depth	mm	540	540	550	550	550
<b>Weight, approx.</b>						
	kg	290	290	450	450	450
<b>Frame size</b>						
		HX	HX	JX	JX	JX

<sup>1)</sup> The base load current  $I_{H\ DC}$  is the basis for a duty cycle of 150 % for 60 s or  $I_{max\ DC}$  for 5 s with a duty cycle duration of 300 s.

<sup>2)</sup> The specified power loss represents the maximum value at 100 % utilization. The value is lower under normal operating conditions.

<sup>3)</sup> Total sound pressure level of Active Interface Module and Active Line Module.

<sup>4)</sup> Sum of all motor cables and DC link. Longer cable lengths for specific configurations are available on request. For additional information, please refer to the SINAMICS Low Voltage Engineering Manual.

# SINAMICS S120 Chassis Format Units

## Air-cooled units

### Active Line Modules

#### Technical data

Line voltage 500 ... 690 V 3 AC		Active Line Modules			
		6SL3330-7TG35-8AA3	6SL3330-7TG37-4AA3	6SL3330-7TG41-0AA3	6SL3330-7TG41-3AA3
<b>Rated power</b>					
• For $I_{N\ DC}$ (50 Hz 690 V)	kW	<b>560</b>	<b>800</b>	<b>1100</b>	<b>1400</b>
• For $I_{H\ DC}$ (50 Hz 690 V)	kW	550	705	980	1215
• For $I_{N\ DC}$ (50 Hz 500 V)	kW	435	560	780	965
• For $I_{H\ DC}$ (50 Hz 500 V)	kW	400	510	710	880
• For $I_{N\ DC}$ (60 Hz 575 V)	hp	600	900	1250	1500
• For $I_{H\ DC}$ (60 Hz 575 V)	hp	450	600	1000	1250
<b>DC link current</b>					
• Rated current $I_{N\ DC}$	A	644	823	1148	1422
• Base load current $I_{H\ DC}^{1)}$	A	573	732	1022	1266
• Maximum current $I_{max\ DC}$	A	966	1234	1722	2133
<b>Infeed/regenerative feedback current</b>					
• Rated current $I_{N\ E}$	A	575	735	1025	1270
• Maximum current $I_{max\ E}$	A	862	1102	1537	1905
<b>Current demand</b>					
• 24 V DC auxiliary power supply	A	1.4	1.5	1.7	1.7
• 500 V AC	A	3.0	4.4	4.4	4.4
• 690 V AC	A	2.1	3.1	3.1	3.1
<b>DC link capacitance</b>					
• Active Line Module	μF	7400	11100	14400	19200
• Drive line-up, max.	μF	59200	153600	153600	153600
<b>Power loss, max. <sup>2)</sup></b>					
• At 50 Hz 690 V	kW	6.8	10.2	13.6	16.5
• At 60 Hz 575 V	kW	6.2	9.6	12.9	15.3
<b>Cooling air requirement</b>		m <sup>3</sup> /s	0.78	1.08	1.08
<b>Sound pressure level <math>L_{pA}^{3)}</math></b> (1 m) at 50/60 Hz		dB	70/73	71/73	71/73
<b>Line supply connection</b> U1, V1, W1			2 × M12 screw	3 × M12 screw	3 × M12 screw
• Conductor cross-section, max. (IEC)	mm <sup>2</sup>	4 × 240	6 × 240	6 × 240	6 × 240
<b>DC link connection</b> DCP, DCN			4 × hole for M12	4 × hole for M12	4 × hole for M12
• Conductor cross-section, max. (IEC)	mm <sup>2</sup>	Busbar	Busbar	Busbar	Busbar
<b>PE1/GND connection</b>			M12 screw	M12 screw	M12 screw
• Conductor cross-section, max. (IEC)	mm <sup>2</sup>	240	240	240	240
<b>PE2/GND connection</b>			2 × M12 screw	3 × M12 screw	3 × M12 screw
• Conductor cross-section, max. (IEC)	mm <sup>2</sup>	2 × 240	3 × 240	3 × 240	3 × 240
<b>Cable length, max. <sup>4)</sup></b>					
• Shielded	m	2250	2250	2250	2250
• Unshielded	m	3375	3375	3375	3375
<b>Degree of protection</b>			IP00	IP00	IP00
<b>Dimensions</b>					
• Width	mm	503	704	704	704
• Height	mm	1475	1480	1480	1480
• Depth	mm	540	550	550	550
<b>Weight, approx.</b>		kg	290	450	450
<b>Frame size</b>			HX	JX	JX

<sup>1)</sup> The base load current  $I_{H\ DC}$  is the basis for a duty cycle of 150 % for 60 s or  $I_{max\ DC}$  for 5 s with a duty cycle duration of 300 s.

<sup>2)</sup> The specified power loss represents the maximum value at 100 % utilization. The value is lower under normal operating conditions.

<sup>3)</sup> Total sound pressure level of Active Interface Module and Active Line Module.

<sup>4)</sup> Sum of all motor cables and DC link. Longer cable lengths for specific configurations are available on request. For additional information, please refer to the SINAMICS Low Voltage Engineering Manual.

## Overview



Active Interface Modules are used in conjunction with Active Line Modules. Active Interface Modules contain a Clean Power Filter with basic RI suppression, the pre-charging circuit for the Active Line Module, the line supply voltage sensing circuit and monitoring sensors. The bypass contactor is an integral component in frame sizes FI and GI, thereby making the module very compact. The bypass contactor must be provided separately for frame sizes HI and JI.

Line harmonics are largely suppressed by the Clean Power Filter.

## Design

The scope of supply of the Active Interface Modules includes:

- DRIVE-CLiQ cable for the connection between Active Interface Module and Active Line Module
- DRIVE-CLiQ cable for the connection between the Control Unit and first Motor Module

## Selection and ordering data

Suitable for Active Line Module chassis format, <u>air-cooled</u>	Suitable for Active Line Module chassis format, <u>liquid-cooled</u>	Rated power of the Active Line Modules at 400 V or 690 V kW	Active Interface Module Order No.
<b>Line voltage 380 ... 480 V 3 AC</b>			
6SL3330-7TE32-1AA3	–	132	<b>6SL3300-7TE32-6AA0</b>
6SL3330-7TE32-6AA3	–	160	<b>6SL3300-7TE32-6AA0</b>
6SL3330-7TE33-8AA3	–	235	<b>6SL3300-7TE33-8AA0</b>
6SL3330-7TE35-0AA3	6SL3335-7TE35-0AA3	300	<b>6SL3300-7TE35-0AA0</b>
6SL3330-7TE36-1AA3	–	380	<b>6SL3300-7TE38-4AA0</b>
6SL3330-7TE37-5AA3	–	450	<b>6SL3300-7TE38-4AA0</b>
6SL3330-7TE38-4AA3	6SL3335-7TE38-4AA3	500	<b>6SL3300-7TE38-4AA0</b>
6SL3330-7TE41-0AA3	–	630	<b>6SL3300-7TE41-4AA0</b>
6SL3330-7TE41-2AA3	–	800	<b>6SL3300-7TE41-4AA0</b>
6SL3330-7TE41-4AA3	–	900	<b>6SL3300-7TE41-4AA0</b>
<b>Line voltage 500 ... 690 V 3 AC</b>			
6SL3330-7TG35-8AA3	6SL3335-7TG35-8AA3	560	<b>6SL3300-7TG35-8AA0</b>
6SL3330-7TG37-4AA3	–	800	<b>6SL3300-7TG37-4AA0</b>
6SL3330-7TG41-0AA3	–	1100	<b>6SL3300-7TG41-3AA0</b>
6SL3330-7TG41-3AA3	6SL3335-7TG41-3AA3	1400	<b>6SL3300-7TG41-3AA0</b>



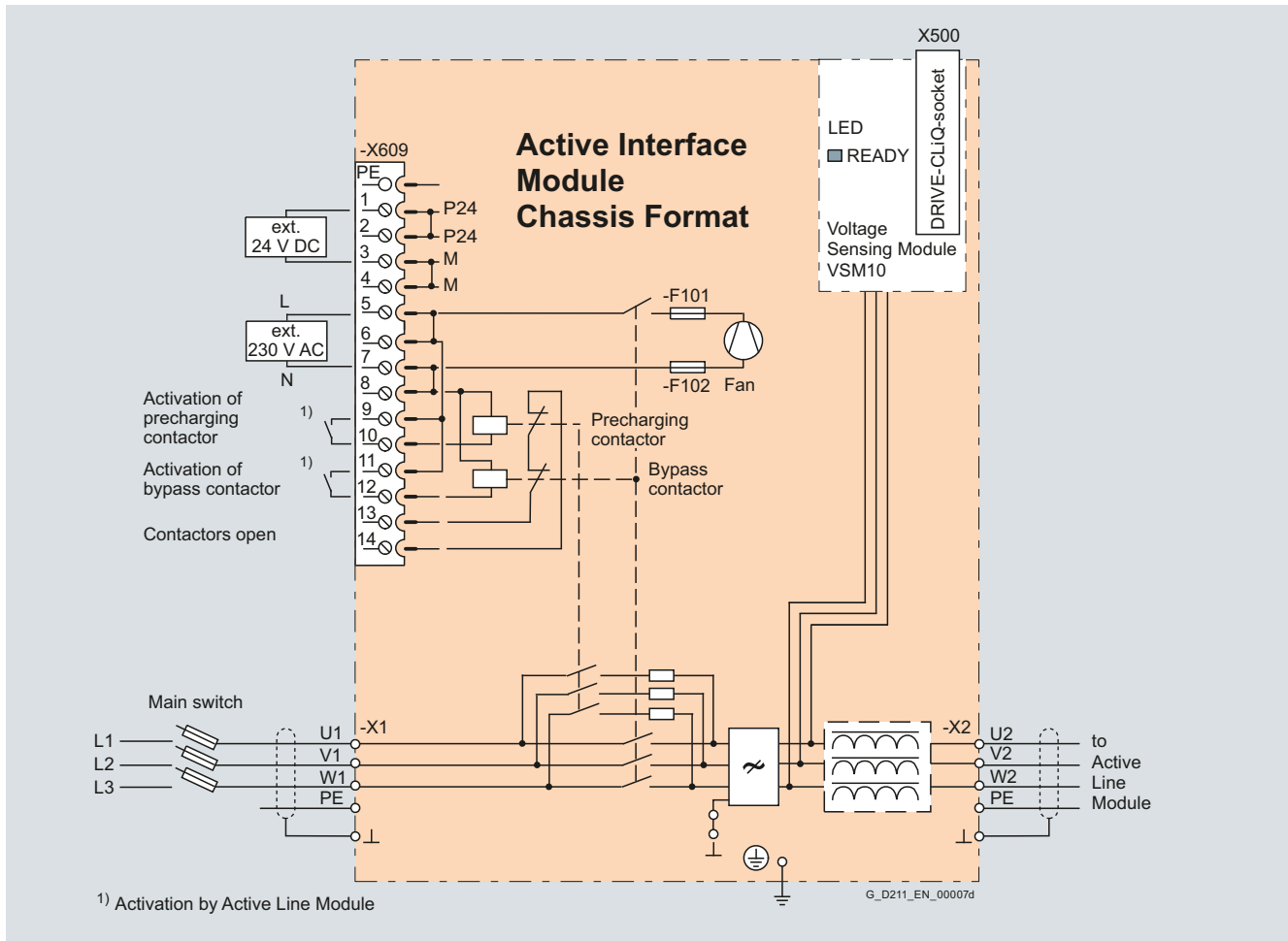
# SINAMICS S120 Chassis Format Units

## Air-cooled units

### Active Interface Modules

#### Integration

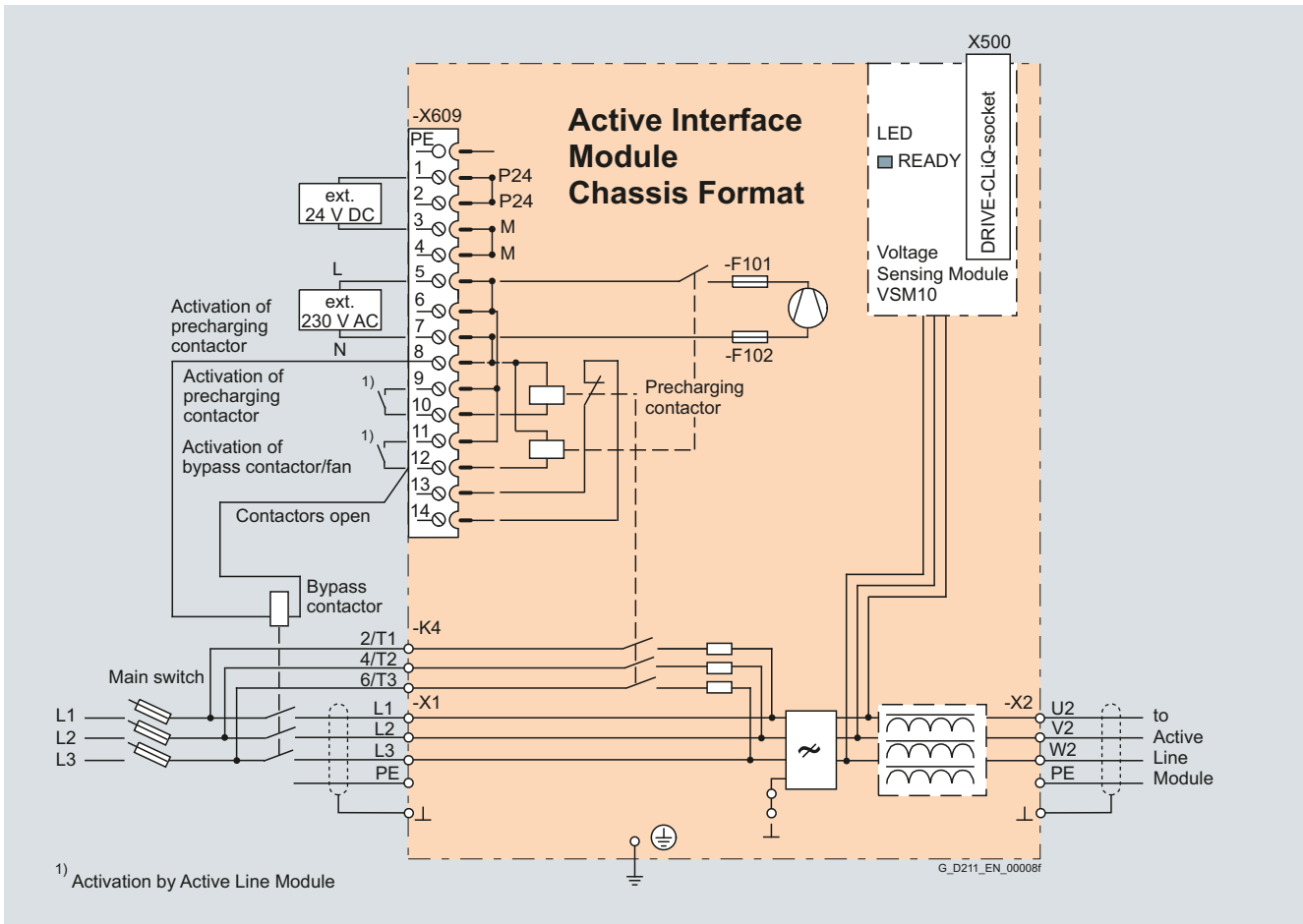
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Connection example of an Active Interface Module with integrated bypass contactor (frame sizes FI and GI)

**Integration**

2



Connection example of an Active Interface Module with externally mounted bypass contactor (frame sizes HI and JI)

# SINAMICS S120 Chassis Format Units

## Air-cooled units

### Active Interface Modules

#### Technical data

Line voltage 380 ... 480 V 3 AC		Active Interface Modules			
		6SL3300-7TE32-6AA0	6SL3300-7TE33-8AA0	6SL3300-7TE35-0AA0	
<b>Suitable for Active Line Module</b>					
• Rated power at 400 V	kW	<b>132</b>	<b>160</b>	<b>235</b>	<b>300</b>
- Air-cooled		6SL3330-7TE32-1AA3	6SL3330-7TE32-6AA3	6SL3330-7TE33-8AA3	6SL3330-7TE35-0AA3
- Liquid-cooled		–	–	–	6SL3335-7TE35-0AA3
<b>Rated current</b>	A	210	260	380	490
<b>Bypass contactor</b>		included	included	included	included
<b>Current demand</b>					
• 24 V DC auxiliary power supply	A	0.17	0.17	0.17	0.17
• 230 V 2 AC					
- Making current	A	1.25	1.25	2.5	2.5
- Holding current	A	0.6	0.6	1.2	1.2
<b>DC link capacitance</b> of the drive line-up, max. <sup>1)</sup>	µF	41600	41600	76800	76800
<b>Power loss, max. <sup>2)</sup></b>					
• At 50 Hz 400 V	kW	2.1	2.2	3.0	3.9
• At 60 Hz 460 V	kW	2.1	2.2	3.0	3.9
<b>Cooling air requirement</b>	m <sup>3</sup> /s	0.24	0.24	0.47	0.47
<b>Line supply/load connection</b> L1, L2, L3/U2, V2, W2		M10 nut	M10 nut	M10 nut	M10 nut
• Conductor cross-section, max. (IEC)	mm <sup>2</sup>	2 × 185	2 × 185	2 × 185	2 × 185
<b>PE/GND connection</b>		M10 nut	M10 nut	M10 nut	M10 nut
• Conductor cross-section, max. (IEC)	mm <sup>2</sup>	2 × 185	2 × 185	2 × 185	2 × 185
<b>Degree of protection</b>		IP20	IP20	IP20	IP20
<b>Dimensions</b>					
• Width	mm	325	325	325	325
• Height	mm	1400	1400	1533	1533
• Depth	mm	355	355	544	544
<b>Weight, approx.</b>	kg	135	135	190	190
<b>Frame size</b>		FI	FI	GI	GI

<sup>1)</sup> Information on higher capacities is included in the SINAMICS Low Voltage Engineering Manual.

<sup>2)</sup> The specified power loss represents the maximum value at 100 % utilization. The value is lower under normal operating conditions.

## Technical data

Line voltage 380 ... 480 V 3 AC		Active Interface Modules			
		6SL3300-7TE38-4AA0		6SL3300-7TE41-4AA0	
<b>Suitable for Active Line Module</b>					
• Rated power at 400 V	kW	<b>380</b>	<b>450/500</b>	<b>630</b>	<b>800/900</b>
- Air-cooled		6SL3330-7TE36-1AA3	6SL3330-7TE37-5AA3 6SL3330-7TE38-4AA3	6SL3330-7TE41-0AA3	6SL3330-7TE41-2AA3 6SL3330-7TE41-4AA3
- Liquid-cooled		–	6SL3335-7TE38-4AA3	–	–
<b>Rated current</b>	A	605	840	985	1405
<b>Bypass contactor</b>		3RT1476-6AP36	3WL1110-2BB34-4AN2-Z C22	3WL1112-2BB34-4AN2-Z C22	3WL1116-2BB34-4AN2-Z C22
<b>Current demand</b>					
• 24 V DC auxiliary power supply	A	0.17	0.17	0.17	0.17
• 230 V 2 AC					
- Making current	A	9.9	9.9	10.5	10.5
- Holding current	A	4.6	4.6	4.9	4.9
<b>DC link capacitance</b> of the drive line-up, max. <sup>1)</sup>	µF	134400	134400	230400	230400
<b>Power loss, max. <sup>2)</sup></b>					
• At 50 Hz 400 V	kW	5.5	6.1	7.5	8.5
• At 60 Hz 460 V	kW	5.5	6.1	7.5	8.5
<b>Cooling air requirement</b>	m <sup>3</sup> /s	0.4	0.4	0.4	0.4
<b>Line supply/load connection</b> L1, L2, L3/U2, V2, W2		4 × hole for M12	4 × hole for M12	3 × hole for M12	3 × hole for M12
• Conductor cross-section, max. (IEC)	mm <sup>2</sup>	4 × 240	4 × 240	6 × 240	6 × 240
<b>PE/GND connection</b>		2 × M12 nut	2 × M12 nut	4 × M12 nut	4 × M12 nut
• Conductor cross-section, max. (IEC)	mm <sup>2</sup>	2 × 240	2 × 240	4 × 240	4 × 240
<b>Degree of protection</b>		IP00	IP00	IP00	IP00
<b>Dimensions</b>					
• Width	mm	305	305	505	505
• Height	mm	1750	1750	1750	1750
• Depth	mm	544	544	544	544
<b>Weight, approx.</b>	kg	390	390	620	620
<b>Frame size</b>		HI	HI	JI	JI

<sup>1)</sup> Information on higher capacities is included in the SINAMICS Low Voltage Engineering Manual.

<sup>2)</sup> The specified power loss represents the maximum value at 100 % utilization. The value is lower under normal operating conditions.

# SINAMICS S120 Chassis Format Units

## Air-cooled units

### Active Interface Modules

#### Technical data

Line voltage 500 ... 690 V 3 AC		Active Interface Modules			
		6SL3300-7TG35-8AA0	6SL3300-7TG37-4AA0	6SL3300-7TG41-3AA0	
<b>Suitable for Active Line Module</b>					
• Rated power at 690 V	kW	<b>560</b>	<b>800</b>	<b>1100</b>	<b>1400</b>
- Air-cooled		6SL3330-7TG35-8AA3	6SL3330-7TG37-4AA3	6SL3330-7TG41-0AA3	6SL3330-7TG41-3AA3
- Liquid-cooled		6SL3335-7TG35-8AA3	–	–	6SL3335-7TG41-3AA3
<b>Rated current</b>	A	575	735	1025	1270
<b>Bypass contactor</b>		3RT1476-6AP36	3RT1476-6AP36 (3 x)	3WL1212-4BB34-4AN2-Z C22	3WL1216-4BB34-4AN2-Z C22
<b>Current demand</b>					
• 24 V DC auxiliary power supply	A	0.17	0.17	0.17	0.17
• 230 V 2 AC					
- Making current	A	9.9	10.5	10.5	10.5
- Holding current	A	4.6	4.9	4.9	4.9
<b>DC link capacitance</b> of the drive line-up, max. <sup>1)</sup>	µF	59200	153600	153600	153600
<b>Power loss, max. <sup>2)</sup></b>					
• At 50 Hz 690 V	kW	6.8	9.0	9.2	9.6
• At 60 Hz 575 V	kW	6.8	9.0	9.2	9.6
<b>Cooling air requirement</b>	m <sup>3</sup> /s	0.4	0.4	0.4	0.4
<b>Line supply/load connection</b> L1, L2, L3/U2, V2, W2		4 × hole for M12	3 × hole for M12	3 × hole for M12	3 × hole for M12
• Conductor cross-section, max. (IEC)	mm <sup>2</sup>	4 × 240	6 × 240	6 × 240	6 × 240
<b>PE/GND connection</b>		2 × M12 nut	4 × M12 nut	4 × M12 nut	4 × M12 nut
• Conductor cross-section, max. (IEC)	mm <sup>2</sup>	2 × 240	4 × 240	4 × 240	4 × 240
<b>Degree of protection</b>		IP00	IP00	IP00	IP00
<b>Dimensions</b>					
• Width	mm	305	505	505	505
• Height	mm	1750	1750	1750	1750
• Depth	mm	544	544	544	544
<b>Weight, approx.</b>	kg	390	620	620	620
<b>Frame size</b>		HI	JI	JI	JI

<sup>1)</sup> Information on higher capacities is included in the SINAMICS Low Voltage Engineering Manual.

<sup>2)</sup> The specified power loss represents the maximum value at 100 % utilization. The value is lower under normal operating conditions.

## Overview



A Motor Module comprises a self-commutated inverter with IGBTs. It generates a variable voltage with variable frequency from the DC link voltage that feeds the connected motor.

Several Motor Modules can be interconnected through a common DC bus. This makes it possible to exchange energy between the Motor Modules. This means that if a Motor Module is in the generator mode, this energy can be used by another Motor Module operating in the motor mode.

Motor Modules are controlled by a Control Unit.

## Design

The Motor Modules in the chassis format have the following interfaces as standard:

- 1 DC link connection (DCP, DCN) for connecting to the supply DC busbar
- 1 DC link connection (DCPA, DCNA) for connecting a Braking Module
- 1 DC link connection (DCPS, DCNS) to connect a dv/dt filter
- 1 connection for the 24 V DC electronics power supply
- 3 DRIVE-CLiQ sockets
- 1 motor connection
- 1 connection for Safety Integrated
- 1 temperature sensor input (KTY84-130, PTC or Pt100)
- 2 PE/protective conductor connections

The status of the Motor Modules is indicated via two multi-color LEDs.

The scope of supply of the Motor Modules includes:

- DRIVE-CLiQ cable to connect to the CU320-2 or SIMOTION D4x5 Control Unit
- DRIVE-CLiQ cable for connection to the next Motor Module

## Selection and ordering data

Type rating at 400 V or 690 V kW	Rated output current A	Motor Module Order No.
<b>Line voltage 380 ... 480 V 3 AC (DC link voltage 510 ... 720 V DC)</b>		
110	210	<b>6SL3320-1TE32-1AA3</b>
132	260	<b>6SL3320-1TE32-6AA3</b>
160	310	<b>6SL3320-1TE33-1AA3</b>
200	380	<b>6SL3320-1TE33-8AA3</b>
250	490	<b>6SL3320-1TE35-0AA3</b>
315	605	<b>6SL3320-1TE36-1AA3</b>
400	745	<b>6SL3320-1TE37-5AA3</b>
450	840	<b>6SL3320-1TE38-4AA3</b>
560	985	<b>6SL3320-1TE41-0AA3</b>
710	1260	<b>6SL3320-1TE41-2AA3</b>
800	1405	<b>6SL3320-1TE41-4AA3</b>
<b>Line voltage 500 ... 690 V 3 AC (DC link voltage 675 ... 1035 V DC)</b>		
75	85	<b>6SL3320-1TG28-5AA3</b>
90	100	<b>6SL3320-1TG31-0AA3</b>
110	120	<b>6SL3320-1TG31-2AA3</b>
132	150	<b>6SL3320-1TG31-5AA3</b>
160	175	<b>6SL3320-1TG31-8AA3</b>
200	215	<b>6SL3320-1TG32-2AA3</b>
250	260	<b>6SL3320-1TG32-6AA3</b>
315	330	<b>6SL3320-1TG33-3AA3</b>
400	410	<b>6SL3320-1TG34-1AA3</b>
450	465	<b>6SL3320-1TG34-7AA3</b>
560	575	<b>6SL3320-1TG35-8AA3</b>
710	735	<b>6SL3320-1TG37-4AA3</b>
800	810	<b>6SL3320-1TG38-1AA3</b>
900	910	<b>6SL3320-1TG38-8AA3</b>
1000	1025	<b>6SL3320-1TG41-0AA3</b>
1200	1270	<b>6SL3320-1TG41-3AA3</b>

Description	Order No.
<b>Accessories for re-ordering</b>	
<b>Warning labels in 16 languages</b> Using this set of labels, another language can be placed over the German or English labels available as standard. A set of labels is provided with the devices. The following languages are available once in the set of labels: Chinese (simplified), Danish, Finnish, French, Greek, Italian, Japanese, Korean, Dutch, Polish, Portuguese/Brazilian, Russian, Swedish, Spanish, Czech, Turkish	<b>6SL3166-3AB00-0AA0</b>
<b>Dust protection blanking plugs</b> (50 units) For DRIVE-CLiQ port	<b>6SL3066-4CA00-0AA0</b>

Motor-side components and Braking Modules (→ System components).



# SINAMICS S120 Chassis Format Units

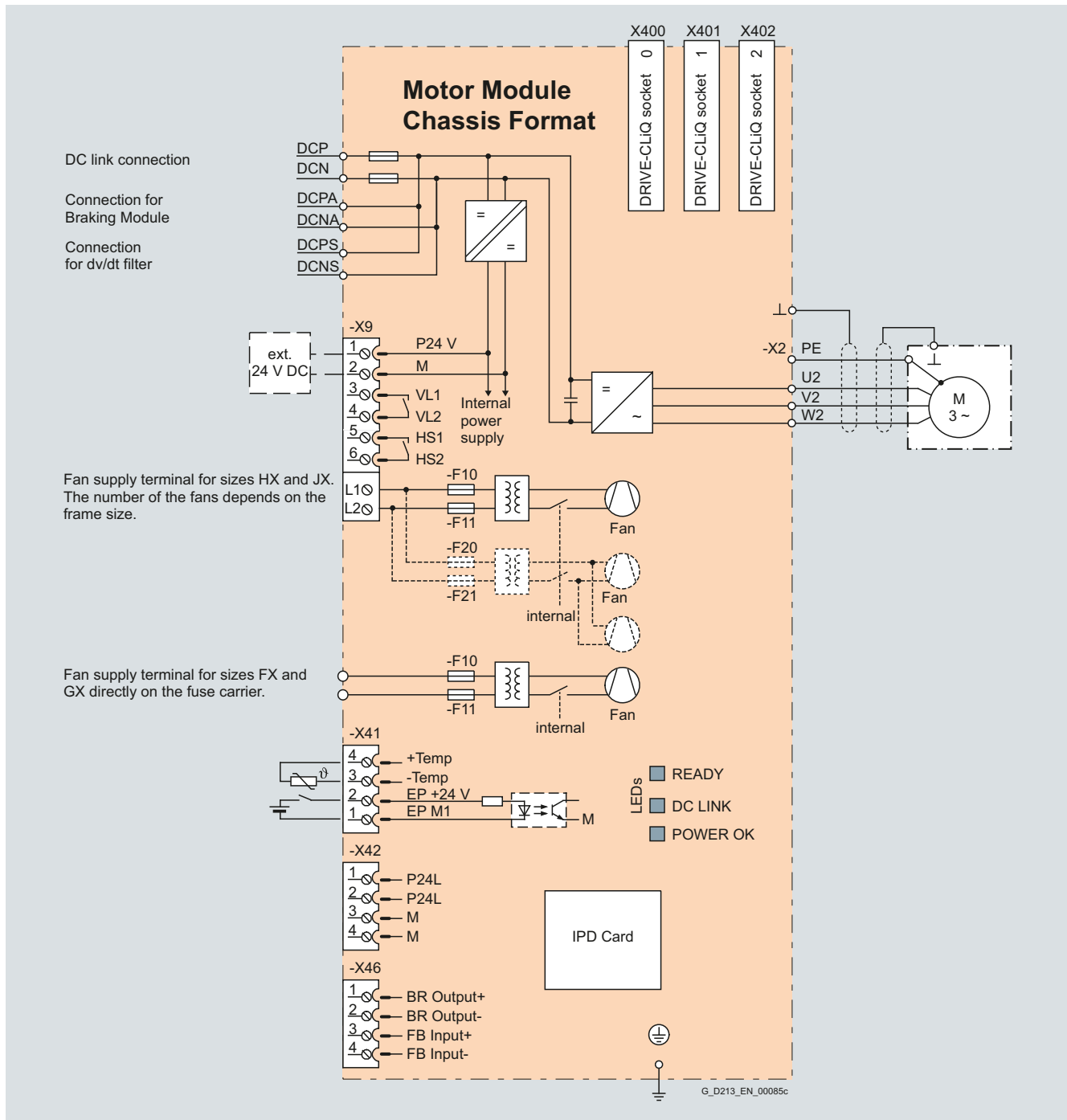
## Air-cooled units

### Motor Modules

#### Integration

The Motor Modules communicate with the higher-level control module via DRIVE-CLiQ. The control module in this case can be a CU320-2 or a SIMOTION D Control Unit.

2



Connection example of a Motor Module

## Technical data

## General technical specifications

Electrical specifications	
<b>Efficiency</b>	> 98.5 %
<b>DC link voltage</b> (up to 2000 m above sea level)	510 ... 720 V DC (line supply voltage 380 ... 480 V 3 AC) or 675 ... 1035 V DC (line supply voltage 500 ... 690 V 3 AC)
<b>Output frequency <sup>1)</sup></b>	
• Control type Servo	0 ... 650 Hz
• Control type Vector	0 ... 600 Hz
• Control type V/f	0 ... 600 Hz
<b>Conformity</b>	CE (EMC Directive No. 2004/108/EC and Low-Voltage Directive No. 2006/95/EC)
<b>Approvals, according to</b>	cULus (only for drive units connected to line voltages 380 ... 480 V 3 AC and 500 ... 600 V 3 AC)
<b>Safety Integrated</b>	Safety Integrity Level 2 (SIL2) acc. to IEC 61508, Performance Level d (PLd) acc. to EN ISO 13849-1 and Control Category 3 acc. to EN ISO 13849-1 (previously EN 954-1).

Line voltage 380 ... 480 V 3 AC DC link voltage 510 ... 720 V DC		Motor Modules				
		6SL3320-1TE32-1AA3	6SL3320-1TE32-6AA3	6SL3320-1TE33-1AA3	6SL3320-1TE33-8AA3	6SL3320-1TE35-0AA3
<b>Type rating</b>						
• For $I_L$ (50 Hz 400 V) <sup>2)</sup>	kW	<b>110</b>	<b>132</b>	<b>160</b>	<b>200</b>	<b>250</b>
• For $I_H$ (50 Hz 400 V) <sup>2)</sup>	kW	90	110	132	160	200
• For $I_L$ (60 Hz 460 V) <sup>3)</sup>	hp	150	200	250	300	400
• For $I_H$ (60 Hz 460 V) <sup>3)</sup>	hp	150	200	200	250	350
<b>Output current</b>						
• Rated current $I_{NA}$	A	210	260	310	380	490
• Base load current $I_L$ <sup>4)</sup>	A	205	250	302	370	477
• Base load current $I_H$ <sup>5)</sup>	A	178	233	277	340	438
• Maximum current $I_{max A}$	A	307	375	453	555	715
<b>DC link current</b>						
• Rated current $I_{NDC}$ when supplied from						
- Basic/Smart Line Module	A	252	312	372	456	588
- Active Line Module	A	227	281	335	411	529
• Base load current $I_{LDC}$ <sup>4)</sup> when supplied from						
- Basic/Smart Line Module	A	245	304	362	444	573
- Active Line Module	A	221	273	326	400	515
• Base load current $I_{HDC}$ <sup>5)</sup> when supplied from						
- Basic/Smart Line Module	A	224	277	331	405	523
- Active Line Module	A	202	250	298	365	470
<b>Current demand</b>						
• 24 V DC auxiliary power supply	A	0.8	0.8	0.9	0.9	0.9
• 400 V AC	A	0.63	1.13	1.8	1.8	1.8
<b>DC link capacitance</b>	μF	4200	5200	6300	7800	9600

1) Please note:

- The correlation between the maximum output frequency, pulse frequency and current derating. Higher output frequencies for specific configurations are available on request.
  - The correlation between the minimum output frequency and permissible output current (current derating).
- Information is provided in the [SINAMICS Low Voltage Engineering Manual](#).

2) Rated power of a typ. 6-pole standard induction motor based on  $I_L$  or  $I_H$  with 400 V 3 AC 50 Hz.3) Rated power of a typ. 6-pole standard induction motor based on  $I_L$  or  $I_H$  with 460 V 3 AC 60 Hz.4) The base load current  $I_L$  is the basis for a duty cycle of 110 % for 60 s or 150 % for 10 s with a duty cycle duration of 300 s.5) The base load current  $I_H$  is the basis for a duty cycle of 150 % for 60 s or 160 % for 10 s with a duty cycle duration of 300 s.

# SINAMICS S120 Chassis Format Units

## Air-cooled units

### Motor Modules

#### Technical data

Line voltage 380 ... 480 V 3 AC DC link voltage 510 ... 720 V DC		Motor Modules				
		6SL3320-1TE32-1AA3	6SL3320-1TE32-6AA3	6SL3320-1TE33-1AA3	6SL3320-1TE33-8AA3	6SL3320-1TE35-0AA3
<b>Pulse frequency <sup>1)</sup></b>						
• Rated frequency	kHz	2	2	2	2	2
• Pulse frequency, max.						
- Without current derating	kHz	2	2	2	2	2
- With current derating	kHz	8	8	8	8	8
<b>Power loss, max. <sup>2)</sup></b>						
• At 50 Hz 400 V	kW	1.86	2.5	2.96	3.67	4.28
• At 60 Hz 460 V	kW	1.94	2.6	3.1	3.8	4.5
<b>Cooling air requirement</b>		m <sup>3</sup> /s	0.17	0.23	0.36	0.36
<b>Sound pressure level <math>L_{pA}</math></b> (1 m) at 50/60 Hz		dB	64/67	64/67	69/73	69/73
<b>DC link connection</b> DCP, DCN			M10 screw	M10 screw	M10 screw	M10 screw
• Conductor cross-section, max. (IEC)	mm <sup>2</sup>	2 × 185	2 × 185	2 × 240	2 × 240	2 × 240
<b>Motor connection</b> U2, V2, W2			M10 screw	M10 screw	M10 screw	M10 screw
• Conductor cross-section, max. (IEC)	mm <sup>2</sup>	2 × 185	2 × 185	2 × 240	2 × 240	2 × 240
<b>Cable length, max. <sup>3)</sup></b>						
• Shielded	m	300	300	300	300	300
• Unshielded	m	450	450	450	450	450
<b>PE1/GND connection</b>			M10 screw	M10 screw	M10 screw	M10 screw
• Conductor cross-section, max. (IEC)	mm <sup>2</sup>	2 × 185	2 × 185	2 × 240	2 × 240	2 × 240
<b>PE2/GND connection</b>			M10 screw	M10 screw	M10 screw	M10 screw
• Conductor cross-section, max. (IEC)	mm <sup>2</sup>	2 × 185	2 × 185	2 × 240	2 × 240	2 × 240
<b>Degree of protection</b>			IP20	IP20	IP20	IP20
<b>Dimensions</b>						
• Width	mm	326	326	326	326	326
• Height	mm	1400	1400	1533	1533	1533
• Depth	mm	356	356	545	545	545
<b>Weight, approx.</b>		kg	95	95	136	136
<b>Frame size</b>			FX	FX	GX	GX

<sup>1)</sup> Information regarding the correlation between the pulse frequency and maximum output current/output frequency is provided in the SINAMICS Low Voltage Engineering Manual.

<sup>2)</sup> The specified power loss represents the maximum value at 100 % utilization. The value is lower under normal operating conditions.

<sup>3)</sup> Sum of all motor cables and DC link. Longer cable lengths for specific configurations are available on request. For additional information, please refer to the SINAMICS Low Voltage Engineering Manual.

## Technical data

Line voltage 380 ... 480 V 3 AC DC link voltage 510 ... 720 V DC		Motor Modules		
		6SL3320-1TE36-1AA3	6SL3320-1TE37-5AA3	6SL3320-1TE38-4AA3
<b>Type rating</b>				
• For $I_L$ (50 Hz 400 V) <sup>1)</sup>	kW	<b>315</b>	<b>400</b>	<b>450</b>
• For $I_H$ (50 Hz 400 V) <sup>1)</sup>	kW	250	315	400
• For $I_L$ (60 Hz 460 V) <sup>2)</sup>	hp	500	600	700
• For $I_H$ (60 Hz 460 V) <sup>2)</sup>	hp	350	450	600
<b>Output current</b>				
• Rated current $I_{NA}$	A	605	745	840
• Base load current $I_L$ <sup>3)</sup>	A	590	725	820
• Base load current $I_H$ <sup>4)</sup>	A	460	570	700
• Maximum current $I_{max A}$	A	885	1087	1230
<b>DC link current</b>				
• Rated current $I_{NDC}$ when supplied from				
- Basic/Smart Line Module	A	726	894	1008
- Active Line Module	A	653	805	907
• Base load current $I_{LDC}$ <sup>3)</sup> when supplied from				
- Basic/Smart Line Module	A	707	871	982
- Active Line Module	A	636	784	884
• Base load current $I_{HDC}$ <sup>4)</sup> when supplied from				
- Basic/Smart Line Module	A	646	795	897
- Active Line Module	A	581	716	807
<b>Current demand</b>				
• 24 V DC auxiliary power supply	A	1.0	1.0	1.0
• 400 V AC	A	3.6	3.6	3.6
<b>DC link capacitance</b>				
	μF	12600	15600	16800
<b>Pulse frequency <sup>5)</sup></b>				
• Rated frequency	kHz	1.25	1.25	1.25
• Pulse frequency, max.				
- Without current derating	kHz	1.25	1.25	1.25
- With current derating	kHz	7.5	7.5	7.5
<b>Power loss, max. <sup>6)</sup></b>				
• At 50 Hz 400 V	kW	5.84	6.68	7.15
• At 60 Hz 460 V	kW	6.3	7.3	7.8
<b>Cooling air requirement</b>				
	m <sup>3</sup> /s	0.78	0.78	0.78
<b>Sound pressure level <math>L_{pA}</math></b> (1 m) at 50/60 Hz				
	dB	70/73	70/73	70/73

<sup>1)</sup> Rated power of a typ. 6-pole standard induction motor based on  $I_L$  or  $I_H$  with 400 V 3 AC 50 Hz.

<sup>2)</sup> Rated power of a typ. 6-pole standard induction motor based on  $I_L$  or  $I_H$  with 460 V 3 AC 60 Hz.

<sup>3)</sup> The base load current  $I_L$  is the basis for a duty cycle of 110 % for 60 s or 150 % for 10 s with a duty cycle duration of 300 s.

<sup>4)</sup> The base load current  $I_H$  is the basis for a duty cycle of 150 % for 60 s or 160 % for 10 s with a duty cycle duration of 300 s.

<sup>5)</sup> Information regarding the correlation between the pulse frequency and maximum output current/output frequency is provided in the SINAMICS Low Voltage Engineering Manual.

<sup>6)</sup> The specified power loss represents the maximum value at 100 % utilization. The value is lower under normal operating conditions.

# SINAMICS S120 Chassis Format Units

## Air-cooled units

### Motor Modules

#### Technical data

Line voltage 380 ... 480 V 3 AC DC link voltage 510 ... 720 V DC		Motor Modules		
		6SL3320-1TE36-1AA3	6SL3320-1TE37-5AA3	6SL3320-1TE38-4AA3
<b>DC link connection</b> DCP, DCN		4 × hole for M10 Busbar	4 × hole for M10 Busbar	4 × hole for M10 Busbar
<b>Motor connection</b> U2, V2, W2		2 × M12 screw	2 × M12 screw	2 × M12 screw
• Conductor cross-section, max. (IEC)	mm <sup>2</sup>	4 × 240	4 × 240	4 × 240
<b>Cable length, max. <sup>1)</sup></b>				
• Shielded	m	300	300	300
• Unshielded	m	450	450	450
<b>PE1/GND connection</b>		M12 screw	M12 screw	M12 screw
• Conductor cross-section, max. (IEC)	mm <sup>2</sup>	240	240	240
<b>PE2/GND connection</b>		2 × M12 screw	2 × M12 screw	2 × M12 screw
• Conductor cross-section, max. (IEC)	mm <sup>2</sup>	2 × 240	2 × 240	2 × 240
<b>Degree of protection</b>		IP00	IP00	IP00
<b>Dimensions</b>				
• Width	mm	503	503	503
• Height	mm	1475	1475	1475
• Depth	mm	547	547	547
<b>Weight, approx.</b>	kg	290	290	290
<b>Frame size</b>		HX	HX	HX

<sup>1)</sup> Sum of all motor cables and DC link. Longer cable lengths for specific configurations are available on request. [For additional information, please refer to the SINAMICS Low Voltage Engineering Manual.](#)

## Technical data

Line voltage 380 ... 480 V 3 AC DC link voltage 510 ... 720 V DC		Motor Modules		
		6SL3320-1TE41-0AA3	6SL3320-1TE41-2AA3	6SL3320-1TE41-4AA3
<b>Type rating</b>				
• For $I_L$ (50 Hz 400 V) <sup>1)</sup>	kW	<b>560</b>	<b>710</b>	<b>800</b>
• For $I_H$ (50 Hz 400 V) <sup>1)</sup>	kW	450	560	710
• For $I_L$ (60 Hz 460 V) <sup>2)</sup>	hp	800	1000	1150
• For $I_H$ (60 Hz 460 V) <sup>2)</sup>	hp	700	900	1000
<b>Output current</b>				
• Rated current $I_{NA}$	A	985	1260	1405
• Base load current $I_L$ <sup>3)</sup>	A	960	1230	1370
• Base load current $I_H$ <sup>4)</sup>	A	860	1127	1257
• Maximum current $I_{max A}$	A	1440	1845	2055
<b>DC link current</b>				
• Rated current $I_{NDC}$ when supplied from				
- Basic/Smart Line Module	A	1182	1512	1686
- Active Line Module	A	1064	1361	1517
• Base load current $I_{LDC}$ <sup>3)</sup> when supplied from				
- Basic/Smart Line Module	A	1152	1474	1643
- Active Line Module	A	1037	1326	1479
• Base load current $I_{HDC}$ <sup>4)</sup> when supplied from				
- Basic/Smart Line Module	A	1051	1345	1500
- Active Line Module	A	946	1211	1350
<b>Current demand</b>				
• 24 V DC auxiliary power supply	A	1.25	1.40	1.40
• 400 V AC	A	5.4	5.4	5.4
<b>DC link capacitance</b>				
	μF	18900	26100	28800
<b>Pulse frequency</b> <sup>5)</sup>				
• Rated pulse frequency	kHz	1.25	1.25	1.25
• Pulse frequency, max.				
- Without current derating	kHz	1.25	1.25	1.25
- With current derating	kHz	7.5	7.5	7.5
<b>Power loss, max.</b> <sup>6)</sup>				
• At 50 Hz 400 V	kW	9.5	11.1	12.0
• At 60 Hz 460 V	kW	10.2	12.0	13.0
<b>Cooling air requirement</b>				
	m <sup>3</sup> /s	1.1	1.1	1.1
<b>Sound pressure level <math>L_{pA}</math></b> (1 m) at 50/60 Hz				
	dB	71/73	71/73	71/73

<sup>1)</sup> Rated power of a typ. 6-pole standard induction motor based on  $I_L$  or  $I_H$  with 400 V 3 AC 50 Hz.

<sup>2)</sup> Rated power of a typ. 6-pole standard induction motor based on  $I_L$  or  $I_H$  with 460 V 3 AC 60 Hz.

<sup>3)</sup> The base load current  $I_L$  is the basis for a duty cycle of 110 % for 60 s or 150 % for 10 s with a duty cycle duration of 300 s.

<sup>4)</sup> The base load current  $I_H$  is the basis for a duty cycle of 150 % for 60 s or 160 % for 10 s with a duty cycle duration of 300 s.

<sup>5)</sup> Information regarding the correlation between the pulse frequency and maximum output current/output frequency is provided in the SINAMICS Low Voltage Engineering Manual.

<sup>6)</sup> The specified power loss represents the maximum value at 100 % utilization. The value is lower under normal operating conditions.

# SINAMICS S120 Chassis Format Units

## Air-cooled units

### Motor Modules

#### Technical data

Line voltage 380 ... 480 V 3 AC DC link voltage 510 ... 720 V DC		Motor Modules		
		6SL3320-1TE41-0AA3	6SL3320-1TE41-2AA3	6SL3320-1TE41-4AA3
<b>DC link connection</b> DCP, DCN		4 × hole for M10 Busbar	4 × hole for M10 Busbar	4 × hole for M10 Busbar
<b>Motor connection</b> U2, V2, W2		3 × M12 screw	3 × M12 screw	3 × M12 screw
• Conductor cross-section, max. (IEC)		mm <sup>2</sup> 6 × 240	6 × 240	6 × 240
<b>Cable length, max. <sup>1)</sup></b>				
• Shielded		m 300	300	300
• Unshielded		m 450	450	450
<b>PE1/GND connection</b>		M12 screw	M12 screw	M12 screw
• Conductor cross-section, max. (IEC)		mm <sup>2</sup> 240	240	240
<b>PE2/GND connection</b>		3 × M12 screw	3 × M12 screw	3 × M12 screw
• Conductor cross-section, max. (IEC)		mm <sup>2</sup> 3 × 240	3 × 240	3 × 240
<b>Degree of protection</b>		IP00	IP00	IP00
<b>Dimensions</b>				
• Width		mm 704	704	704
• Height		mm 1475	1475	1475
• Depth		mm 549	549	549
<b>Weight, approx.</b>		kg 450	450	450
<b>Frame size</b>		JX	JX	JX

<sup>1)</sup> Sum of all motor cables and DC link. Longer cable lengths for specific configurations are available on request. [For additional information, please refer to the SINAMICS Low Voltage Engineering Manual.](#)



## Technical data

Line voltage 500 ... 690 V 3 AC DC link voltage 675 ... 1035 V DC		Motor Modules			
		6SL3320-1TG28-5AA3	6SL3320-1TG31-0AA3	6SL3320-1TG31-2AA3	6SL3320-1TG31-5AA3
<b>Type rating</b>					
• For $I_L$ (50 Hz 690 V) <sup>1)</sup>	kW	<b>75</b>	<b>90</b>	<b>110</b>	<b>132</b>
• For $I_H$ (50 Hz 690 V) <sup>1)</sup>	kW	55	75	90	110
• For $I_L$ (50 Hz 500 V) <sup>1)</sup>	kW	55	55	75	90
• For $I_H$ (50 Hz 500 V) <sup>1)</sup>	kW	45	55	75	90
• For $I_L$ (60 Hz 575 V) <sup>2)</sup>	hp	75	75	100	150
• For $I_H$ (60 Hz 575 V) <sup>2)</sup>	hp	75	75	100	125
<b>Output current</b>					
• Rated current $I_{NA}$	A	85	100	120	150
• Base load current $I_L$ <sup>3)</sup>	A	80	95	115	142
• Base load current $I_H$ <sup>4)</sup>	A	76	89	107	134
• Maximum current $I_{max A}$	A	120	142	172	213
<b>DC link current</b>					
• Rated current $I_{N DC}$ when supplied from					
- Basic/Smart Line Module	A	102	120	144	180
- Active Line Module	A	92	108	130	162
• Base load current $I_L DC$ <sup>3)</sup> when supplied from					
- Basic/Smart Line Module	A	99	117	140	175
- Active Line Module	A	89	105	126	157
• Base load current $I_H DC$ <sup>4)</sup> when supplied from					
- Basic/Smart Line Module	A	90	106	128	160
- Active Line Module	A	81	96	115	144
<b>Current demand</b>					
• 24 V DC auxiliary power supply	A	0.8	0.8	0.8	0.8
• 500 V AC	A	0.7	0.7	0.7	0.7
• 690 V AC	A	0.4	0.4	0.4	0.4
<b>DC link capacitance</b>					
	μF	1200	1200	1600	2800
<b>Pulse frequency <sup>5)</sup></b>					
• Rated frequency	kHz	1.25	1.25	1.25	1.25
• Pulse frequency, max.					
- Without current derating	kHz	1.25	1.25	1.25	1.25
- With current derating	kHz	7.5	7.5	7.5	7.5
<b>Power loss, max. <sup>6)</sup></b>					
• At 50 Hz 690 V	kW	1.17	1.43	1.89	1.80
• At 60 Hz 575 V	kW	1.1	1.3	1.77	1.62
<b>Cooling air requirement</b>					
	m <sup>3</sup> /s	0.17	0.17	0.17	0.17
<b>Sound pressure level <math>L_{pA}</math> (1 m) at 50/60 Hz</b>					
	dB	64/67	64/67	64/67	64/67

<sup>1)</sup> Rated power of a typ. 6-pole standard induction motor based on  $I_L$  or  $I_H$  at 500 V or 690 V 3 AC 50 Hz.

<sup>2)</sup> Rated power of a typ. 6-pole standard induction motor based on  $I_L$  or  $I_H$  at 575 V 3 AC 60 Hz.

<sup>3)</sup> The base load current  $I_L$  is the basis for a duty cycle of 110 % for 60 s or 150 % for 10 s with a duty cycle duration of 300 s.

<sup>4)</sup> The base load current  $I_H$  is the basis for a duty cycle of 150 % for 60 s or 160 % for 10 s with a duty cycle duration of 300 s.

<sup>5)</sup> Information regarding the correlation between the pulse frequency and maximum output current/output frequency is provided in the SINAMICS Low Voltage Engineering Manual.

<sup>6)</sup> The specified power loss represents the maximum value at 100 % utilization. The value is lower under normal operating conditions.

# SINAMICS S120 Chassis Format Units

## Air-cooled units

### Motor Modules

#### Technical data

Line voltage 500 ... 690 V 3 AC DC link voltage 675 ... 1035 V DC		Motor Modules			
		6SL3320-1TG28-5AA3	6SL3320-1TG31-0AA3	6SL3320-1TG31-2AA3	6SL3320-1TG31-5AA3
<b>DC link connection</b> DCP, DCN		M10 screw	M10 screw	M10 screw	M10 screw
• Conductor cross-section, max. (IEC)	mm <sup>2</sup>	2 × 185	2 × 185	2 × 185	2 × 185
<b>Motor connection</b> U2, V2, W2		M10 screw	M10 screw	M10 screw	M10 screw
• Conductor cross-section, max. (IEC)	mm <sup>2</sup>	2 × 185	2 × 185	2 × 185	2 × 185
<b>Cable length, max. <sup>1)</sup></b>					
• Shielded	m	300	300	300	300
• Unshielded	m	450	450	450	450
<b>PE1/GND connection</b>		M10 screw	M10 screw	M10 screw	M10 screw
• Conductor cross-section, max. (IEC)	mm <sup>2</sup>	2 × 185	2 × 185	2 × 185	2 × 185
<b>PE2/GND connection</b>		M10 screw	M10 screw	M10 screw	M10 screw
• Conductor cross-section, max. (IEC)	mm <sup>2</sup>	2 × 185	2 × 185	2 × 185	2 × 185
<b>Degree of protection</b>		IP20	IP20	IP20	IP20
<b>Dimensions</b>					
• Width	mm	326	326	326	326
• Height	mm	1400	1400	1400	1400
• Depth	mm	356	356	356	356
<b>Weight, approx.</b>	kg	95	95	95	95
<b>Frame size</b>		FX	FX	FX	FX

<sup>1)</sup> Sum of all motor cables and DC link. Longer cable lengths for specific configurations are available on request. [For additional information, please refer to the SINAMICS Low Voltage Engineering Manual.](#)

## Technical data

Line voltage 500 ... 690 V 3 AC DC link voltage 675 ... 1035 V DC		Motor Modules			
		6SL3320-1TG31-8AA3	6SL3320-1TG32-2AA3	6SL3320-1TG32-6AA3	6SL3320-1TG33-3AA3
<b>Type rating</b>					
• For $I_L$ (50 Hz 690 V) <sup>1)</sup>	kW	<b>160</b>	<b>200</b>	<b>250</b>	<b>315</b>
• For $I_H$ (50 Hz 690 V) <sup>1)</sup>	kW	132	160	200	250
• For $I_L$ (50 Hz 500 V) <sup>1)</sup>	kW	110	132	160	200
• For $I_H$ (50 Hz 500 V) <sup>1)</sup>	kW	90	110	132	160
• For $I_L$ (60 Hz 575 V) <sup>2)</sup>	hp	150	200	250	300
• For $I_H$ (60 Hz 575 V) <sup>2)</sup>	hp	150	200	200	250
<b>Output current</b>					
• Rated current $I_{NA}$	A	175	215	260	330
• Base load current $I_L$ <sup>3)</sup>	A	171	208	250	320
• Base load current $I_H$ <sup>4)</sup>	A	157	192	233	280
• Maximum current $I_{max A}$	A	255	312	375	480
<b>DC link current</b>					
• Rated current $I_{N DC}$ when supplied from					
- Basic/Smart Line Module	A	210	258	312	396
- Active Line Module	A	189	232	281	356
• Base load current $I_L DC$ <sup>3)</sup> when supplied from					
- Basic/Smart Line Module	A	204	251	304	386
- Active Line Module	A	184	226	273	347
• Base load current $I_H DC$ <sup>4)</sup> when supplied from					
- Basic/Smart Line Module	A	186	229	277	352
- Active Line Module	A	168	206	250	316
<b>Current demand</b>					
• 24 V DC auxiliary power supply	A	0.9	0.9	0.9	0.9
• 500 V AC	A	1.5	1.5	1.5	1.5
• 690 V AC	A	1.0	1.0	1.0	1.0
<b>DC link capacitance</b>					
	μF	2800	2800	3900	4200
<b>Pulse frequency <sup>5)</sup></b>					
• Rated frequency	kHz	1.25	1.25	1.25	1.25
• Pulse frequency, max.					
- Without current derating	kHz	1.25	1.25	1.25	1.25
- With current derating	kHz	7.5	7.5	7.5	7.5
<b>Power loss, max. <sup>6)</sup></b>					
• At 50 Hz 690 V	kW	2.67	3.09	3.62	4.34
• At 60 Hz 575 V	kW	2.5	2.91	3.38	3.98
<b>Cooling air requirement</b>					
	m <sup>3</sup> /s	0.36	0.36	0.36	0.36
<b>Sound pressure level <math>L_{pA}</math> (1 m) at 50/60 Hz</b>					
	dB	69/73	69/73	69/73	69/73

<sup>1)</sup> Rated power of a typ. 6-pole standard induction motor based on  $I_L$  or  $I_H$  at 500 V or 690 V 3 AC 50 Hz.

<sup>2)</sup> Rated power of a typ. 6-pole standard induction motor based on  $I_L$  or  $I_H$  at 575 V 3 AC 60 Hz.

<sup>3)</sup> The base load current  $I_L$  is the basis for a duty cycle of 110 % for 60 s or 150 % for 10 s with a duty cycle duration of 300 s.

<sup>4)</sup> The base load current  $I_H$  is the basis for a duty cycle of 150 % for 60 s or 160 % for 10 s with a duty cycle duration of 300 s.

<sup>5)</sup> Information regarding the correlation between the pulse frequency and maximum output current/output frequency is provided in the SINAMICS Low Voltage Engineering Manual.

<sup>6)</sup> The specified power loss represents the maximum value at 100 % utilization. The value is lower under normal operating conditions.

# SINAMICS S120 Chassis Format Units

## Air-cooled units

### Motor Modules

#### Technical data

Line voltage 500 ... 690 V 3 AC DC link voltage 675 ... 1035 V DC		Motor Modules			
		6SL3320-1TG31-8AA3	6SL3320-1TG32-2AA3	6SL3320-1TG32-6AA3	6SL3320-1TG33-3AA3
<b>DC link connection</b> DCP, DCN		M10 screw	M10 screw	M10 screw	M10 screw
• Conductor cross-section, max. (IEC)	mm <sup>2</sup>	2 × 240	2 × 240	2 × 240	2 × 240
<b>Motor connection</b> U2, V2, W2		M10 screw	M10 screw	M10 screw	M10 screw
• Conductor cross-section, max. (IEC)	mm <sup>2</sup>	2 × 240	2 × 240	2 × 240	2 × 240
<b>Cable length, max. <sup>1)</sup></b>					
• Shielded	m	300	300	300	300
• Unshielded	m	450	450	450	450
<b>PE1/GND connection</b>		M10 screw	M10 screw	M10 screw	M10 screw
• Conductor cross-section, max. (IEC)	mm <sup>2</sup>	2 × 240	2 × 240	2 × 240	2 × 240
<b>PE2/GND connection</b>		M10 screw	M10 screw	M10 screw	M10 screw
• Conductor cross-section, max. (IEC)	mm <sup>2</sup>	2 × 240	2 × 240	2 × 240	2 × 240
<b>Degree of protection</b>		IP20	IP20	IP20	IP20
<b>Dimensions</b>					
• Width	mm	326	326	326	326
• Height	mm	1533	1533	1533	1533
• Depth	mm	545	545	545	545
<b>Weight, approx.</b>	kg	136	136	136	136
<b>Frame size</b>		GX	GX	GX	GX

<sup>1)</sup> Sum of all motor cables and DC link. Longer cable lengths for specific configurations are available on request. [For additional information, please refer to the SINAMICS Low Voltage Engineering Manual.](#)

## Technical data

Line voltage 500 ... 690 V 3 AC DC link voltage 675 ... 1035 V DC		Motor Modules			
		6SL3320-1TG34-1AA3	6SL3320-1TG34-7AA3	6SL3320-1TG35-8AA3	6SL3320-1TG37-4AA3
<b>Type rating</b>					
• For $I_L$ (50 Hz 690 V) <sup>1)</sup>	kW	400	450	560	710
• For $I_H$ (50 Hz 690 V) <sup>1)</sup>	kW	315	400	450	630
• For $I_L$ (50 Hz 500 V) <sup>1)</sup>	kW	250	315	400	500
• For $I_H$ (50 Hz 500 V) <sup>1)</sup>	kW	200	250	315	450
• For $I_L$ (60 Hz 575 V) <sup>2)</sup>	hp	400	450	600	700
• For $I_H$ (60 Hz 575 V) <sup>2)</sup>	hp	350	450	500	700
<b>Output current</b>					
• Rated current $I_{NA}$	A	410	465	575	735
• Base load current $I_L$ <sup>3)</sup>	A	400	452	560	710
• Base load current $I_H$ <sup>4)</sup>	A	367	416	514	657
• Maximum current $I_{max A}$	A	600	678	840	1065
<b>DC link current</b>					
• Rated current $I_{N DC}$ when supplied from					
- Basic/Smart Line Module	A	492	558	690	882
- Active Line Module	A	443	502	621	794
• Base load current $I_L DC$ <sup>3)</sup> when supplied from					
- Basic/Smart Line Module	A	479	544	672	859
- Active Line Module	A	431	489	605	774
• Base load current $I_H DC$ <sup>4)</sup> when supplied from					
- Basic/Smart Line Module	A	437	496	614	784
- Active Line Module	A	394	446	552	706
<b>Current demand</b>					
• 24 V DC auxiliary power supply	A	1.0	1.0	1.0	1.25
• 500 V AC	A	3.0	3.0	3.0	4.4
• 690 V AC	A	2.1	2.1	2.1	3.1
<b>DC link capacitance</b>					
	μF	7400	7400	7400	11100
<b>Pulse frequency <sup>5)</sup></b>					
• Rated frequency	kHz	1.25	1.25	1.25	1.25
• Pulse frequency, max.					
- Without current derating	kHz	1.25	1.25	1.25	1.25
- With current derating	kHz	7.5	7.5	7.5	7.5
<b>Power loss, max. <sup>6)</sup></b>					
• At 50 Hz 690 V	kW	6.13	6.80	10.3	10.9
• At 60 Hz 575 V	kW	5.71	6.32	9.7	10
<b>Cooling air requirement</b>					
	m <sup>3</sup> /s	0.78	0.78	0.78	1.474
<b>Sound pressure level <math>L_{pA}</math> (1 m) at 50/60 Hz</b>					
	dB	70/73	70/73	70/73	71/73

<sup>1)</sup> Rated power of a typ. 6-pole standard induction motor based on  $I_L$  or  $I_H$  at 500 V or 690 V 3 AC 50 Hz.

<sup>2)</sup> Rated power of a typ. 6-pole standard induction motor based on  $I_L$  or  $I_H$  at 575 V 3 AC 60 Hz.

<sup>3)</sup> The base load current  $I_L$  is the basis for a duty cycle of 110 % for 60 s or 150 % for 10 s with a duty cycle duration of 300 s.

<sup>4)</sup> The base load current  $I_H$  is the basis for a duty cycle of 150 % for 60 s or 160 % for 10 s with a duty cycle duration of 300 s.

<sup>5)</sup> Information regarding the correlation between the pulse frequency and maximum output current/output frequency is provided in the SINAMICS Low Voltage Engineering Manual.

<sup>6)</sup> The specified power loss represents the maximum value at 100 % utilization. The value is lower under normal operating conditions.

# SINAMICS S120 Chassis Format Units

## Air-cooled units

### Motor Modules

#### Technical data

Line voltage 500 ... 690 V 3 AC DC link voltage 675 ... 1035 V DC		Motor Modules			
		6SL3320-1TG34-1AA3	6SL3320-1TG34-7AA3	6SL3320-1TG35-8AA3	6SL3320-1TG37-4AA3
<b>DC link connection</b> DCP, DCN		4 × hole for M10 Busbar	4 × hole for M10 Busbar	4 × hole for M10 Busbar	4 × hole for M10 Busbar
<b>Motor connection</b> U2, V2, W2		2 × M12 screw	2 × M12 screw	2 × M12 screw	3 × M12 screw
• Conductor cross-section, max. (IEC)	mm <sup>2</sup>	4 × 240	4 × 240	4 × 240	6 × 240
<b>Cable length, max. <sup>1)</sup></b>					
• Shielded	m	300	300	300	300
• Unshielded	m	450	450	450	450
<b>PE1/GND connection</b>		M12 screw	M12 screw	M12 screw	M12 screw
• Conductor cross-section, max. (IEC)	mm <sup>2</sup>	240	240	240	240
<b>PE2/GND connection</b>		2 × M12 screw	2 × M12 screw	2 × M12 screw	3 × M12 screw
• Conductor cross-section, max. (IEC)	mm <sup>2</sup>	2 × 240	2 × 240	2 × 240	3 × 240
<b>Degree of protection</b>		IP00	IP00	IP00	IP00
<b>Dimensions</b>					
• Width	mm	503	503	503	704
• Height	mm	1475	1475	1475	1475
• Depth	mm	547	547	547	550
<b>Weight, approx.</b>	kg	290	290	290	450
<b>Frame size</b>		HX	HX	HX	JX

<sup>1)</sup> Sum of all motor cables and DC link. Longer cable lengths for specific configurations are available on request. [For additional information, please refer to the SINAMICS Low Voltage Engineering Manual.](#)

## Technical data

Line voltage 500 ... 690 V 3 AC DC link voltage 675 ... 1035 V DC		Motor Modules			
		6SL3320-1TG38-1AA3	6SL3320-1TG38-8AA3	6SL3320-1TG41-0AA3	6SL3320-1TG41-3AA3
<b>Type rating</b>					
• For $I_L$ (50 Hz 690 V) <sup>1)</sup>	kW	<b>800</b>	<b>900</b>	<b>1000</b>	<b>1200</b>
• For $I_H$ (50 Hz 690 V) <sup>1)</sup>	kW	710	800	900	1000
• For $I_L$ (50 Hz 500 V) <sup>1)</sup>	kW	560	630	710	900
• For $I_H$ (50 Hz 500 V) <sup>1)</sup>	kW	500	560	630	800
• For $I_L$ (60 Hz 575 V) <sup>2)</sup>	hp	800	900	1000	1250
• For $I_H$ (60 Hz 575 V) <sup>2)</sup>	hp	700	800	900	1000
<b>Output current</b>					
• Rated current $I_{NA}$	A	810	910	1025	1270
• Base load current $I_L$ <sup>3)</sup>	A	790	880	1000	1230
• Base load current $I_H$ <sup>4)</sup>	A	724	814	917	1136
• Maximum current $I_{max A}$	A	1185	1320	1500	1845
<b>DC link current</b>					
• Rated current $I_{N DC}$ when supplied from					
- Basic/Smart Line Module	A	972	1092	1230	1524
- Active Line Module	A	875	983	1107	1372
• Base load current $I_L DC$ <sup>3)</sup> when supplied from					
- Basic/Smart Line Module	A	947	1064	1199	1485
- Active Line Module	A	853	958	1079	1337
• Base load current $I_H DC$ <sup>4)</sup> when supplied from					
- Basic/Smart Line Module	A	865	971	1094	1356
- Active Line Module	A	778	874	985	1221
<b>Current demand</b>					
• 24 V DC auxiliary power supply	A	1.25	1.4	1.4	1.4
• 500 V AC	A	4.4	4.4	4.4	4.4
• 690 V AC	A	3.1	3.1	3.1	3.1
<b>DC link capacitance</b>					
	μF	11100	14400	14400	19200
<b>Pulse frequency <sup>5)</sup></b>					
• Rated frequency	kHz	1.25	1.25	1.25	1.25
• Pulse frequency, max.					
- Without current derating	kHz	1.25	1.25	1.25	1.25
- With current derating	kHz	7.5	7.5	7.5	7.5
<b>Power loss, max. <sup>6)</sup></b>					
• At 50 Hz 690 V	kW	11.5	11.7	13.2	16.0
• At 60 Hz 575 V	kW	10.5	10.6	12.0	14.2
<b>Cooling air requirement</b>					
	m <sup>3</sup> /s	1.474	1.474	1.474	1.474
<b>Sound pressure level <math>L_{pA}</math> (1 m) at 50/60 Hz</b>					
	dB	71/73	71/73	71/73	71/73

<sup>1)</sup> Rated power of a typ. 6-pole standard induction motor based on  $I_L$  or  $I_H$  at 500 V or 690 V 3 AC 50 Hz.

<sup>2)</sup> Rated power of a typ. 6-pole standard induction motor based on  $I_L$  or  $I_H$  at 575 V 3 AC 60 Hz.

<sup>3)</sup> The base load current  $I_L$  is the basis for a duty cycle of 110 % for 60 s or 150 % for 10 s with a duty cycle duration of 300 s.

<sup>4)</sup> The base load current  $I_H$  is the basis for a duty cycle of 150 % for 60 s or 160 % for 10 s with a duty cycle duration of 300 s.

<sup>5)</sup> Information regarding the correlation between the pulse frequency and maximum output current/output frequency is provided in the SINAMICS Low Voltage Engineering Manual.

<sup>6)</sup> The specified power loss represents the maximum value at 100 % utilization. The value is lower under normal operating conditions.



# SINAMICS S120 Chassis Format Units

## Air-cooled units

### Motor Modules

#### Technical data

Line voltage 500 ... 690 V 3 AC DC link voltage 675 ... 1035 V DC		Motor Modules			
		6SL3320-1TG38-1AA3	6SL3320-1TG38-8AA3	6SL3320-1TG41-0AA3	6SL3320-1TG41-3AA3
<b>DC link connection</b> DCP, DCN		4 × hole for M10 Busbar	4 × hole for M10 Busbar	4 × hole for M10 Busbar	4 × hole for M10 Busbar
<b>Motor connection</b> U2, V2, W2		3 × M12 screw	3 × M12 screw	3 × M12 screw	3 × M12 screw
• Conductor cross-section, max. (IEC)	mm <sup>2</sup>	6 × 240	6 × 240	6 × 240	6 × 240
<b>Cable length, max. <sup>1)</sup></b>					
• Shielded	m	300	300	300	300
• Unshielded	m	450	450	450	450
<b>PE1/GND connection</b>		M12 screw	M12 screw	M12 screw	M12 screw
• Conductor cross-section, max. (IEC)	mm <sup>2</sup>	240	240	240	240
<b>PE2/GND connection</b>		3 × M12 screw	3 × M12 screw	3 × M12 screw	3 × M12 screw
• Conductor cross-section, max. (IEC)	mm <sup>2</sup>	3 × 240	3 × 240	3 × 240	3 × 240
<b>Degree of protection</b>		IP00	IP00	IP00	IP00
<b>Dimensions</b>					
• Width	mm	704	704	704	704
• Height	mm	1480	1480	1480	1480
• Depth	mm	549	549	549	549
<b>Weight, approx.</b>	kg	450	450	450	450
<b>Frame size</b>		JX	JX	JX	JX

<sup>1)</sup> Sum of all motor cables and DC link. Longer cable lengths for specific configurations are available on request. [For additional information, please refer to the SINAMICS Low Voltage Engineering Manual.](#)

## Mounting device for power blocks

## Overview



Power block mounting device for installing and removing the power blocks for the Basic Line Modules, Smart Line Modules, Active Line Modules and Motor Modules in chassis format.

The mounting device is a mounting aid. It is placed in front of the module and attached to the module. The telescopic rails allow the device to be adjusted to the installation height of the power blocks.

Once the mechanical and electrical connections have been released, the power block can be removed from the module.

The power block is guided and supported by the guide rails on the handling device.

## Selection and ordering data

Description	Order No.
<b>Mounting device</b> for installing and removing power blocks	<b>6SL3766-1FA00-0AA0</b>

# SINAMICS S120 Chassis Format Units

## Liquid-cooled units

### Liquid-cooled units

#### Overview



The SINAMICS S120 liquid-cooled drive units are specifically designed to address the requirements relating to liquid cooling; they are characterized by their high power density and optimized footprint. Liquid cooling dissipates heat much more efficiently than air cooling systems. As a result, liquid-cooled units are much more compact than air-cooled units with the same power rating. Since the power losses generated by the electronic components are almost completely dissipated by the liquid coolant, only very small cooling fans are required. This makes the drive units extremely quiet in operation. Due to their compact dimensions and almost negligible cooling air requirement, liquid-cooled units are the preferred solution wherever installation space is restricted and/or the ambient operating conditions are rough.

Control cabinets with liquid cooling are easy to implement as hermetically sealed units with degrees of protection of IP54 or higher.

The product portfolio includes the following liquid-cooled SINAMICS S120 chassis units:

- Ready-to-connect AC/AC units:
  - Power Modules
- Infeed units:
  - Basic Line Modules
  - Active Line Modules
- Inverters (Motor Modules)

System components such as line reactors, Active Interface Modules, motor reactors and motor filters are air-cooled.

#### *Highlights of the liquid-cooled units*

- Up to a 60 % smaller footprint than air-cooled drive converters
- All main components such as power semiconductors, DC link capacitors and balancing resistors are cooled by the cooling circuit
- Only a low flow rate is required
- Uniform pressure drop of 0.7 bar
- Automatic protective functions
- Plated busbars
- Extremely quiet with < 56 dB
- Compatible with all components and functions and tools of the SINAMICS system family
- The power rating can be extended by connecting units in parallel
- No equipment fans

#### Cabinet units in liquid-cooled version

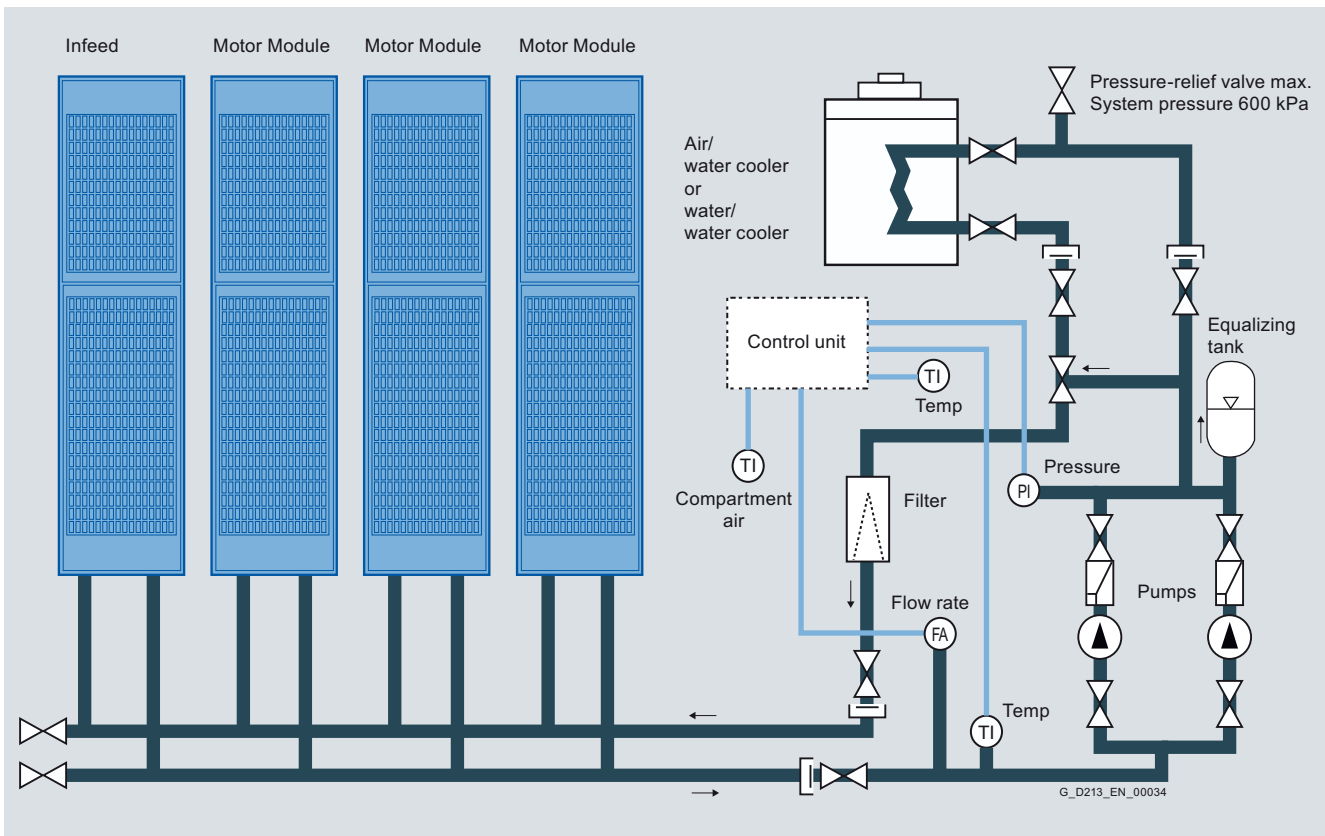
Liquid-cooled SINAMICS S120 drive units are also available as cabinet units, including cooling system. These are tailored to the specific requirements and represent a tailor-made, all-in-one solution for every drive task. You can obtain information about these units from your local Siemens office.

# SINAMICS S120 Chassis Format Units

## Liquid-cooled units

### Liquid-cooled units

#### Overview



Example of a drive line-up with SINAMICS S120 liquid-cooled

# SINAMICS S120 Chassis Format Units

## Liquid-cooled units

### Liquid-cooled units

#### Technical data

##### General technical specifications

Unless clearly specified otherwise, the following technical data are valid for all the following components of the liquid-cooled SINAMICS S120 drive system in the chassis format.

Electrical specifications	
<b>Rated voltages</b>	380 ... 480 V 3 AC, $\pm 10\%$ (-15 % < 1 min) 500 ... 690 V 3 AC, $\pm 10\%$ (-15 % < 1 min)
<b>Line supply types</b>	Grounded TN/TT systems and non-grounded IT systems
<b>Line frequency</b>	47 ... 63 Hz
<b>Overvoltage category</b>	III to EN 61800-5-1
<b>Electronics power supply</b>	24 V DC, -15 % +20 % implemented as PELV circuit in accordance with EN 61800-5-1 Ground = negative pole grounded via the electronics
<b>Rated short-circuit current SCCR (Short Circuit Current Rating)</b> according to UL508C (up to 600 V), in conjunction with the specified fuses or circuit breakers	
Rated power	
• 1.1 ... 447 kW	65 kA
• 448 ... 671 kW	84 kA
• 672 ... 1193 kW	170 kA
• > 1194 kW	200 kA
<b>Control method</b>	Vector/servo control with and without encoder or V/f control
<b>Fixed speeds</b>	15 fixed speeds plus 1 minimum speed, parameterizable (in the default setting, 3 fixed setpoints plus 1 minimum speed are selectable using terminal block/PROFIBUS/PROFINET)
<b>Skipped speed ranges</b>	4, parameterizable
<b>Setpoint resolution</b>	0.001 rpm digital (14 bits + sign) 12 bit analog
<b>Braking operation</b>	With Active Line Modules and Smart Line Modules, four-quadrant operation as standard (energy recovery). With Basic Line Modules, single-quadrant operation as standard. Braking when the power fails using an optional braking module.

## Technical data

## Mechanical specifications

<b>Degree of protection</b>	IP00 or IP20 dependent on type	
<b>Protection class</b>	I acc. to EN 61800-5-1	
<b>Touch protection</b>	EN 50274/BGV A3 (for the intended purpose)	
<b>Type of cooling</b>	Liquid cooling with integrated heat exchanger in aluminum or stainless steel version	
<b>Cooling circuit</b>	<ul style="list-style-type: none"> <li>• System pressure with respect to the atmosphere, max. 600 kPa</li> <li>• Pressure drop at rated volumetric flow 70 kPa</li> <li>• Recommended pressure range 80 ... 200 kPa</li> <li>• Inlet temperature of liquid coolant Dependent on the ambient temperature, condensation is not permitted 0 ... 45 °C without derating &gt; 45 ... 50 °C, see derating data Temperature range between 0 °C and 5 °C only with antifreeze (recommended antifreeze "Antifrogen N" from the Clariant company)</li> </ul>	
<b>Coolant quality</b>	for aluminum heat sinks	for stainless steel heat sinks
• Coolant basis	Deionized water with reduced conductivity (5 ... 10 µS/cm), e.g.: • "Battery water" with 0.2 % inhibitor, Nalco TRAC100 (manufacturer: Nalco) or Antifrogen N with a component X of 20 % < X ≤ 45 % (manufacturer: Clariant) • or filtered drinking water with 0.2 % inhibitor, Nalco TRAC100 (manufacturer: Nalco) or Antifrogen N with a component X of 20 % < X ≤ 45 % (manufacturer: Clariant) with the following quality:	Filtered drinking water with the following quality:
• Chloride ions	< 40 mg/l, if required, achieved by adding deionized water	< 200 mg/l
• Sulfate ions	< 50 mg/l	< 240 mg/l
• Nitrate ions	< 50 mg/l	< 50 mg/l
• pH value	5.5 ... 8.0	6.5 ... 9.0
• Conductivity	< 500 µS/cm	< 2000 µS/cm
• Total hardness	< 1.7 mmol/l	< 1.7 mmol/l
• Dissolved substances	< 340 mg/l	< 340 mg/l
• Grain size of particles in the water	< 100 µm	< 100 µm
	The coolant definition specified here should only be considered as recommendation. For units that have been shipped, the information and data provided in the equipment manual supplied must be observed!	

A detailed description of the cooling circuits and the recommended coolant is given in the SINAMICS Low Voltage Engineering Manual on the CD-ROM provided with the catalog.

# SINAMICS S120 Chassis Format Units

## Liquid-cooled units

### Liquid-cooled units

#### Technical data

Ambient conditions	Storage <sup>1)</sup>	Transport <sup>1)</sup>	Operation
<b>Ambient temperature (air)</b>	-40 ... +70 °C Class 1K3 acc. to EN 60721-3-1	-40 ... +70 °C Class 2K4 acc. to EN 60721-3-2	<u>Line-side components, Power Modules, Line Modules and Motor Modules:</u> 0 ... 45 °C without derating 45 ... 50 °C, see derating data <u>Control Units, supplementary system components, DC link components and Sensor Modules</u> 0 ... 50 °C
<b>Relative humidity</b> Condensation, splashwater, and ice formation not permitted (EN 60204, Part 1)	<u>5 ... 95 % <sup>2)</sup></u> Class 1K4 acc. to EN 60721-3-1	5 ... 95 % at 40 °C Class 2K3 acc. to EN 60721-3-2	<u>5 ... 95 % <sup>2)</sup></u> Class 3K3 acc. to EN 60721-3-3
<b>Environmental class/ harmful chemical substances</b>	Class 1C2 acc. to EN 60721-3-1	Class 2C2 acc. to EN 60721-3-2	Class 3C2 acc. to EN 60721-3-3
<b>Organic/ biological influences</b>	Class 1B1 acc. to EN 60721-3-1	Class 2B1 acc. to EN 60721-3-2	Class 3B1 acc. to EN 60721-3-3
<b>Degree of pollution</b>	2 acc. to EN 61800-5-1	2 acc. to EN 61800-5-1	2 acc. to EN 61800-5-1
<b>Installation altitude</b>	Up to 2000 m above sea level without derating > 2000 m above sea level, see derating data	Up to 2000 m above sea level without derating > 2000 m above sea level, see derating data	Up to 2000 m above sea level without derating > 2000 m above sea level, see derating data
Mechanical stability	Storage <sup>1)</sup>	Transport <sup>1)</sup>	Operation
<b>Vibration load</b>		Class 2M2 acc. to EN 60721-3-2	Test values acc. to EN 60068-2-6 test Fc: • 10 ... 58 Hz with constant deflection 0.075 mm • 58 ... 150 Hz with the constant acceleration 9.81 m/s <sup>2</sup> (1 × g)
<b>Shock load</b>		Class 2M2 acc. to EN 60721-3-2	Test values acc. to EN 60068-2-27 test Ea: 98 m/s <sup>2</sup> (10 × g)/20 ms
Compliance with standards			
<b>Conformances/ approvals, according to</b>	CE (EMC Directive No. 2004/108/EC and Low-Voltage Directive No. 2006/95/EC) cULus (only for devices connected to line supply voltages 380 ... 480 V 3 AC and 500 ... 600 V 3 AC) (see Appendix)		
<b>Radio interference suppression</b>	SINAMICS drive converter systems are not designed for connection to the public network (first environment). <u>Radio interference suppression</u> is compliant with the EMC product standard for variable-speed drives EN 61800-3, "Second environment" (industrial line supplies). The equipment can cause electromagnetic interference when it is connected to the public network. However, if supplementary measures are taken (e.g. → line filter), it can also be operated in the "first environment".		

<sup>1)</sup> In transport packaging.

<sup>2)</sup> Deviations with respect to the specified class are underlined.



### Characteristic curves

#### Overload capability

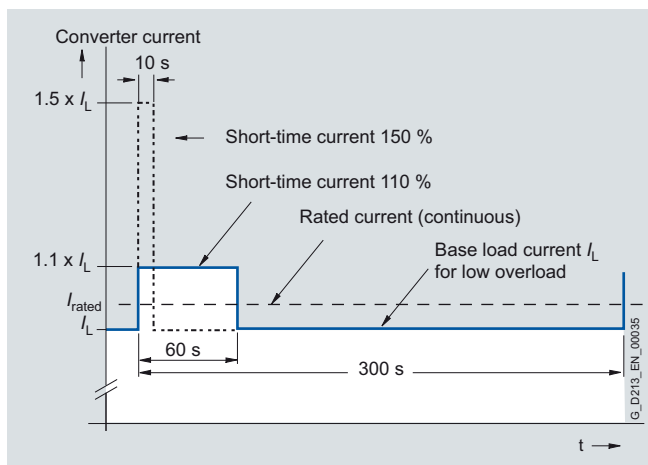
SINAMICS S120 Liquid Cooled units have an overload reserve, e.g. to handle breakaway torques. If larger surge loads occur, this must be taken into account when configuring. In drives with overload requirements, the appropriate base load current must, therefore, be used as a basis for the required load.

The permissible overload levels are valid under the prerequisite that the drive units are operated with their base load current before and after the overload condition based on a duty cycle duration of 300 s.

For short, repeating load cycles with significant load fluctuations within the load cycle, the appropriate sections in the SINAMICS Low Voltage Engineering Manual must be observed (as PDF file on the CD-ROM provided with the catalog).

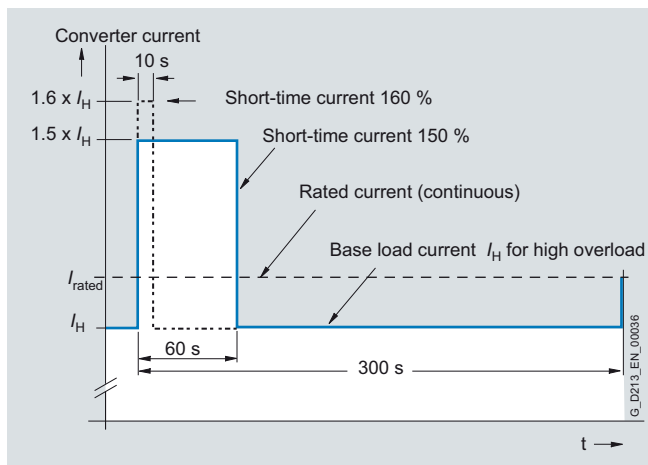
#### Power Modules and Motor Modules

The base load current for a low overload  $I_L$  is the basis for a duty cycle of 110 % for 60 s or 150 % for 10 s.



Low overload

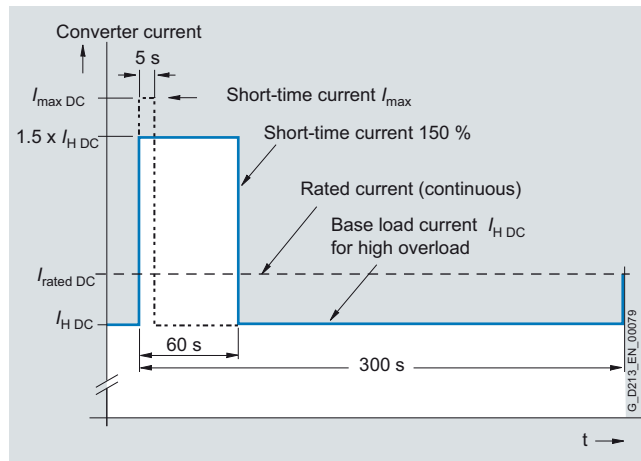
The base load current for a high overload  $I_H$  is the basis for a duty cycle of 150 % for 60 s or 160 % for 10 s.



High overload

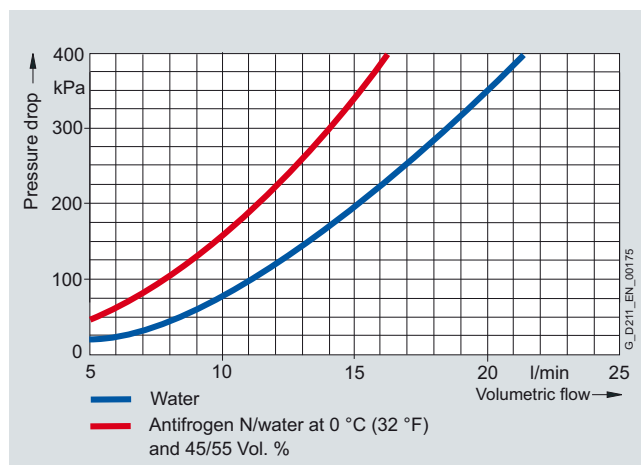
#### Line Modules

The base load current for a high overload  $I_{HDC}$  is the basis for a duty cycle of 150 % for 60 s or  $I_{max DC}$  for 5 s.

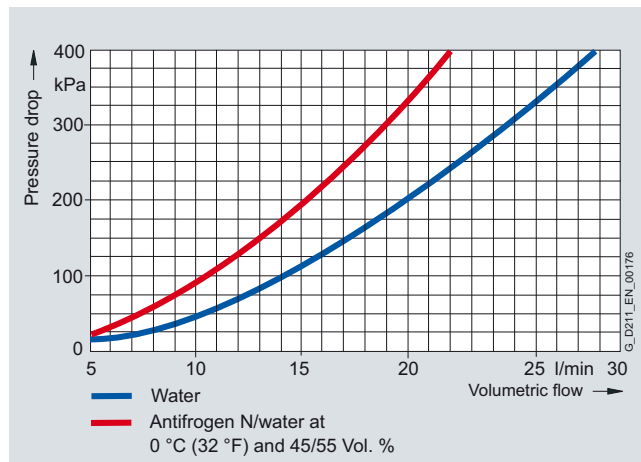


High overload

#### Pressure drop



Pressure drop for frame size FL



Pressure drop for frame size GL

2

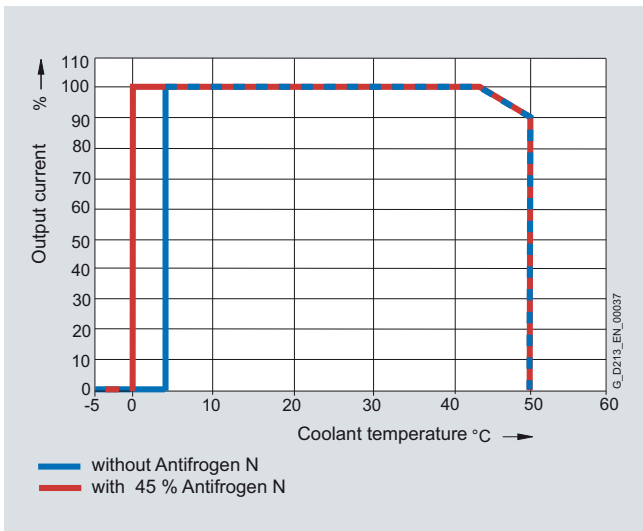
# SINAMICS S120 Chassis Format Units

## Liquid-cooled units

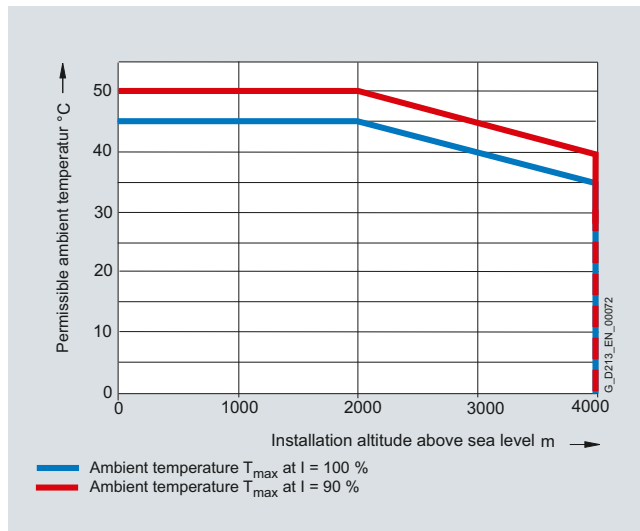
### Liquid-cooled units

#### Characteristic curves

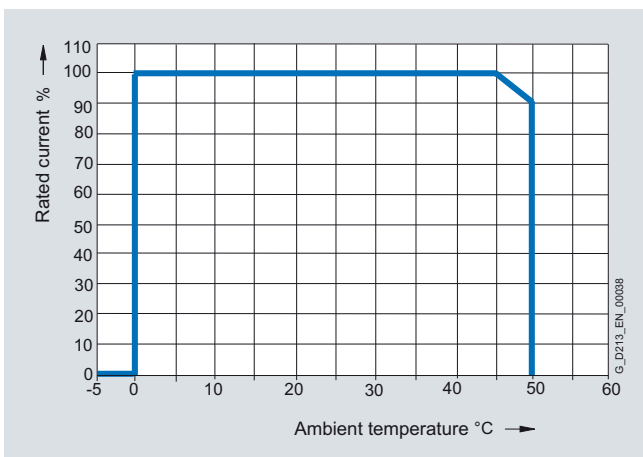
2



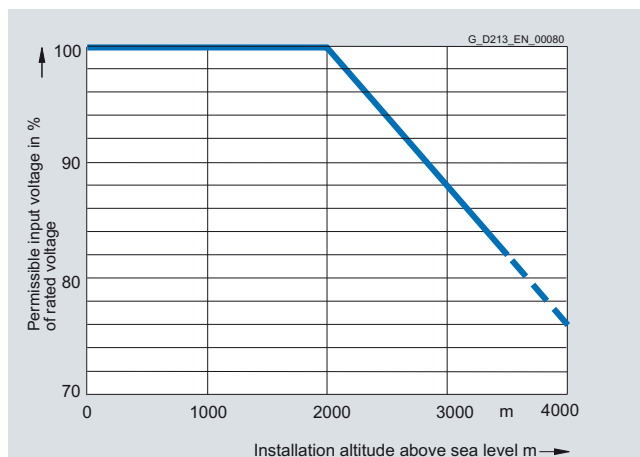
Current derating as a function of the temperature of the cooling liquid



Permissible ambient temperature as a function of installation altitude



Current derating as a function of ambient temperature



Voltage derating as a function of installation altitude

# SINAMICS S120 Chassis Format Units

## Liquid-cooled units

### Power Modules

#### Overview



The Power Module comprises a line rectifier, a DC link and an inverter to supply the motor.

Power Modules are designed for drives that are not capable of regenerating energy to the mains supply. Regenerative energy produced while braking is converted to heat using braking resistors.

Liquid-cooled Power Modules are suitable for applications where space is restricted and for plants/machines that cannot be equipped with air-cooled units due to critical environmental conditions.

#### Design

The liquid-cooled Power Modules have the following interfaces as standard:

- 1 line supply connection
- 1 DC link connection
- 3 DRIVE-CLiQ sockets
- 1 Safe stop input (enable pulses)
- 1 temperature sensor input (KTY84-130, PTC or Pt100)
- 1 connection for the 24 V DC electronics power supply
- 1 motor connection
- 2 PE/protective conductor connections
- 2 coolant connections

The CU310 Control Unit can be integrated into the liquid-cooled Power Modules.

The scope of supply of the Power Modules includes:

- 1 DRIVE-CLiQ cable for connection to the CU310 Control Unit
- 1 CD-ROM with Manual in the PDF format
- 2 seals for coolant connections

#### Selection and ordering data

Type rating at 400 V kW	Rated output current A	Power Module Order No.
<b>Line voltage 380 ... 480 V 3 AC</b>		
110	210	<b>6SL3315-1TE32-1AA3</b>
132	260	<b>6SL3315-1TE32-6AA3</b>
160	310	<b>6SL3315-1TE33-1AA3</b>
250	490	<b>6SL3315-1TE35-0AA3</b>

Description	Order No.
-------------	-----------

#### Accessories for re-ordering

Description	Order No.
<b>Warning labels in 16 languages</b> Using this set of labels, another language can be placed over the German or English labels available as standard. A set of labels is provided with the devices. The following languages are available once in the set of labels: Chinese (simplified), Danish, Finnish, French, Greek, Italian, Japanese, Korean, Dutch, Polish, Portuguese/Brazilian, Russian, Swedish, Spanish, Czech, Turkish	<b>6SL3166-3AB00-0AA0</b>
<b>Dust protection blanking plugs</b> (50 units) For DRIVE-CLiQ port	<b>6SL3066-4CA00-0AA0</b>

[Line and motor-side components \(→ System components\).](#)

Description	Order No.
-------------	-----------

#### Accessories

<b>3-way valve DN15 ¾" connection <sup>1)</sup></b>	<b>VXP45.15-2.5</b>
<b>Actuator drive for 3-way valve <sup>1)</sup></b>	
• 230 V 1 AC	<b>SSC31</b>
• 24 V 1 AC	<b>SSC81</b>

#### Derating data

The following derating factors must be taken into account when using the units:

Liquid-cooled Power Module, chassis format	Rated output current A	Derating factor at the pulse frequency	
		2.5 kHz	4 kHz
6SL3315-...	A	0.95	0.82
1TE32-1AA3	210	0.95	0.83
1TE32-6AA3	260	0.97	0.88
1TE33-1AA3	310	0.94	0.78
1TE35-0AA3	490		

Output current as a function of the pulse frequency

<sup>1)</sup> Recommended components to configure closed-loop flow control as anti-condensation protection; manufacturer: Siemens SBT.  
 For additional information, refer to the manual.

# SINAMICS S120 Chassis Format Units

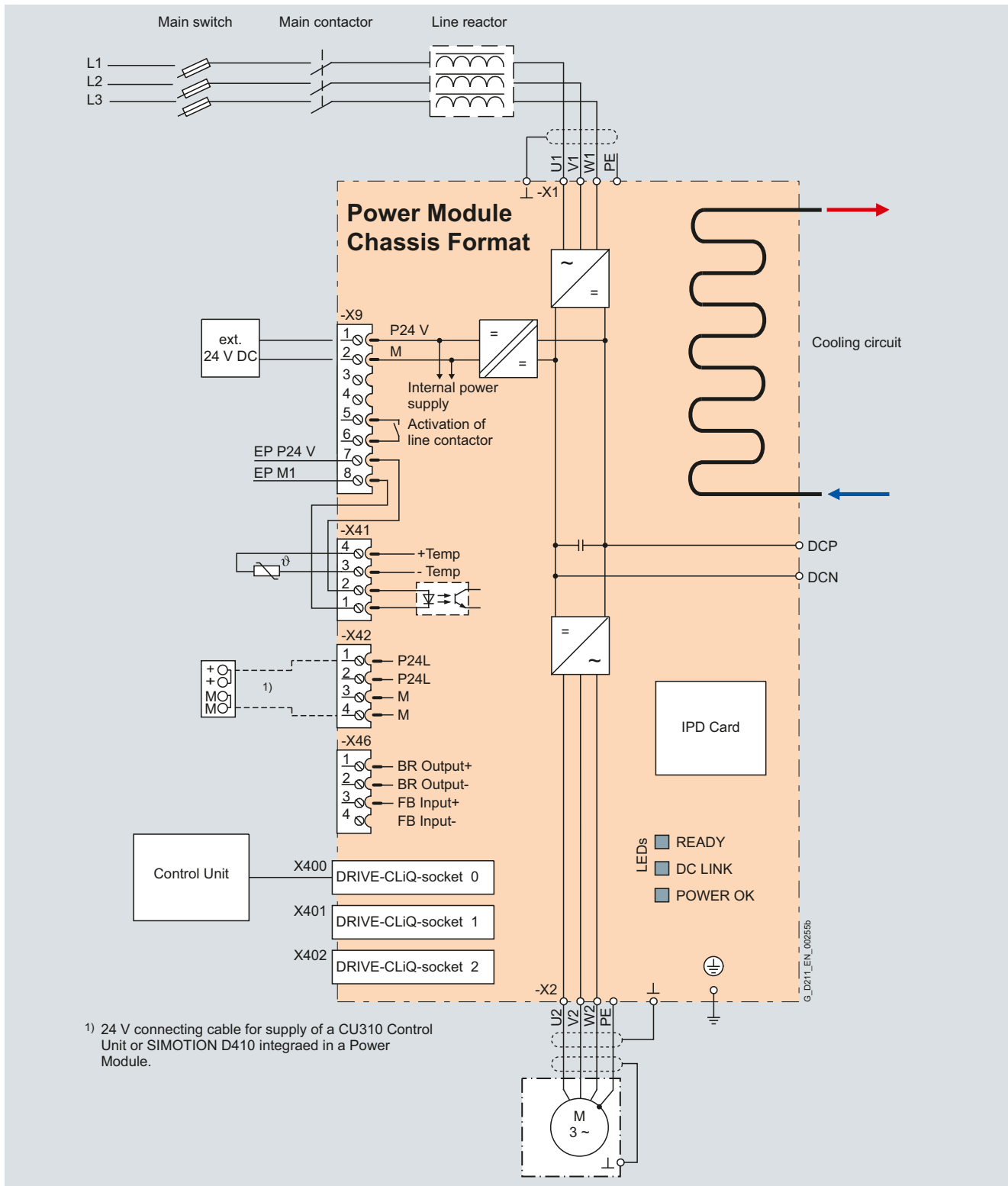
## Liquid-cooled units

### Power Modules

#### Integration

The Power Modules communicate with the higher-level control module via DRIVE-CLiQ. The control module in this case can be a CU310, CU320-2 or a SIMOTION D Control Unit. An external 24 V DC power supply is required to operate liquid-cooled Power Modules.

2



Connection example, liquid-cooled Power Module in the chassis format

**Note:**  
The integrated 24 V power supply at connector X42 can have a maximum load of 2 A. When the Control Unit is supplied from the

integrated power supply, the total load of the digital outputs must be carefully observed in order that the 2 A is not exceeded.

### Technical data

#### General technical specifications

Electrical specifications	
<b>Line supply voltage</b> up to 2000 m above sea level	380 ... 480 V 3 AC $\pm 10\%$ (-15 % < 1 min)
<b>Line power factor</b> for a three-phase AC line supply voltage and rated power	
• Basic fundamental ( $\cos \varphi_1$ )	> 0.96
• Total ( $\lambda$ )	0.75 ... 0.93
<b>Efficiency</b>	> 98 %
<b>DC link voltage, approx.</b>	1.35 $\times$ line voltage
<b>Output voltage, approx.</b>	0 ... 0.97 $\times U_{line}$
<b>Output frequency <sup>1)</sup></b>	
• Control type Servo	0 ... 650 Hz
• Control type Vector	0 ... 600 Hz
• Control type $V/f$	0 ... 600 Hz
<b>Electronics power supply</b>	24 V DC -15 %/+20 %
<b>Main contactor control</b>	
• Terminal block -X9/5-6	240 V AC, max. 8 A 30 V DC, max. 1 A
<b>Conformity</b>	CE (EMC Directive No. 2004/108/EC and Low-Voltage Directive No. 2006/95/EC)
<b>Approvals, according to</b>	cULus
<b>Safety Integrated</b>	Safety Integrity Level 2 (SIL2) acc. to IEC 61508, Performance Level d (PLd) acc. to EN ISO 13849-1 and Control Category 3 acc. to EN ISO 13849-1 (previously EN 954-1).

<sup>1)</sup> Please note:

- The correlation between the maximum output frequency, pulse frequency and current derating. Higher output frequencies for specific configurations are available on request.
- The correlation between the minimum output frequency and permissible output current (current derating).

Information is provided in the [SINAMICS Low Voltage Engineering Manual](#).

# SINAMICS S120 Chassis Format Units

## Liquid-cooled units

### Power Modules

#### Technical data

Line voltage 380 ... 480 V 3 AC		Power Modules			
		6SL3315-1TE32-1AA3	6SL3315-1TE32-6AA3	6SL3315-1TE33-1AA3	6SL3315-1TE35-0AA3
<b>Type rating</b>					
• For $I_L$ (50 Hz 400 V) <sup>1)</sup>	kW	<b>110</b>	<b>132</b>	<b>160</b>	<b>250</b>
• For $I_H$ (50 Hz 400 V) <sup>1)</sup>	kW	90	110	132	200
• For $I_L$ (60 Hz 460 V) <sup>2)</sup>	hp	150	200	250	400
• For $I_H$ (60 Hz 460 V) <sup>2)</sup>	hp	150	200	200	350
<b>Output current</b>					
• Rated current $I_{NA}$	A	210	260	310	490
• Base load current $I_L$ <sup>3)</sup>	A	205	250	302	477
• Base load current $I_H$ <sup>4)</sup>	A	178	233	277	438
• Max. output current $I_{max A}$	A	307	375	453	715
<b>Input current</b>					
• Rated current $I_{NE}$	A	230	285	340	540
• Maximum current $I_{max E}$	A	336	411	496	788
<b>Current demand</b>					
• 24 V DC auxiliary power supply	A	1.4	1.4	1.5	1.5
<b>Pulse frequency <sup>5)</sup></b>					
• Rated frequency	kHz	2	2	2	2
• Pulse frequency, max.					
- Without current derating	kHz	2	2	2	2
- With current derating	kHz	8	8	8	8
<b>Power loss, at 50 Hz 400 V <sup>6)</sup></b>					
• Dissipated to the coolant	kW	2.36	2.97	3.31	5.29
• Dissipated to the ambient air	kW	0.06	0.07	0.09	0.14
• Total	kW	2.42	3.04	3.4	5.43
<b>Coolant flow rate <sup>7)</sup></b>					
	l/min	9	9	12	12
<b>Volume of liquid</b> in the integrated heat exchanger		dm <sup>3</sup>	0.52	0.52	0.88
<b>Pressure drop, typ. <sup>8)</sup></b> for volumetric flow		Pa	70000	70000	70000
<b>Heat exchanger material</b>			Stainless steel	Stainless steel	Stainless steel
<b>Sound pressure level <math>L_{pA}</math></b> (1 m) at 50/60 Hz		dB	52	52	52
<b>Line supply connection</b> U1, V1, W1			Hole for M12	Hole for M12	Hole for M12
• Conductor cross-section, max. (IEC)	mm <sup>2</sup>	2 × 95	2 × 95	2 × 240	2 × 240
<b>Motor connection</b> U2/T1, V2/T2, W2/T3			Hole for M12	Hole for M12	2 × hole for M12
• Conductor cross-section, max. (IEC)	mm <sup>2</sup>	2 × 95	2 × 95	2 × 240	2 × 240
<b>Cable length, max. <sup>9)</sup></b>					
• Shielded	m	300	300	300	300
• Unshielded	m	450	450	450	450
<b>PE/GND connection</b>					
• Conductor cross-section, max. (IEC)	mm <sup>2</sup>	2 × hole for M12 2 × 95	2 × hole for M12 2 × 95	2 × hole for M12 2 × 240	2 × hole for M12 2 × 240
<b>Degree of protection</b>			IP00	IP00	IP00
<b>Dimensions</b>					
• Width	mm	265	265	265	265
• Height	mm	836	836	983	983
• Depth	mm	549	549	549	549
<b>Weight, approx.</b>		kg	77	77	108
<b>Frame size</b>			FL	FL	GL

<sup>1)</sup> Rated power of a typ. 6-pole standard induction motor based on  $I_L$  or  $I_H$  with 400 V 3 AC 50 Hz.

<sup>2)</sup> Rated power of a typ. 6-pole standard induction motor based on  $I_L$  or  $I_H$  with 460 V 3 AC 60 Hz.

<sup>3)</sup> The base load current  $I_L$  is the basis for a duty cycle of 110 % for 60 s or 150 % for 10 s with a duty cycle duration of 300 s

<sup>4)</sup> The base load current  $I_H$  is the basis for a duty cycle of 150 % for 60 s or 160 % for 10 s with a duty cycle duration of 300 s

<sup>5)</sup> Information regarding the correlation between the pulse frequency and maximum output current/output frequency is provided in the SINAMICS Low Voltage Engineering Manual.

<sup>6)</sup> The specified power loss represents the maximum value at 100 % utilization. The value is lower under normal operating conditions.

<sup>7)</sup> The value applies to water and a mixture of water and Antifrogen N mixture with 45 % Antifrogen N as coolant.

<sup>8)</sup> The value is valid for water as coolant. [Additional information and notes on other coolants is provided in the SINAMICS Low Voltage Engineering Manual.](#)

<sup>9)</sup> Longer cable lengths for specific configurations are available on request. [For additional information, please refer to the SINAMICS Low Voltage Engineering Manual.](#)

# SINAMICS S120 Chassis Format Units

## Liquid-cooled units

### Basic Line Modules

#### Overview



Basic Line Modules are used for applications where energy is not fed back into the line supply or where energy is exchanged in the DC link between axes operating in the motor and generator modes. The connected Motor Modules are pre-charged via the thyristor gate control.

Basic Line Modules are designed for connection to grounded TN/TT and non-grounded IT supply systems.

Liquid-cooled Basic Line Modules are especially suitable for applications where installation space is restricted and for critical environmental conditions.

#### Design

The liquid-cooled Basic Line Modules have the following interfaces as standard:

- 1 line supply connection
- 1 DC link connection (DCP, DCN) for supplying the connected Motor Modules
- 3 DRIVE-CLiQ sockets
- 1 temperature sensor input (KTY84-130, PTC or Pt100)
- 1 connection for the 24 V DC electronics power supply
- 1 PE/protective conductor connection
- 2 coolant connections

The scope of supply of the Power Modules includes:

- 1 DRIVE-CLiQ cable to connect to the CU320-2 or SIMOTION D4x5 Control Unit
- 1 CD-ROM with Manual in the PDF format
- 2 seals for coolant connections

#### Selection and ordering data

Rated power at 400 V or 690 V kW	Rated DC link current A	Basic Line Module Order No.
<b>Line voltage 380 ... 480 V 3 AC</b>		
360	740	<b>6SL3335-1TE37-4AA3</b>
600	1220	<b>6SL3335-1TE41-2AA3</b>
830	1730	<b>6SL3335-1TE41-7AA3</b>
<b>Line voltage 500 ... 690 V 3 AC</b>		
355	420	<b>6SL3335-1TG34-2AA3</b>
630	730	<b>6SL3335-1TG37-3AA3</b>
1100	1300	<b>6SL3335-1TG41-3AA3</b>
1370	1650	<b>6SL3335-1TG41-7AA3</b>

Description	Order No.
<b>Accessories for re-ordering</b>	
<b>Warning labels in 16 languages</b> Using this set of labels, another language can be placed over the German or English labels available as standard. A set of labels is provided with the devices. The following languages are available once in the set of labels: Chinese (simplified), Danish, Finnish, French, Greek, Italian, Japanese, Korean, Dutch, Polish, Portuguese/Brazilian, Russian, Swedish, Spanish, Czech, Turkish	<b>6SL3166-3AB00-0AA0</b>
<b>Dust protection blanking plugs</b> (50 units) For DRIVE-CLiQ port	<b>6SL3066-4CA00-0AA0</b>

Line-side components (→ System components).



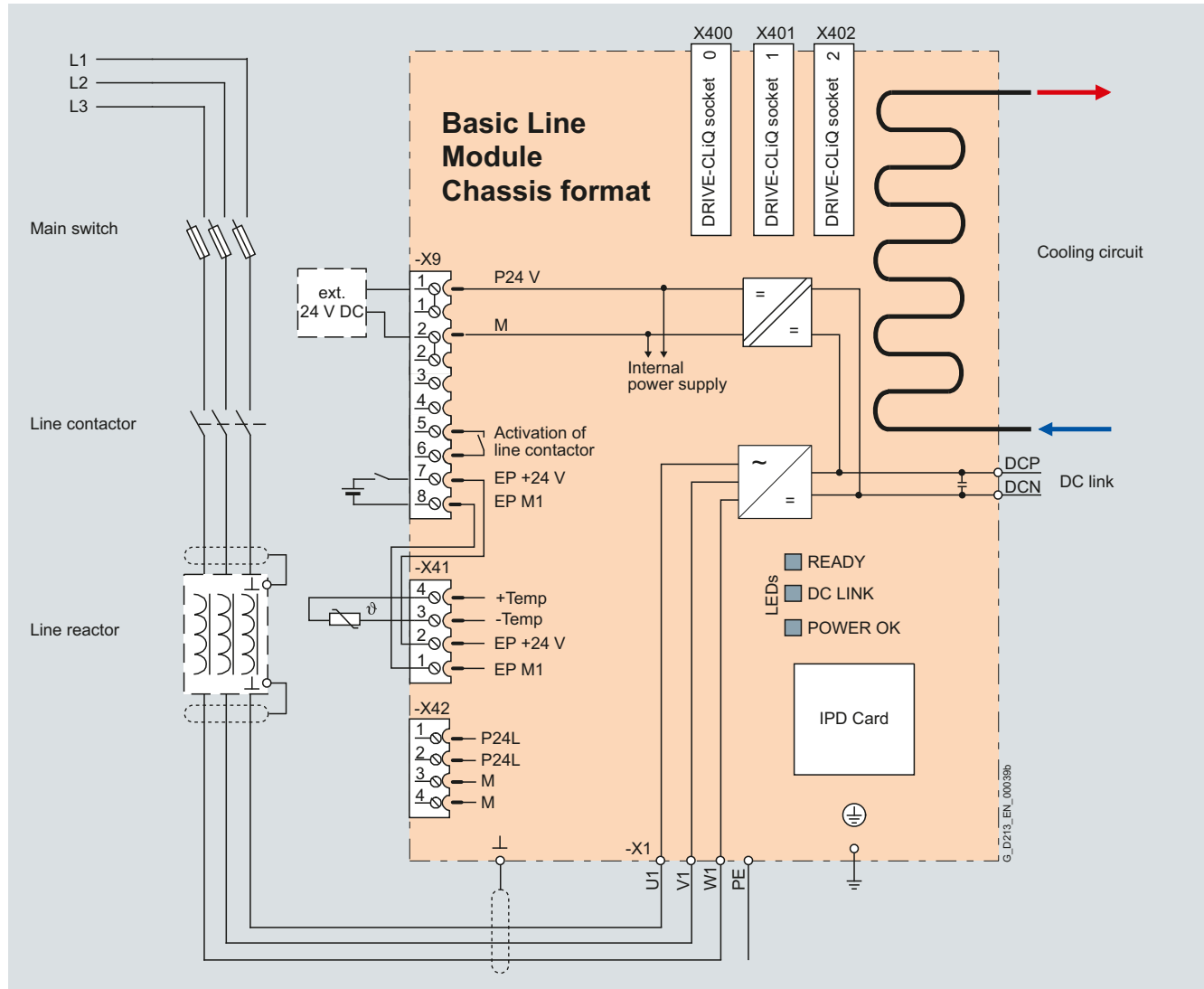
# SINAMICS S120 Chassis Format Units

## Liquid-cooled units

### Basic Line Modules

#### Integration

The liquid-cooled Basic Line Modules communicate with the higher-level control module via DRIVE-CLiQ. The control module in this case can be a CU320-2 or a SIMOTION D Control Unit. An external 24 V DC power supply is required to operate liquid-cooled Basic Line Modules.



Connection example of a Basic Line Module

#### Technical data

##### General technical specifications

##### Electrical specifications

<b>Line power factor at rated power</b>	
• Basic fundamental ( $\cos \phi_1$ )	> 0.96
• Total ( $\lambda$ )	0.75 ... 0.93
<b>Efficiency</b>	> 99 %
<b>DC link voltage, approx. <sup>1)</sup></b>	$1.35 \times$ line voltage
<b>Main contactor control</b>	
• Terminal block -X9/5-6	240 V AC, max. 8 A 30 V DC, max. 1 A

<sup>1)</sup> The DC link voltage is unregulated and load-dependent. For additional information, please refer to the SINAMICS Low Voltage Engineering Manual.

### Technical data

Line voltage 380 ... 480 V 3 AC		Basic Line Modules		
		6SL3335-1TE37-4AA3	6SL3335-1TE41-2AA3	6SL3335-1TE41-7AA3
<b>Rated power</b>				
• For $I_{NDC}$ (50 Hz 400 V)	kW	<b>360</b>	<b>600</b>	<b>830</b>
• For $I_H$ (50 Hz 400 V)	kW	280	450	650
• For $I_{NDC}$ (60 Hz 460 V)	hp	555	925	1280
• For $I_H$ (60 Hz 460 V)	hp	430	690	1000
<b>DC link current</b>				
• Rated current $I_{NDC}$	A	740	1220	1730
• Base load current $I_{HDC}^{1)}$	A	578	936	1350
• Maximum current $I_{maxDC}$	A	1110	1830	2595
<b>Input current</b>				
• Rated current $I_{NE}$	A	610	1000	1420
• Maximum current $I_{maxE}$	A	915	1500	2130
<b>Current demand</b>				
• 24 V DC auxiliary power supply	A	0.7	0.7	0.7
<b>DC link capacitance</b>				
• Basic Line Module	μF	12000	20300	26100
• Drive line-up, max.	μF	96000	162400	208800
<b>Power loss, at 50 Hz 400 V <sup>2)</sup></b>				
• Dissipated to the coolant	kW	2.66	4.32	5.78
• Dissipated to the ambient air	kW	0.24	0.4	0.57
• Total	kW	2.9	4.72	6.35
<b>Coolant flow rate <sup>3)</sup></b>				
	l/min	9	9	12
<b>Volume of liquid in the integrated heat exchanger</b>				
	dm <sup>3</sup>	0.45	0.45	0.79
<b>Pressure drop, typ. <sup>4)</sup> for volumetric flow</b>				
	Pa	70000	70000	70000
<b>Heat exchanger material</b>				
		Aluminum	Aluminum	Aluminum
<b>Sound pressure level <math>L_{pA}</math> (1 m) at 50/60 Hz</b>				
	dB	54	56	56
<b>Line supply connection U1, V1, W1</b>				
		2 × M12 nut	2 × M12 nut	2 × M12 nut
• Conductor cross-section, max. (IEC)	mm <sup>2</sup>	4 × 240	4 × 240	4 × 240
<b>DC link connection DCP, DCN</b>				
		2 × M12 nut Busbar	2 × M12 nut Busbar	2 × M12 nut Busbar
<b>PE/GND connection</b>				
		2 × M12 nut	2 × M12 nut	2 × M12 nut
• Conductor cross-section, max. (IEC)	mm <sup>2</sup>	4 × 240	4 × 240	4 × 240
<b>Cable length, max. <sup>5)</sup></b>				
• Shielded	m	2600	4000	4800
• Unshielded	m	3900	6000	7200
<b>Degree of protection</b>				
		IP00	IP00	IP00
<b>Dimensions</b>				
• Width	mm	160	160	160
• Height	mm	1137	1137	1562
• Depth	mm	545	545	545
<b>Weight, approx.</b>				
	kg	108	108	185
<b>Frame size</b>				
		FBL	FBL	GBL

<sup>1)</sup> The base load current  $I_{HDC}$  is the basis for a duty cycle of 150 % for 60 s or  $I_{maxDC}$  for 5 s with a duty cycle duration of 300 s.

<sup>2)</sup> The specified power loss represents the maximum value at 100 % utilization. The value is lower under normal operating conditions.

<sup>3)</sup> The value applies to water and a mixture of water and Antifrogen N mixture with 45 % Antifrogen N as coolant.

<sup>4)</sup> The value is valid for water as coolant. [Additional information and notes on other coolants is provided in the SINAMICS Low Voltage Engineering Manual.](#)

<sup>5)</sup> Sum of all motor cables and DC link. Longer cable lengths for specific configurations are available on request. [For additional information, please refer to the SINAMICS Low Voltage Engineering Manual.](#)

# SINAMICS S120 Chassis Format Units

## Liquid-cooled units

### Basic Line Modules

#### Technical data

Line voltage 500 ... 690 V 3 AC		Basic Line Module			
		6SL3335-1TG34-2AA3	6SL3335-1TG37-3AA3	6SL3335-1TG41-3AA3	6SL3335-1TG41-7AA3
<b>Rated power</b>					
• For $I_{NDC}$ (50 Hz 690 V)	kW	<b>355</b>	<b>630</b>	<b>1100</b>	<b>1370</b>
• For $I_H$ (50 Hz 690 V)	kW	275	475	840	1070
• For $I_{NDC}$ (50 Hz 500 V)	kW	245	420	750	950
• For $I_H$ (50 Hz 500 V)	kW	200	345	610	775
• For $I_{NDC}$ (60 Hz 575 V)	hp	395	705	1230	1530
• For $I_H$ (60 Hz 575 V)	hp	305	530	940	1195
<b>DC link current</b>					
• Rated current $I_{NDC}$	A	420	730	1300	1650
• Base load current $I_{HDC}^{1)}$	A	328	570	1014	1287
• Maximum current $I_{maxDC}$	A	630	1095	1950	2475
<b>Input current</b>					
• Rated current $I_{NE}$	A	340	600	1070	1350
• Maximum current $I_{maxE}$	A	510	900	1605	2025
<b>Current demand</b>					
• 24 V DC auxiliary power supply	A	0.7	0.7	0.7	0.7
<b>DC link capacitance</b>					
• Basic Line Module	$\mu\text{F}$	4800	7700	15500	19300
• Drive line-up, max.	$\mu\text{F}$	38400	61600	124000	154400
<b>Power loss, at 50 Hz 500/690 V <sup>2)</sup></b>					
• Dissipated to the coolant	kW	1.48/1.54	2.65/2.71	4.55/4.66	5.6/5.7
• Dissipated to the ambient air	kW	0.22	0.38	0.43	0.54
• Total	kW	1.7/1.76	3.03/3.09	4.98/5.09	6.14/6.24
<b>Coolant flow rate <sup>3)</sup></b>					
	l/min	9	9	12	12
<b>Volume of liquid in the integrated heat exchanger</b>					
	$\text{dm}^3$	0.45	0.45	0.79	0.79
<b>Pressure drop, typ. <sup>4)</sup> for volumetric flow</b>					
	Pa	70000	70000	70000	70000
<b>Heat exchanger material</b>					
		Aluminum	Aluminum	Aluminum	Aluminum
<b>Sound pressure level <math>L_{pA}</math> (1 m) at 50/60 Hz</b>					
	dB	54	54	56	56
<b>Line supply connection</b> U1, V1, W1					
		2 × M12 nut	2 × M12 nut	2 × M12 nut	2 × M12 nut
• Conductor cross-section, max. (IEC)	$\text{mm}^2$	4 × 240	4 × 240	4 × 240	4 × 240
<b>DC link connection</b> DCP, DCN					
		2 × M12 nut Busbar	2 × M12 nut Busbar	2 × M12 nut Busbar	2 × M12 nut Busbar
<b>PE/GND connection</b>					
		2 × M12 nut	2 × M12 nut	2 × M12 nut	2 × M12 nut
• Conductor cross-section, max. (IEC)		4 × 240	4 × 240	4 × 240	4 × 240
<b>Cable length, max. <sup>5)</sup></b>					
• Shielded	m	1500	1500	2250	2250
• Unshielded	m	2250	2250	3375	3375
<b>Degree of protection</b>					
		IP00	IP00	IP00	IP00
<b>Dimensions</b>					
• Width	mm	160	160	160	160
• Height	mm	1137	1137	1562	1562
• Depth	mm	545	545	545	545
<b>Weight, approx.</b>					
	kg	108	108	185	185
<b>Frame size</b>					
		FBL	FBL	GBL	GBL

<sup>1)</sup> The base load current  $I_{HDC}$  is the basis for a duty cycle of 150 % for 60 s or  $I_{maxDC}$  for 5 s with a duty cycle duration of 300 s.

<sup>2)</sup> The specified power loss represents the maximum value at 100 % utilization. The value is lower under normal operating conditions.

<sup>3)</sup> The value applies to water and a mixture of water and Antifrogen N mixture with 45 % Antifrogen N as coolant.

<sup>4)</sup> The value is valid for water as coolant. [Additional information and notes on other coolants is provided in the SINAMICS Low Voltage Engineering Manual.](#)

<sup>5)</sup> Sum of all motor cables and DC link. Longer cable lengths for specific configurations are available on request. [For additional information, please refer to the SINAMICS Low Voltage Engineering Manual.](#)

# SINAMICS S120 Chassis Format Units

## Liquid-cooled units

### Active Line Modules

#### Overview



The self-commutated infeed/regenerative feedback units (with IGBTs in infeed and regenerative feedback directions) generate a regulated DC link voltage. This means that the connected Motor Modules are decoupled from the line voltage. Line voltage fluctuations within the permissible supply tolerances have no effect on the motor voltage.

If required, the Active Line Modules can also provide reactive power compensation.

Active Line Modules are designed for connection to grounded TN/TT and non-grounded IT supply systems.

Liquid-cooled Active Line Modules are especially suitable for applications where installation space is restricted and for critical environmental conditions.

Active Line Modules are always operated together with the associated Active Interface Modules. These include the necessary pre-charging circuit as well as a Clean Power Filter.

System components such as line reactors, Active Interface Modules, motor reactors and motor filters are air-cooled.

See also selection and ordering data in the section [Chassis Format, air-cooled](#) → [Active Interface Module](#).

#### Design

The liquid-cooled Active Line Modules have the following interfaces as standard:

- 1 line supply connection
- 1 connection for the 24 V DC electronics power supply
- 1 DC link connection (DCP, DCN) for supplying the connected Motor Modules
- 3 DRIVE-CLiQ sockets
- 1 temperature sensor input (KTY84-130, PTC or Pt100)
- 1 PE/protective conductor connection
- 2 coolant connections

The following are included in the scope of supply of the Active Line Modules:

- 1 DRIVE-CLiQ cable to connect to the CU320-2 or SIMOTION D4x5 Control Unit
- 1 CD-ROM with Manual in PDF format
- 2 seals for coolant connections

#### Selection and ordering data

Rated power at 400 V or 690 V kW	Rated DC link current A	Active Line Module Order No.
<b>Line voltage 380 ... 480 V 3 AC</b>		
300	549	<b>6SL3335-7TE35-0AA3</b>
500	940	<b>6SL3335-7TE38-4AA3</b>
<b>Line voltage 500 ... 690 V 3 AC</b>		
560	644	<b>6SL3335-7TG35-8AA3</b>
1400	1422	<b>6SL3335-7TG41-3AA3</b>

Description	Order No.
<b>Accessories for re-ordering</b>	
<b>Warning labels in 16 languages</b> Using this set of labels, another language can be placed over the German or English labels available as standard. A set of labels is provided with the devices. The following languages are available once in the set of labels: Chinese (simplified), Danish, Finnish, French, Greek, Italian, Japanese, Korean, Dutch, Polish, Portuguese/Brazilian, Russian, Swedish, Spanish, Czech, Turkish	<b>6SL3166-3AB00-0AA0</b>
<b>Dust protection blanking plugs</b> (50 units) For DRIVE-CLiQ port	<b>6SL3066-4CA00-0AA0</b>

[Line-side components as well as recommended system components](#) (→ [Components](#)).

# SINAMICS S120 Chassis Format Units

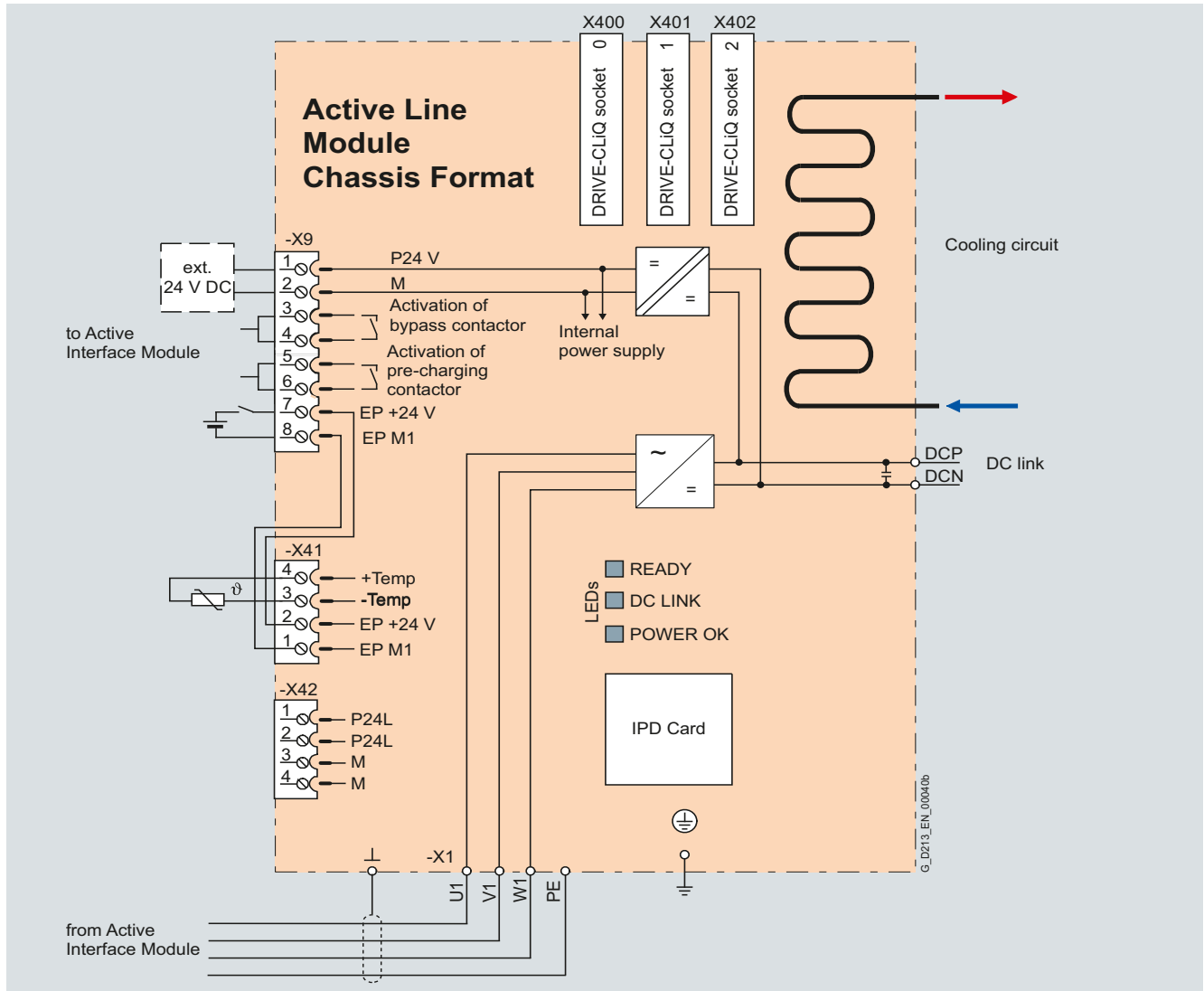
## Liquid-cooled units

### Active Line Modules

#### Integration

Active Line Modules are always operated together with the associated Active Interface Modules. Active Interface Modules contain a Clean Power Filter with basic RI suppression, the pre-charging circuit for the Active Line Module, line supply voltage sensing circuit and monitoring sensors.

The liquid-cooled Active Line Modules communicate with the higher-level control module via DRIVE-CLiQ. The control module in this case can be a CU320-2 or a SIMOTION D Control Unit. An external 24 V DC power supply is required to operate the Active Line Modules.



Connection example of an Active Line Module

#### Technical data

##### General technical specifications

##### Electrical specifications

##### Line power factor

- Basic fundamental ( $\cos \varphi_1$ ) 1.0 (factory setting), can be altered by input of a reactive current setpoint
- Total ( $\lambda$ ) 1.0 (factory setting)

##### Efficiency

- > 98.5 % (ALM)
- > 99 % (AIM)

##### DC link voltage, approx.

The DC link voltage is regulated and can be adjusted as a voltage decoupled from the line voltage. Factory setting of the DC link voltage:  $1.5 \times$  line voltage

##### Conformity

CE (EMC Directive No. 2004/108/EC and Low-Voltage Directive No. 2006/95/EC)

##### Approvals, according to

cULus (only for drive units connected to line voltages 380 ... 480 V 3 AC and 500 ... 600 V 3 AC)

##### Safety Integrated

Safety Integrity Level 2 (SIL2) acc. to IEC 61508, Performance Level d (PLd) acc. to EN ISO 13849-1 and Control Category 3 acc. to EN ISO 13849-1 (previously EN 954-1).

### Technical data

Line voltage 380 ... 480 V 3 AC		Active Line Modules	
		6SL3335-7TE35-0AA3	6SL3335-7TE38-4AA3
<b>Rated power</b>			
• For $I_{NDC}$ (50 Hz 400 V)	kW	<b>300</b>	<b>500</b>
• For $I_{HDC}$ (50 Hz 400 V)	kW	270	465
• For $I_{NDC}$ (60 Hz 460 V)	hp	500	700
• For $I_{HDC}$ (60 Hz 460 V)	hp	400	700
<b>DC link current</b>			
• Rated current $I_{NDC}$	A	549	941
• Base load current $I_{HDC}^{1)}$	A	489	837
• Maximum current $I_{maxDC}$	A	823	1410
<b>Infeed/regenerative feedback current</b>			
• Rated current $I_{NE}$	A	490	840
• Maximum current $I_{maxE}$	A	735	1260
<b>Current demand</b>			
• 24 V DC auxiliary power supply	A	1.5	1.6
<b>DC link capacitance</b>			
• Active Line Module	μF	9600	17400
<b>Power loss, at 50 Hz 400 V <sup>2)</sup></b>			
• Dissipated to the coolant	kW	3.1	5.52
• Dissipated to the ambient air	kW	0.14	0.23
• Total	kW	3.24	5.75
<b>Coolant flow rate <sup>3)</sup></b>			
	l/min	12	16
<b>Volume of liquid in the integrated heat exchanger</b>			
	dm <sup>3</sup>	0.91	0.74
<b>Pressure drop, typ. <sup>4)</sup> for volumetric flow</b>			
	Pa	70000	70000
<b>Heat exchanger material</b>			
		Stainless steel	Aluminum
<b>Sound pressure level <math>L_{pA}^{5)}</math> (1 m) at 50/60 Hz</b>			
	dB	52	54
<b>Line supply connection U1, V1, W1</b>			
		Hole for M12	2 x hole for M12
• Conductor cross-section, max. (IEC)	mm <sup>2</sup>	2 × 240	4 × 185
<b>DC link connection DCP, DCN</b>			
		2 × hole for M12 Busbar	2 × hole for M12 Busbar
<b>PE/GND connection</b>			
		2 × hole for M12	2 × hole for M12
• Conductor cross-section, max. (IEC)	mm <sup>2</sup>	2 × 240	4 × 185
<b>Cable length, max. <sup>6)</sup></b>			
• Shielded	m	2700	3900
• Unshielded	m	4050	5850
<b>Degree of protection</b>			
		IP00	IP00
<b>Dimensions</b>			
• Width	mm	150	265
• Height	mm	1172	1002
• Depth	mm	545	545
<b>Weight, approx.</b>			
	kg	80	110
<b>Frame size</b>			
		GXL	HXL

<sup>1)</sup> The base load current  $I_{HDC}$  is the basis for a duty cycle of 150 % for 60 s or  $I_{maxDC}$  for 5 s with a duty cycle duration of 300 s.

<sup>2)</sup> The specified power loss represents the maximum value at 100 % utilization. The value is lower under normal operating conditions.

<sup>3)</sup> The value applies to water and a mixture of water and Antifrogen N mixture with 45 % Antifrogen N as coolant.

<sup>4)</sup> The value is valid for water as coolant. [Additional information and notes on other coolants is provided in the SINAMICS Low Voltage Engineering Manual.](#)

<sup>5)</sup> Total sound pressure level of Active Interface Module and Active Line Module.

<sup>6)</sup> Sum of all motor cables and DC link. Longer cable lengths for specific configurations are available on request. [For additional information, please refer to the SINAMICS Low Voltage Engineering Manual.](#)

# SINAMICS S120 Chassis Format Units

## Liquid-cooled units

### Active Line Modules

#### Technical data

Line voltage 500 ... 690 V 3 AC		Active Line Modules	
		6SL3335-7TG35-8AA3	6SL3335-7TG41-3AA3
<b>Rated power</b>			
• For $I_{N\ DC}$ (50 Hz 690 V)	kW	<b>560</b>	<b>1400</b>
• For $I_{H\ DC}$ (50 Hz 690 V)	kW	550	1215
• For $I_{N\ DC}$ (50 Hz 500 V)	kW	435	965
• For $I_{H\ DC}$ (50 Hz 500 V)	kW	400	880
• For $I_{N\ DC}$ (60 Hz 575 V)	hp	600	1500
• For $I_{H\ DC}$ (60 Hz 575 V)	hp	450	1250
<b>DC link current</b>			
• Rated current $I_{N\ DC}$	A	644	1422
• Base load current $I_{H\ DC}$ <sup>1)</sup>	A	573	1266
• Maximum current $I_{max\ DC}$	A	966	2133
<b>Infeed/regenerative feedback current</b>			
• Rated current $I_{N\ E}$	A	575	1270
• Maximum current $I_{max\ E}$	A	862	1905
<b>Current demand</b>			
• 24 V DC auxiliary power supply	A	1.6	1.46
<b>DC link capacitance</b>			
• Active Line Module	μF	9670	19330
<b>Power loss, at 50 Hz 500/690 V <sup>2)</sup></b>			
• Dissipated to the coolant	kW	4.0/5.45	9.36/12.92
• Dissipated to the ambient air	kW	0.16	0.57
• Total	kW	4.16/5.61	9.93/13.49
<b>Coolant flow rate <sup>3)</sup></b>			
	l/min	16	27
<b>Volume of liquid in the integrated heat exchanger</b>			
	dm <sup>3</sup>	0.74	1.56
<b>Pressure drop, typ. <sup>4)</sup> for volumetric flow</b>			
	Pa	70000	70000
<b>Heat exchanger material</b>			
		Aluminum	Aluminum
<b>Sound pressure level <math>L_{pA}</math> <sup>5)</sup> (1 m) at 50/60 Hz</b>			
	dB	54	56
<b>Line supply connection</b>			
U1, V1, W1		2 × hole for M12	2 × hole for M12
• Conductor cross-section, max. (IEC)	mm <sup>2</sup>	4 × 185	Busbar
<b>DC link connection</b>			
DCP, DCN		2 × hole for M12 Busbar	2 × hole for M12 Busbar
<b>PE/GND connection</b>			
• Conductor cross-section, max. (IEC)	mm <sup>2</sup>	2 × hole for M12 4 × 185	2 × hole for M12 Busbar
<b>Cable length, max. <sup>6)</sup></b>			
• Shielded	m	2250	2250
• Unshielded	m	3375	3375
<b>Degree of protection</b>			
		IP00	IP00
<b>Dimensions</b>			
• Width	mm	265	295
• Height	mm	1002	1516
• Depth	mm	545	545
<b>Weight, approx.</b>			
	kg	110	220
<b>Frame size</b>			
		HXL	JXL

1) The base load current  $I_{H\ DC}$  is the basis for a duty cycle of 150 % for 60 s or  $I_{max\ DC}$  for 5 s with a duty cycle duration of 300 s.

2) The specified power loss represents the maximum value at 100 % utilization. The value is lower under normal operating conditions.

3) The value applies to water and a mixture of water and Antifrogen N mixture with 45 % Antifrogen N as coolant.

4) The value is valid for water as coolant. [Additional information and notes on other coolants is provided in the SINAMICS Low Voltage Engineering Manual.](#)

5) Total sound pressure level of Active Interface Module and Active Line Module.

6) Sum of all motor cables and DC link. Longer cable lengths for specific configurations are available on request. [For additional information, please refer to the SINAMICS Low Voltage Engineering Manual.](#)

# SINAMICS S120 Chassis Format Units

## Liquid-cooled units

### Motor Modules

#### Overview



A Motor Module comprises a self-commutated inverter with IGBTs. It generates a variable voltage with variable frequency from the DC link voltage that feeds the connected motor.

Several Motor Modules can be interconnected through a common DC bus. This makes it possible to exchange energy between the Motor Modules. This means that if a Motor Module is in the generator mode, this energy can be used by another Motor Module operating in the motor mode.

Motor Modules are controlled by a Control Unit.

Liquid-cooled Motor Modules are available for applications where installation space is restricted and for plants or machines that cannot be equipped with air-cooled drive units as a result of critical environmental conditions.

#### Design

The liquid-cooled Motor Modules have the following interfaces as standard:

- 1 motor connection
- 1 DC link connection (DCP, DCN) for connecting to the supply DC busbar
- 1 connection for Safety Integrated
- 1 temperature sensor input (KTY84-130, PTC or Pt100)
- 3 DRIVE-CLiQ sockets
- 1 connection for the 24 V DC electronics power supply
- 2 PE/protective conductor connections
- 2 coolant connections

The scope of supply of the Motor Modules includes:

- 1 DRIVE-CLiQ cable to connect to the CU320-2 or SIMOTION D4x5 Control Unit
- 1 CD-ROM with Manual in PDF format
- 2 seals for coolant connections

#### Selection and ordering data

Type rating at 400 V or 690 V	Rated output current	Motor Module
kW	A	Order No.
<b>Line voltage 380 ... 480 V 3 AC (DC link voltage 510 ... 720 V DC)</b>		
110	210	<b>6SL3325-1TE32-1AA3</b>
132	260	<b>6SL3325-1TE32-6AA3</b>
160	310	<b>6SL3325-1TE33-1AA3</b>
250	490	<b>6SL3325-1TE35-0AA3</b>
315	605	<b>6SL3325-1TE36-1AA3</b>
450	840	<b>6SL3325-1TE38-4AA3</b>
560	985	<b>6SL3325-1TE41-0AA3</b>
800	1405	<b>6SL3325-1TE41-4AA3</b>
<b>Line voltage 500 ... 690 V 3 AC (DC link voltage 675 ... 1035 V DC)</b>		
90	100	<b>6SL3325-1TG31-0AA3</b>
132	150	<b>6SL3325-1TG31-5AA3</b>
200	215	<b>6SL3325-1TG32-2AA3</b>
315	330	<b>6SL3325-1TG33-3AA3</b>
560	575	<b>6SL3325-1TG35-8AA3</b>
800	810	<b>6SL3325-1TG38-1AA3</b>
1000	1025	<b>6SL3325-1TG41-0AA3</b>
1200	1270	<b>6SL3325-1TG41-3AA3</b>

Description	Order No.
<b>Accessories for re-ordering</b>	
<b>Warning labels in 16 languages</b>	<b>6SL3166-3AB00-0AA0</b>
Using this set of labels, another language can be placed over the German or English labels available as standard. A set of labels is provided with the devices. The following languages are available once in the set of labels: Chinese (simplified), Danish, Finnish, French, Greek, Italian, Japanese, Korean, Dutch, Polish, Portuguese/Brazilian, Russian, Swedish, Spanish, Czech, Turkish	
<b>Dust protection blanking plugs (50 units)</b>	<b>6SL3066-4CA00-0AA0</b>
For DRIVE-CLiQ port	

[Motor-side components \(→ System components\).](#)



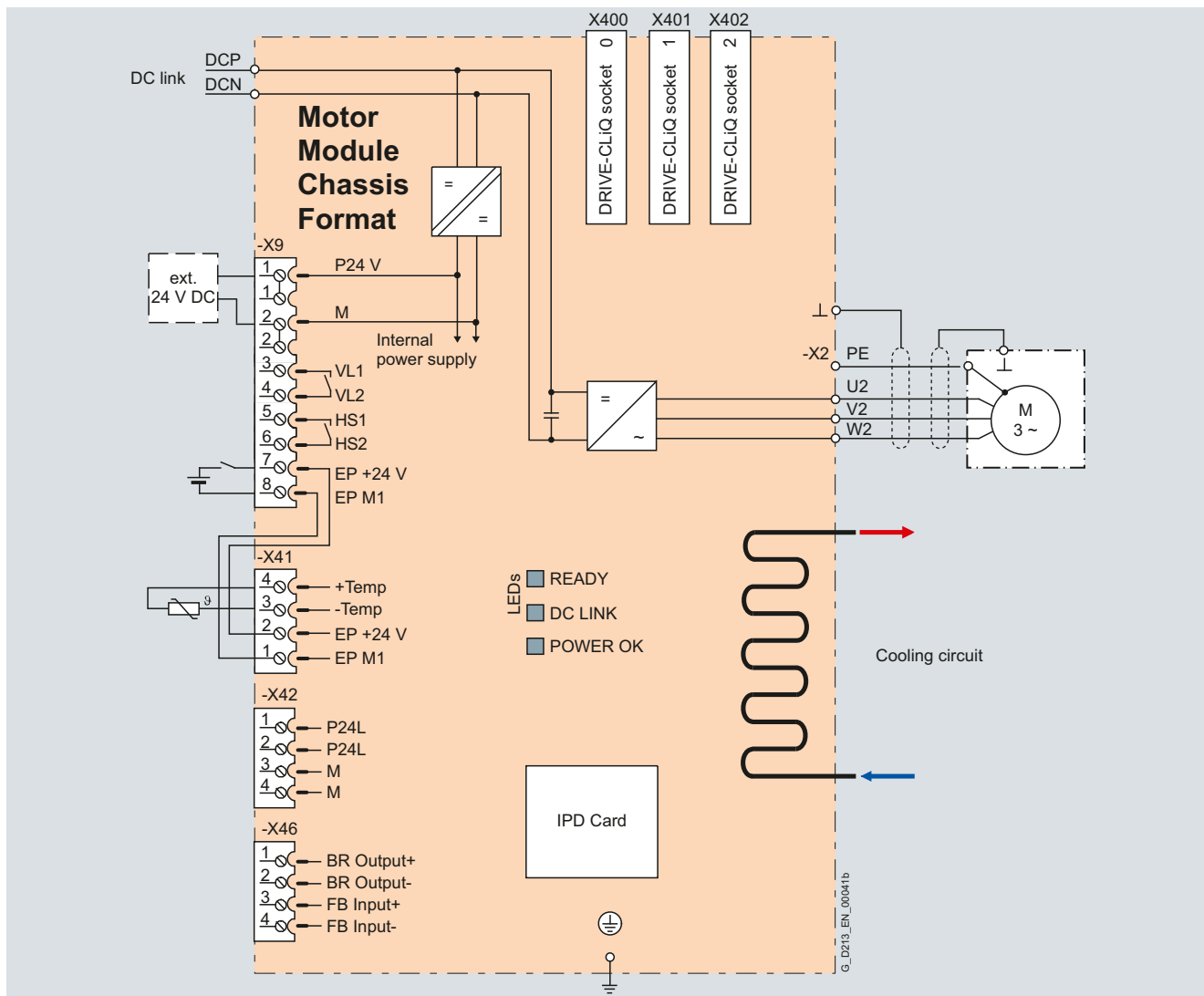
# SINAMICS S120 Chassis Format Units

## Liquid-cooled units

### Motor Modules

#### Integration

The liquid-cooled Motor Modules communicate with the higher-level control module via DRIVE-CLiQ. The control module in this case can be a CU320-2 or a SIMOTION D Control Unit.



Connection example of a liquid-cooled Motor Module

#### Technical data

##### General technical specifications

##### Electrical specifications

<b>DC link voltage</b> (up to 2000 m above sea level)	510 ... 720 V DC (line supply voltage 380 ... 480 V 3 AC) or 675 ... 1035 V DC (line supply voltage 500 ... 690 V 3 AC)
<b>Efficiency</b>	> 98.5 %
<b>Output frequency <sup>1)</sup></b>	
• Control type Servo	0 ... 650 Hz
• Control type Vector	0 ... 600 Hz
• Control type V/f	0 ... 600 Hz
<b>Conformity</b>	CE (EMC Directive No. 2004/108/EC and Low-Voltage Directive No. 2006/95/EC)
<b>Approvals, according to</b>	cULus (only for drive units connected to line voltages 380 ... 480 V 3 AC and 500 ... 600 V 3 AC)
<b>Safety Integrated</b>	Safety Integrity Level 2 (SIL2) acc. to IEC 61508, Performance Level d (PLd) acc. to EN ISO 13849-1 and Control Category 3 acc. to EN ISO 13849-1 (previously EN 954-1).

<sup>1)</sup> Please note:  
- The correlation between the maximum output frequency, pulse frequency and current derating. Higher output frequencies for specific configurations are available on request.

- The correlation between the minimum output frequency and permissible output current (current derating).  
[Information is provided in the SINAMICS Low Voltage Engineering Manual.](#)

### Technical data

Line voltage 380 ... 480 V 3 AC DC link voltage 510 ... 720 V DC		Motor Modules			
		6SL3325-1TE32-1AA3	6SL3325-1TE32-6AA3	6SL3325-1TE33-1AA3	6SL3325-1TE35-0AA3
<b>Type rating</b>					
• For $I_L$ (50 Hz 400 V) <sup>1)</sup>	kW	<b>110</b>	<b>132</b>	<b>160</b>	<b>250</b>
• For $I_H$ (50 Hz 400 V) <sup>1)</sup>	kW	90	110	132	200
• For $I_L$ (60 Hz 460 V) <sup>2)</sup>	hp	150	200	250	400
• For $I_H$ (60 Hz 460 V) <sup>2)</sup>	hp	150	200	200	350
<b>Output current</b>					
• Rated current $I_{NA}$	A	210	260	310	490
• Base load current $I_L$ <sup>3)</sup>	A	205	250	302	477
• Base load current $I_H$ <sup>4)</sup>	A	178	233	277	438
• Maximum current $I_{max A}$	A	307	375	453	715
<b>DC link current</b>					
• Rated current $I_{NDC}$ when supplied from					
- Basic Line Module	A	256	317	380	600
- Active Line Module	A	230	287	340	538
• Base load current $I_{LDC}$ <sup>3)</sup> when supplied from					
- Basic Line Module	A	250	305	368	581
- Active Line Module	A	225	274	331	522
• Base load current $I_{HDC}$ <sup>4)</sup> when supplied from					
- Basic Line Module	A	227	284	338	534
- Active Line Module	A	195	255	303	480
<b>Current demand</b>					
• 24 V DC auxiliary power supply	A	1.4	1.4	1.5	1.5
<b>DC link capacitance</b>					
	μF	4800	5800	8400	9600
<b>Pulse frequency <sup>5)</sup></b>					
• Rated frequency	kHz	2	2	2	2
• Pulse frequency, max.					
- Without current derating	kHz	2	2	2	2
- With current derating	kHz	8	8	8	8
<b>Power loss, at 50 Hz 400 V <sup>6)</sup></b>					
• Dissipated to the coolant	kW	1.55	1.88	2.2	3.42
• Dissipated to the ambient air	kW	0.06	0.07	0.09	0.14
• Total	kW	1.61	1.95	2.29	3.56
<b>Coolant flow rate <sup>7)</sup></b>					
	l/min	9	9	12	12
<b>Volume of liquid in the integrated heat exchanger</b>					
	dm <sup>3</sup>	0.31	0.31	0.91	0.91
<b>Pressure drop, typ. <sup>8)</sup> for volumetric flow</b>					
	Pa	70000	70000	70000	70000
<b>Heat exchanger material</b>					
		Stainless steel	Stainless steel	Stainless steel	Stainless steel
<b>Sound pressure level <math>L_{pA}</math> (1 m) at 50/60 Hz</b>					
	dB	52	52	52	52

<sup>1)</sup> Rated power of a typ. 6-pole standard induction motor based on  $I_L$  or  $I_H$  with 400 V 3 AC 50 Hz.

<sup>2)</sup> Rated power of a typ. 6-pole standard induction motor based on  $I_L$  or  $I_H$  with 460 V 3 AC 60 Hz.

<sup>3)</sup> The base load current  $I_L$  is the basis for a duty cycle of 110 % for 60 s or 150 % for 10 s with a duty cycle duration of 300 s.

<sup>4)</sup> The base load current  $I_H$  is the basis for a duty cycle of 150 % for 60 s or 160 % for 10 s with a duty cycle duration of 300 s.

<sup>5)</sup> [Additional notes regarding the correlation between the pulse frequency and maximum output current/output frequency is provided in the SINAMICS Low Voltage Engineering Manual.](#)

<sup>6)</sup> The specified power loss represents the maximum value at 100 % utilization. The value is lower under normal operating conditions.

<sup>7)</sup> The value applies to water and a mixture of water and Antifrogen N mixture with 45 % Antifrogen N as coolant.

<sup>8)</sup> The value is valid for water as coolant. [Additional information and notes on other coolants is provided in the SINAMICS Low Voltage Engineering Manual.](#)

# SINAMICS S120 Chassis Format Units

## Liquid-cooled units

### Motor Modules

#### Technical data

Line voltage 380 ... 480 V 3 AC DC link voltage 510 ... 720 V DC		Motor Modules			
		6SL3325-1TE32-1AA3	6SL3325-1TE32-6AA3	6SL3325-1TE33-1AA3	6SL3325-1TE35-0AA3
<b>DC link connection</b> DCP, DCN		2 × hole for M12 Busbar	2 × hole for M12 Busbar	2 × hole for M12 Busbar	2 × hole for M12 Busbar
<b>Motor connection</b> U2, V2, W2		Hole for M12	Hole for M12	Hole for M12	Hole for M12
• Conductor cross-section, max. (IEC)	mm <sup>2</sup>	2 × 95	2 × 95	2 × 240	2 × 240
<b>Cable length, max. <sup>1)</sup></b>					
• Shielded	m	300	300	300	300
• Unshielded	m	450	450	450	450
<b>PE/GND connection</b>		2 × hole for M12	2 × hole for M12	2 × hole for M12	2 × hole for M12
• Conductor cross-section, max. (IEC)	mm <sup>2</sup>	2 × 95	2 × 95	2 × 240	2 × 240
<b>Degree of protection</b>		IP00	IP00	IP00	IP00
<b>Dimensions</b>					
• Width	mm	150	150	150	150
• Height	mm	746	746	1172	1172
• Depth	mm	545	545	545	545
<b>Weight, approx.</b>	kg	41	41	80	80
<b>Frame size</b>		FXL	FXL	GXL	GXL

<sup>1)</sup> Sum of all motor cables. Longer cable lengths for specific configurations are available on request. [For additional information, please refer to the SINAMICS Low Voltage Engineering Manual.](#)

### Technical data

Line voltage 380 ... 480 V 3 AC DC link voltage 510 ... 720 V DC		Motor Modules			
		6SL3325-1TE36-1AA3	6SL3325-1TE38-4AA3	6SL3325-1TE41-0AA3	6SL3325-1TE41-4AA3
<b>Type rating</b>					
• For $I_L$ (50 Hz 400 V) <sup>1)</sup>	kW	<b>315</b>	<b>450</b>	<b>560</b>	<b>800</b>
• For $I_H$ (50 Hz 400 V) <sup>1)</sup>	kW	250	400	450	710
• For $I_L$ (60 Hz 460 V) <sup>2)</sup>	hp	500	700	800	1000
• For $I_H$ (60 Hz 460 V) <sup>2)</sup>	hp	350	600	700	1000
<b>Output current</b>					
• Rated current $I_{NA}$	A	605	840	985	1405
• Base load current $I_L$ <sup>3)</sup>	A	590	820	960	1370
• Base load current $I_H$ <sup>4)</sup>	A	460	700	860	1257
• Maximum current $I_{maxA}$	A	885	1230	1440	2055
<b>DC link current</b>					
• Rated current $I_{NDC}$ when supplied from					
- Basic Line Module	A	738	1025	1202	1714
- Active Line Module	A	664	922	1080	1544
• Base load current $I_{LDC}$ <sup>3)</sup> when supplied from					
- Basic Line Module	A	719	1000	1170	1670
- Active Line Module	A	646	898	1051	1500
• Base load current $I_{HDC}$ <sup>4)</sup> when supplied from					
- Basic Line Module	A	561	853	1048	1532
- Active Line Module	A	504	767	942	1377
<b>Current demand</b>					
• 24 V DC auxiliary power supply	A	1.6	1.6	1.46	1.46
<b>DC link capacitance</b>					
	μF	12600	17400	21000	29000
<b>Pulse frequency <sup>5)</sup></b>					
• Rated frequency	kHz	1.25	1.25	1.25	1.25
• Pulse frequency, max.					
- Without current derating	kHz	1.25	1.25	1.25	1.25
- With current derating	kHz	7.5	7.5	7.5	7.5
<b>Power loss, at 50 Hz 400 V <sup>6)</sup></b>					
• Dissipated to the coolant	kW	4.65	5.52	7.46	9.53
• Dissipated to the ambient air	kW	0.16	0.23	0.48	0.62
• Total	kW	4.81	5.75	7.94	10.15
<b>Coolant flow rate <sup>7)</sup></b>					
	l/min	16	16	27	27
<b>Volume of liquid</b> in the integrated heat exchanger					
	dm <sup>3</sup>	0.74	0.74	1.56	1.56
<b>Pressure drop, typ. <sup>8)</sup></b> for volumetric flow					
	Pa	70000	70000	70000	70000
<b>Heat exchanger material</b>					
		Aluminum	Aluminum	Aluminum	Aluminum
<b>Sound pressure level <math>L_{pA}</math></b> (1 m) at 50/60 Hz					
	dB	54	54	56	56

<sup>1)</sup> Rated power of a typ. 6-pole standard induction motor based on  $I_L$  or  $I_H$  with 400 V 3 AC 50 Hz.

<sup>2)</sup> Rated power of a typ. 6-pole standard induction motor based on  $I_L$  or  $I_H$  with 460 V 3 AC 60 Hz.

<sup>3)</sup> The base load current  $I_L$  is the basis for a duty cycle of 110 % for 60 s or 150 % for 10 s with a duty cycle duration of 300 s.

<sup>4)</sup> The base load current  $I_H$  is the basis for a duty cycle of 150 % for 60 s or 160 % for 10 s with a duty cycle duration of 300 s.

<sup>5)</sup> Additional notes regarding the correlation between the pulse frequency and maximum output current/output frequency is provided in the [SINAMICS Low Voltage Engineering Manual](#).

<sup>6)</sup> The specified power loss represents the maximum value at 100 % utilization. The value is lower under normal operating conditions.

<sup>7)</sup> The value applies to water and a mixture of water and Antifrogen N mixture with 45 % Antifrogen N as coolant.

<sup>8)</sup> The value is valid for water as coolant. [Additional information and notes on other coolants is provided in the SINAMICS Low Voltage Engineering Manual](#).

# SINAMICS S120 Chassis Format Units

## Liquid-cooled units

### Motor Modules

#### Technical data

Line voltage 380 ... 480 V 3 AC DC link voltage 510 ... 720 V DC		Motor Modules			
		6SL3325-1TE36-1AA3	6SL3325-1TE38-4AA3	6SL3325-1TE41-0AA3	6SL3325-1TE41-4AA3
<b>DC link connection</b> DCP, DCN		2 × hole for M12 Busbar	2 × hole for M12 Busbar	2 × hole for M12 Busbar	2 × hole for M12 Busbar
<b>Motor connection</b> U2, V2, W2		2 × hole for M12	2 × hole for M12	2 × hole for M12	2 × hole for M12
• Conductor cross-section, max. (IEC)	mm <sup>2</sup>	4 × 185	4 × 185	4 × 240	4 × 240
<b>Cable length, max. <sup>1)</sup></b>					
• Shielded	m	300	300	300	300
• Unshielded	m	450	450	450	450
<b>PE/GND connection</b>		2 × hole for M12	2 × hole for M12	2 × hole for M12	2 × hole for M12
• Conductor cross-section, max. (IEC)	mm <sup>2</sup>	4 × 185	4 × 185	Busbar	Busbar
<b>Degree of protection</b>		IP00	IP00	IP00	IP00
<b>Dimensions</b>					
• Width	mm	265	265	295	295
• Height	mm	1002	1002	1516	1516
• Depth	mm	545	545	545	545
<b>Weight, approx.</b>	kg	110	110	220	220
<b>Frame size</b>		HXL	HXL	JXL	JXL

<sup>1)</sup> Sum of all motor cables. Longer cable lengths for specific configurations are available on request. [For additional information, please refer to the SINAMICS Low Voltage Engineering Manual.](#)

### Technical data

Line voltage 500 ... 690 V 3 AC DC link voltage 675 ... 1035 V DC		Motor Modules			
		6SL3325-1TG31-0AA3	6SL3325-1TG31-5AA3	6SL3325-1TG32-2AA3	6SL3325-1TG33-3AA3
<b>Rated power</b>					
• For $I_L$ (50 Hz 690 V) <sup>1)</sup>	kW	<b>90</b>	<b>132</b>	<b>200</b>	<b>315</b>
• For $I_H$ (50 Hz 690 V) <sup>1)</sup>	kW	75	110	160	250
• For $I_L$ (50 Hz 500 V) <sup>1)</sup>	kW	55	90	132	200
• For $I_H$ (50 Hz 500 V) <sup>1)</sup>	kW	55	90	132	200
• For $I_L$ (60 Hz 575 V) <sup>2)</sup>	hp	75	150	200	300
• For $I_H$ (60 Hz 575 V) <sup>2)</sup>	hp	75	125	200	250
<b>Output current</b>					
• Rated current $I_{NA}$	A	100	150	215	330
• Base load current $I_L$ <sup>3)</sup>	A	95	142	208	320
• Base load current $I_H$ <sup>4)</sup>	A	89	134	192	280
• Maximum current $I_{max A}$	A	142	213	312	480
<b>DC link current</b>					
• Rated current $I_{N DC}$ when supplied from					
- Basic Line Module	A	122	183	263	403
- Active Line Module	A	110	165	237	363
• Base load current $I_L DC$ <sup>3)</sup> when supplied from					
- Basic Line Module	A	116	173	253	390
- Active Line Module	A	105	156	229	352
• Base load current $I_H DC$ <sup>4)</sup> when supplied from					
- Basic Line Module	A	108	163	234	341
- Active Line Module	A	98	147	211	308
<b>Current demand</b>					
• 24 V DC auxiliary power supply	A	1.0	1.0	1.5	1.5
<b>DC link capacitance</b>					
	μF	2800	2800	4200	5800
<b>Pulse frequency <sup>5)</sup></b>					
• Rated frequency	kHz	1.25	1.25	1.25	1.25
• Pulse frequency, max.					
- Without current derating	kHz	1.25	1.25	1.25	1.25
- With current derating	kHz	7.5	7.5	7.5	7.5
<b>Power loss, at 50 Hz 500/690 V <sup>6)</sup></b>					
• Dissipated to the coolant	kW	0.8/1.09	1.15/1.57	1.65/2.25	2.4/3.27
• Dissipated to the ambient air	kW	0.06	0.07	0.09	0.11
• Total	kW	0.86/1.15	1.22/1.64	1.74/2.34	2.51/3.38
<b>Coolant flow rate <sup>7)</sup></b>					
	l/min	9	9	12	12
<b>Volume of liquid in the integrated heat exchanger</b>					
	dm <sup>3</sup>	0.31	0.31	0.91	0.91
<b>Pressure drop, typ. <sup>8)</sup> for volumetric flow</b>					
	Pa	70000	70000	70000	70000
<b>Heat exchanger material</b>		Stainless steel	Stainless steel	Stainless steel	Stainless steel

<sup>1)</sup> Rated power of a typ. 6-pole standard induction motor based on  $I_L$  or  $I_H$  at 500 V or 690 V 3 AC 50 Hz.

<sup>2)</sup> Rated power of a typ. 6-pole standard induction motor based on  $I_L$  or  $I_H$  at 575 V 3 AC 60 Hz.

<sup>3)</sup> The base load current  $I_L$  is the basis for a duty cycle of 110 % for 60 s or 150 % for 10 s with a duty cycle duration of 300 s.

<sup>4)</sup> The base load current  $I_H$  is the basis for a duty cycle of 150 % for 60 s or 160 % for 10 s with a duty cycle duration of 300 s.

<sup>5)</sup> [Additional notes regarding the correlation between the pulse frequency and maximum output current/output frequency is provided in the SINAMICS Low Voltage Engineering Manual.](#)

<sup>6)</sup> The specified power loss represents the maximum value at 100 % utilization. The value is lower under normal operating conditions.

<sup>7)</sup> The value applies to water and a mixture of water and Antifrogen N mixture with 45 % Antifrogen N as coolant.

<sup>8)</sup> The value is valid for water as coolant. [Additional information and notes on other coolants is provided in the SINAMICS Low Voltage Engineering Manual.](#)

# SINAMICS S120 Chassis Format Units

## Liquid-cooled units

### Motor Modules

#### Technical data

Line voltage 500 ... 690 V 3 AC DC link voltage 675 ... 1035 V DC		Motor Modules			
		6SL3325-1TG31-0AA3	6SL3325-1TG31-5AA3	6SL3325-1TG32-2AA3	6SL3325-1TG33-3AA3
Sound pressure level $L_{pA}$ (1 m) at 50/60 Hz	dB	52	52	52	52
DC link connection DCP, DCN		2 × hole for M12 Busbar	2 × hole for M12 Busbar	2 × hole for M12 Busbar	2 × hole for M12 Busbar
Motor connection U2, V2, W2		Hole for M12	Hole for M12	Hole for M12	Hole for M12
• Conductor cross-section, max. (IEC)	mm <sup>2</sup>	2 × 95	2 × 95	4 × 240	4 × 240
Cable length, max. <sup>1)</sup>					
• Shielded	m	300	300	300	300
• Unshielded	m	450	450	450	450
PE/GND connection		2 × hole for M12	2 × hole for M12	2 × hole for M12	2 × hole for M12
• Conductor cross-section, max. (IEC)	mm <sup>2</sup>	2 × 95	2 × 95	2 × 240	2 × 240
Degree of protection		IP00	IP00	IP00	IP00
Dimensions					
• Width	mm	150	150	150	150
• Height	mm	728	728	1172	1172
• Depth	mm	545	545	545	545
Weight, approx.	kg	41	41	80	80
Frame size		FXL	FXL	GXL	GXL

<sup>1)</sup> Sum of all motor cables. Longer cable lengths for specific configurations are available on request. [For additional information, please refer to the SINAMICS Low Voltage Engineering Manual.](#)

### Technical data

Line voltage 500 ... 690 V 3 AC DC link voltage 675 ... 1035 V DC		Motor Modules			
		6SL3325-1TG35-8AA3	6SL3325-1TG38-1AA3	6SL3325-1TG41-0AA3	6SL3325-1TG41-3AA3
<b>Rated power</b>					
• For $I_L$ (50 Hz 690 V) <sup>1)</sup>	kW	<b>560</b>	<b>800</b>	<b>1000</b>	<b>1200</b>
• For $I_H$ (50 Hz 690 V) <sup>1)</sup>	kW	450	710	900	1000
• For $I_L$ (50 Hz 500 V) <sup>1)</sup>	kW	400	560	710	900
• For $I_H$ (50 Hz 500 V) <sup>1)</sup>	kW	315	560	630	800
• For $I_L$ (60 Hz 575 V) <sup>2)</sup>	hp	600	800	1000	1250
• For $I_H$ (60 Hz 575 V) <sup>2)</sup>	hp	500	700	900	1000
<b>Output current</b>					
• Rated current $I_{NA}$	A	575	810	1025	1270
• Base load current $I_L$ <sup>3)</sup>	A	560	790	1000	1230
• Base load current $I_H$ <sup>4)</sup>	A	514	724	917	1136
• Maximum current $I_{max A}$	A	840	1185	1500	1845
<b>DC link current</b>					
• Rated current $I_{N DC}$ when supplied from					
- Basic Line Module	A	702	990	1250	1550
- Active Line Module	A	632	891	1125	1395
• Base load current $I_L DC$ <sup>3)</sup> when supplied from					
- Basic Line Module	A	683	963	1219	1500
- Active Line Module	A	616	869	1100	1353
• Base load current $I_H DC$ <sup>4)</sup> when supplied from					
- Basic Line Module	A	627	883	1118	1384
- Active Line Module	A	565	796	1009	1250
<b>Current demand</b>					
• 24 V DC auxiliary power supply	A	1.6	1.46	1.46	1.46
<b>DC link capacitance</b>					
	μF	9670	14000	16000	19330
<b>Pulse frequency <sup>5)</sup></b>					
• Rated frequency	kHz	1.25	1.25	1.25	1.25
• Pulse frequency, max.					
- Without current derating	kHz	1.25	1.25	1.25	1.25
- With current derating	kHz	7.5	7.5	7.5	7.5
<b>Power loss, at 50 Hz 500/690 V <sup>6)</sup></b>					
• Dissipated to the coolant	kW	4.0/5.45	6.55/9.11	7.5/10.37	9.36/12.92
• Dissipated to the ambient air	kW	0.16	0.45	0.5	0.57
• Total	kW	4.16/5.61	7.0/9.56	8.0/10.87	9.93/13.49
<b>Coolant flow rate <sup>7)</sup></b>					
	l/min	16	27	27	27
<b>Volume of liquid in the integrated heat exchanger</b>					
	dm <sup>3</sup>	0.74	1.56	1.56	1.56
<b>Pressure drop, typ. <sup>8)</sup> for volumetric flow</b>					
	Pa	70000	70000	70000	70000
<b>Heat exchanger material</b>					
		Aluminum	Aluminum	Aluminum	Aluminum

<sup>1)</sup> Rated power of a typ. 6-pole standard induction motor based on  $I_L$  or  $I_H$  at 500 V or 690 V 3 AC 50 Hz.

<sup>2)</sup> Rated power of a typ. 6-pole standard induction motor based on  $I_L$  or  $I_H$  at 575 V 3 AC 60 Hz.

<sup>3)</sup> The base load current  $I_L$  is the basis for a duty cycle of 110 % for 60 s or 150 % for 10 s with a duty cycle duration of 300 s.

<sup>4)</sup> The base load current  $I_H$  is the basis for a duty cycle of 150 % for 60 s or 160 % for 10 s with a duty cycle duration of 300 s.

<sup>5)</sup> Additional notes regarding the correlation between the pulse frequency and maximum output current/output frequency is provided in the SINAMICS Low Voltage Engineering Manual.

<sup>6)</sup> The specified power loss represents the maximum value at 100 % utilization. The value is lower under normal operating conditions.

<sup>7)</sup> The value applies to water and a mixture of water and Antifrogen N mixture with 45 % Antifrogen N as coolant.

<sup>8)</sup> The value is valid for water as coolant. Additional information and notes on other coolants is provided in the SINAMICS Low Voltage Engineering Manual.



# SINAMICS S120 Chassis Format Units

## Liquid-cooled units

### Motor Modules

#### Technical data

Line voltage 500 ... 690 V 3 AC DC link voltage 675 ... 1035 V DC		Motor Modules			
		6SL3325-1TG35-8AA3	6SL3325-1TG38-1AA3	6SL3325-1TG41-0AA3	6SL3325-1TG41-3AA3
Sound pressure level $L_{pA}$ (1 m) at 50/60 Hz	dB	54	56	56	56
DC link connection DCP, DCN		2 × hole for M12 Busbar	2 × hole for M12 Busbar	2 × hole for M12 Busbar	2 × hole for M12 Busbar
Motor connection U2, V2, W2		2 × hole for M12	2 × hole for M12	2 × hole for M12	2 × hole for M12
• Conductor cross-section, max. (IEC)	mm <sup>2</sup>	4 × 185	4 × 240	4 × 240	4 × 240
Cable length, max. <sup>1)</sup>					
• Shielded	m	300	300	300	300
• Unshielded	m	450	450	450	450
PE/GND connection		2 × hole for M12	2 × hole for M12	2 × hole for M12	2 × hole for M12
• Conductor cross-section, max. (IEC)	mm <sup>2</sup>	4 × 185	Busbar	Busbar	Busbar
Degree of protection		IP00	IP00	IP00	IP00
Dimensions					
• Width	mm	265	295	295	295
• Height	mm	1002	1516	1516	1516
• Depth	mm	545	545	545	545
Weight, approx.	kg	110	220	220	220
Frame size		HXL	JXL	JXL	JXL

<sup>1)</sup> Sum of all motor cables. Longer cable lengths for specific configurations are available on request. [For additional information, please refer to the SINAMICS Low Voltage Engineering Manual.](#)

## Overview



In conjunction with line reactors and a logically consistent configuration of the plant or system, line filters limit the interference conducted by the Basic Line Modules and Power Modules to the limit values of Category C2 acc. to EN 61800-3.

The line filters are suitable for TN and TT supply systems grounded at the neutral point.

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## Selection and ordering data

*Line filters for Power Modules*

Suitable for Power Module chassis format, air-cooled	Type rating of the Power Modules at 400 V	Rated input current of the Power Module	Line filter
6SL3310-...	kW	A	Order No.
<b>Line voltage 380 ... 480 V 3 AC</b>			
1TE32-1AA3	110	229	<b>6SL3000-0BE32-5AA0</b>
1TE32-6AA3	132	284	<b>6SL3000-0BE34-4AA0</b>
1TE33-1AA3	160	338	
1TE33-8AA3	200	395	
1TE35-0AA3	250	509	<b>6SL3000-0BE36-0AA0</b>

*Line filters for Basic Line Modules*

Suitable for Basic Line Module chassis format, air-cooled	Rated power of the Basic Line Modules at 400 V or 690 V	Rated input current of the Basic Line Module	Line filter
6SL3330-...	kW	A	Order No.
<b>Line voltage 380 ... 480 V 3 AC</b>			
1TE34-2AA3	200	365	<b>6SL3000-0BE34-4AA0</b>
1TE35-3AA3	250	460	<b>6SL3000-0BE36-0AA0</b>
1TE38-2AA3	400	710	<b>6SL3000-0BE41-2AA0</b>
1TE41-2AA3	560	1010	
1TE41-5AA3	710	1265	<b>6SL3000-0BE41-6AA0</b>
<b>Line voltage 500 ... 690 V 3 AC</b>			
1TG33-0AA3	250	260	<b>6SL3000-0BG34-4AA0</b>
1TG34-3AA3	355	375	
1TG36-8AA3	560	575	<b>6SL3000-0BG36-0AA0</b>
1TG41-1AA3	900	925	<b>6SL3000-0BG41-2AA0</b>
1TG41-4AA3	1100	1180	

Note: Line filters are not available for liquid-cooled drive units.

# SINAMICS S120 Chassis Format Units

## System components

### Line-side components

#### Line filter

#### Technical data

Line voltage 380 ... 480 V 3 AC		Line filter				
		6SL3000-0BE32-5AA0	6SL3000-0BE34-4AA0	6SL3000-0BE36-0AA0	6SL3000-0BE41-2AA0	6SL3000-0BE41-6AA0
<b>Rated current</b>	A	250	440	600	1200	1600
<b>Power loss <sup>1)</sup></b> at 50/60 Hz	kW	0.049	0.049	0.055	0.137	0.182
<b>Load/line supply connection</b>		1 × hole for M10 Provided for busbar connection	1 × hole for M10 Provided for busbar connection	1 × hole for M10 Provided for busbar connection	1 × hole for M12 Provided for busbar connection	1 × hole for M12 Provided for busbar connection
<b>PE connection</b>		Hole for M8	Hole for M8	Hole for M10	Hole for M10	Hole for M10
<b>Degree of protection</b>		IP00	IP00	IP00	IP00	IP00
<b>Dimensions</b>						
• Width	mm	360	360	400	425	505
• Height	mm	240	240	265	265	265
• Depth	mm	116	116	140	145	145
<b>Weight, approx.</b>	kg	12.3	12.3	19.0	25.2	28.8
<b>Conformity</b>		CE	CE	CE	CE	CE
<b>Approvals, according to</b>		cURus	cURus	cURus	cURus	cURus
<b>Suitable for Power Module, chassis format</b>						
• Air-cooled (type rating)		6SL3310-1TE32-1AA3 (110 kW)	6SL3310-1TE32-6AA3 (132 kW) 6SL3310-1TE33-1AA3 (160 kW) 6SL3310-1TE33-8AA3 (200 kW)	6SL3310-1TE35-0AA3 (250 kW)	–	–
<b>Suitable for Basic Line Module, chassis format</b>						
• Air-cooled (rated power)		–	6SL3330-1TE34-2AA3 (200 kW)	6SL3330-1TE35-3AA3 (250 kW)	6SL3330-1TE38-2AA3 (400 kW) 6SL3330-1TE41-2AA3 (560 kW)	6SL3330-1TE41-5AA3 (710 kW)
Line voltage 500 ... 690 V 3 AC		Line filter				
		6SL3000-0BG34-4AA0		6SL3000-0BG36-0AA0	6SL3000-0BG41-2AA0	
<b>Rated current</b>	A	440		600	1200	
<b>Power loss <sup>1)</sup></b> at 50/60 Hz	kW	0.049		0.055	0.137	
<b>Load/line supply connection</b>		1 × hole for M10 Provided for busbar connection		1 × hole for M10 Provided for busbar connection	2 × hole for M12 Provided for busbar connection	
<b>PE connection</b>		Hole for M8		Hole for M10	Hole for M10	
<b>Degree of protection</b>		IP00		IP00	IP00	
<b>Dimensions</b>						
• Width	mm	360		400	505	
• Height	mm	240		265	265	
• Depth	mm	116		140	145	
<b>Weight, approx.</b>	kg	12.3		19.0	25.2	
<b>Conformity</b>		CE		CE	CE	
<b>Approvals, according to</b>		cURus		cURus	cURus	
<b>Suitable for Basic Line Module, chassis format</b>						
• Air-cooled (rated power)		6SL3330-1TG33-0AA3 (250 kW) 6SL3330-1TG34-3AA3 (355 kW)		6SL3330-1TG36-8AA3 (560 kW)	6SL3330-1TG41-1AA3 (900 kW) 6SL3330-1TG41-4AA3 (1100 kW)	

<sup>1)</sup> The specified power loss represents the maximum value at 100 % utilization. The value is lower under normal operating conditions.

## Overview



With a high line short-circuit power (i.e. low line supply cable inductance) a line reactor is required in order to

- protect the drive converter itself from excessively high harmonic currents and therefore overload
- limit the harmonics to permissible values. The harmonic currents are limited by the total inductance comprising the line reactor and mains supply cable inductance.

For additional information, please refer to the SINAMICS Low Voltage Engineering Manual.

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## Selection and ordering data

## Line reactors for SINAMICS S120 Power Modules

Suitable for Power Module, chassis format, <u>air-cooled</u>	Suitable for Power Module, chassis format, <u>liquid-cooled</u>	Type rating of the Power Modules at 400 V	Rated input current of the Power Module	Line reactor
6SL3310-...	6SL3315-...	kW	A	Order No.
<b>Line voltage 380 ... 480 V 3 AC</b>				
1TE32-1AA3	1TE32-1AA3	110	229/230	<b>6SL3000-0CE32-3AA0</b>
1TE32-6AA3	1TE32-6AA3	132	284/285	<b>6SL3000-0CE32-8AA0</b>
1TE33-1AA3	1TE33-1AA3	160	338/340	<b>6SL3000-0CE33-3AA0</b>
1TE33-8AA3	–	200	395	<b>6SL3000-0CE35-1AA0</b>
1TE35-0AA3	1TE35-0AA3	250	509/540	

# SINAMICS S120 Chassis Format Units

## System components

### Line-side components

#### Line reactors

#### Selection and ordering data

##### Line reactors for SINAMICS S120 Basic Line Modules

Suitable for Basic Line Module chassis format, <u>air-cooled</u>	Suitable for Basic Line Module chassis format, <u>liquid-cooled</u>	Rated power of the Basic Line Module at 400 V or 690 V	Rated input current of the Basic Line Module	Line reactor
6SL3330-...	6SL3335-...	kW	A	Order No.
<b>Line voltage 380 ... 480 V 3 AC</b>				
1TE34-2AA3	–	200	365	<b>6SL3000-0CE35-1AA0</b>
1TE35-3AA3	–	250	460	
–	1TE37-4AA3	360	610	<b>6SL3000-0CE36-3AA0</b>
1TE38-2AA3	–	400	710	<b>6SL3000-0CE37-7AA0</b>
1TE41-2AA3	–	560	1010	<b>6SL3000-0CE41-0AA0</b>
–	1TE41-2AA3	600	1000	
1TE41-5AA3	–	710	1265	<b>6SL3000-0CE41-5AA0</b>
–	1TE41-7AA3	830	1420	
<b>Line voltage 500 ... 690 V 3 AC</b>				
1TG33-0AA3	–	250	260	<b>6SL3000-0CH32-7AA0</b>
–	1TG34-2AA3	355	340	<b>6SL3000-0CH33-4AA0</b>
1TG34-3AA3	–	355	375	<b>6SL3000-0CH34-8AA0</b>
1TG36-8AA3	–	560	575	<b>6SL3000-0CH36-0AA0</b>
–	1TG37-3AA3	630	600	
1TG41-1AA3	–	900	925	<b>6SL3000-0CH41-2AA0</b>
–	1TG41-3AA3	1100	1070	
1TG41-4AA3	–	1100	1180	
–	1TG41-7AA3	1370	1350	<b>6SL3000-0CH41-6AA0</b>

##### Line reactors for SINAMICS S120 Smart Line Modules

Suitable for Smart Line Module, chassis format	Rated power of the Smart Line Module at 400 V or 690 V	Rated input current of the Smart Line Module	Line reactor
6SL3330-...	kW	A	Order No.
<b>Line voltage 380 ... 480 V 3 AC</b>			
6TE35-5AA3	250	463	<b>6SL3000-0EE36-2AA0</b>
6TE37-3AA3	355	614	
6TE41-1AA3	500	883	<b>6SL3000-0EE38-8AA0</b>
6TE41-3AA3	630	1093	<b>6SL3000-0EE41-4AA0</b>
6TE41-7AA3	800	1430	
<b>Line voltage 500 ... 690 V 3 AC</b>			
6TG35-5AA3	450	463	<b>6SL3000-0EH34-7AA0</b>
6TG38-8AA3	710	757	<b>6SL3000-0EH37-6AA0</b>
6TG41-2AA3	1000	1009	<b>6SL3000-0EH41-4AA0</b>
6TG41-7AA3	1400	1430	

## Technical data

Line voltage 380 ... 480 V 3 AC		Line reactor					
		6SL3000-0CE32-3AA0	6SL3000-0CE32-8AA0	6SL3000-0CE33-3AA0	6SL3000-0CE35-1AA0	6SL3000-0CE36-3AA0	6SL3000-0CE37-7AA0
<b>Rated current</b>	A	224	278	331	508	628	773
<b>Nominal inductance <math>L_N</math></b>	$\mu\text{H}$	76	62	52	42	27	22
<b>Power loss <sup>1)</sup></b> at 50/60 Hz	kW	0.274	0.247	0.267	0.365	0.368	0.351
<b>Line supply/ load connection</b>		1 × hole for M10 Provided for busbar connection	1 × hole for M10 Provided for busbar connection	1 × hole for M10 Provided for busbar connection	1 × hole for M12 Provided for busbar connection	1 × hole for M12 Provided for busbar connection	1 × hole for M12 Provided for busbar connection
<b>PE connection</b>		M6 screw	M6 screw	M6 screw	M6 screw	M6 screw	M6 screw
<b>Degree of protection</b>		IP00	IP00	IP00	IP00	IP00	IP00
<b>Dimensions</b>							
• Width	mm	270	270	270	300	300	300
• Height	mm	248	248	248	269	269	269
• Depth	mm	200	200	200	212	212	212
<b>Weight, approx.</b>	kg	24.5	26	27.8	38.0	41.4	51.3
<b>Conformity</b>		CE	CE	CE	CE	CE	CE
<b>Approvals, according to</b>		cURus	cURus	cURus	cURus	cURus	cURus
<b>Suitable for Power Module, chassis format</b>							
• Air-cooled (type rating)		6SL3310-1TE32-1AA3 (110 kW)	6SL3310-1TE32-6AA3 (132 kW)	6SL3310-1TE33-1AA3 (160 kW)	6SL3310-1TE33-8AA3 (200 kW) 6SL3310-1TE35-0AA3 (250 kW)	–	–
• Liquid cooled (type rating)		6SL3315-1TE32-1AA3 (110 kW)	6SL3315-1TE32-6AA3 (132 kW)	6SL3315-1TE33-1AA3 (160 kW)	6SL3315-1TE35-0AA3 (250 kW)	–	–
<b>Suitable for Basic Line Module, chassis format</b>							
• Air-cooled (rated power)		–	–	–	6SL3330-1TE34-2AA3 (200 kW) 6SL3330-1TE35-3AA3 (250 kW)	–	6SL3330-1TE38-2AA3 (400 kW)
• Liquid-cooled (rated power)		–	–	–	–	6SL3335-1TE37-4AA3 (360 kW)	–

<sup>1)</sup> The specified power loss represents the maximum value at 100 % utilization. The value is lower under normal operating conditions.

# SINAMICS S120 Chassis Format Units

## System components

### Line-side components

#### Line reactors

#### Technical data

Line voltage 380 ... 480 V 3 AC		Line reactor				
		6SL3000- OCE41-0AA0	6SL3000- OCE41-5AA0	6SL3000- OEE36-2AA0	6SL3000- OEE38-8AA0	6SL3000- OEE41-4AA0
<b>Rated current</b>	A	1022	1485	615	885	1430
<b>Nominal inductance <math>L_N</math></b>	$\mu\text{H}$	16	13	55	35	25
<b>Power loss <sup>1)</sup></b> at 50/60 Hz	kW	0.498	0.776	0.56	0.81	1.08
<b>Line supply/ load connection</b>		1 × hole for M12 Provided for busbar connection	1 × hole for M12 Provided for busbar connection	1 × hole for M10 Provided for busbar connection	1 × hole for M10 Provided for busbar connection	2 × hole for M10 Provided for busbar connection
<b>PE connection</b>		M6 screw	M6 screw	M6 thread	M6 thread	M6 thread
<b>Degree of protection</b>		IP00	IP00	IP00	IP00	IP00
<b>Dimensions</b>						
• Width	mm	350	460	300	442	544
• Height	mm	321	435	264	376	386
• Depth	mm	211	235	203	263	232
<b>Weight, approx.</b>	kg	69.6	118	57	85.5	220
<b>Conformity</b>		CE	CE	CE	CE	CE
<b>Approvals, according to</b>		cURus	cURus	cURus	cURus	cURus
<b>Suitable for Basic Line Module, chassis format</b>						
• Air-cooled (rated power)		6SL3330-1TE41- 2AA3 (560 kW)	6SL3330-1TE41- 5AA3 (710 kW)	–	–	–
• Liquid-cooled (rated power)		6SL3335-1TE41- 2AA3 (600 kW)	6SL3335-1TE41- 7AA3 (830 kW)	–	–	–
<b>Suitable for Smart Line Module, chassis format</b>						
• Air-cooled (rated power)		–	–	6SL3330-6TE35- 5AA3 (250 kW) 6SL3330-6TE37- 3AA3 (355 kW)	6SL3330-6TE41- 1AA3 (500 kW)	6SL3330-6TE41- 3AA3 (630 kW) 6SL3330-6TE41- 7AA3 (800 kW)

<sup>1)</sup> The specified power loss represents the maximum value at 100 % utilization. The value is lower under normal operating conditions.

## Technical data

Line voltage 500 ... 690 V 3 AC		Line reactor					
		6SL3000-0CH32-7AA0	6SL3000-0CH33-4AA0	6SL3000-0CH34-8AA0	6SL3000-0CH36-0AA0	6SL3000-0CH41-2AA0	6SL3000-0EH41-6AA0
<b>Rated current</b>	A	270	342	482	597	1167	1600
<b>Nominal inductance <math>L_N</math></b>	$\mu\text{H}$	100	81	65	46	30	17
<b>Power loss <sup>1)</sup></b> at 50/60 Hz	kW	0.277	0.27	0.48	0.485	0.783	0.977
<b>Line supply/ load connection</b>		1 × hole for M10 Provided for busbar connection	1 × hole for M10 Provided for busbar connection	1 × hole for M12 Provided for busbar connection	1 × hole for M12 Provided for busbar connection	2 × hole for M12 Provided for busbar connection	2 × hole for M12 Provided for busbar connection
<b>PE connection</b>		M6 screw	M6 screw	M6 screw	M6 screw	M6 screw	M6 screw
<b>Degree of protection</b>		IP00	IP00	IP00	IP00	IP00	IP00
<b>Dimensions</b>							
• Width	mm	270	270	350	350	460	416
• Height	mm	248	248	321	321	435	435
• Depth	mm	200	200	232	232	235	250
<b>Weight, approx.</b>	kg	27.9	38.9	55.6	63.8	147	134
<b>Conformity</b>		CE	CE	CE	CE	CE	CE
<b>Approvals <sup>2)</sup>, according to</b>		cURus	cURus	cURus	cURus	cURus	cURus
<b>Suitable for Basic Line Module, chassis format</b>							
• Air-cooled (rated power)		6SL3330-1TG33-0AA3 (250 kW)	–	6SL3330-1TG34-3AA3 (355 kW)	6SL3330-1TG36-8AA3 (560 kW)	6SL3330-1TG41-1AA3 (900 kW)	–
• Liquid-cooled (rated power)		–	6SL3335-1TG34-2AA3 (355 kW)	–	6SL3335-1TG37-3AA3 (630 kW)	6SL3335-1TG41-3AA3 (1100 kW)	6SL3335-1TG41-7AA3 (1370 kW)
<b>Line voltage 500 ... 690 V 3 AC</b>		<b>Line reactor</b>					
		6SL3000-0EH34-7AA0		6SL3000-0EH37-6AA0		6SL3000-0EH41-4AA0	
<b>Rated current</b>	A	465		760		1430	
<b>Nominal inductance <math>L_N</math></b>	$\mu\text{H}$	115		70		40	
<b>Power loss <sup>1)</sup></b> at 50/60 Hz	kW	0.82		0.95		1.85	
<b>Line supply/ load connection</b>		1 × hole for M10 Provided for busbar connection		1 × hole for M10 Provided for busbar connection		2 × hole for M10 Provided for busbar connection	
<b>PE connection</b>		M6 nut		M6 nut		M6 nut	
<b>Degree of protection</b>		IP00		IP00		IP00	
<b>Dimensions</b>							
• Width	mm	360		442		655	
• Height	mm	325		370		383	
• Depth	mm	229		303		288	
<b>Weight, approx.</b>	kg	58		145		239	
<b>Conformity</b>		CE		CE		CE	
<b>Approvals <sup>2)</sup>, according to</b>		cURus		cURus		cURus	
<b>Suitable for Smart Line Module, chassis format</b>							
• Air-cooled (rated power)		6SL3330-6TG35-5AA3 (450 kW)		6SL3330-6TG38-8AA3 (710 kW)		6SL3330-6TG41-2AA3 (1000 kW) 6SL3330-6TG41-7AA3 (1400 kW)	

<sup>1)</sup> The specified power loss represents the maximum value at 100 % utilization. The value is lower under normal operating conditions.

<sup>2)</sup> Only for line voltages 500 ... 600 V 3 AC.



# SINAMICS S120 Chassis Format Units

## System components

### Line-side components Recommended line-side system components

#### Selection and ordering data

Appropriate line-side power components are assigned depending on the power rating of the Power Modules, Basic Line Modules, Smart Line Modules or Active Line Modules.

Further information about the line contactors, switch disconnectors, fuses and circuit breakers is provided in the Catalogs IC 10 and LV 10.1.

#### Assignment of line-side power components to air-cooled and liquid-cooled Power Modules, chassis format

Type rating at 400 V	Rated input current		Suitable for Power Modules, chassis format	Main contactor	Switch disconnector without handle and shaft	Switch disconnector with handle and shaft
	Air-cooled	Liquid-cooled				
kW	A	A	6SL3310-... 6SL3315-... <sup>1) 2)</sup>	Order No.	Order No.	Order No.
<b>Line voltage 380 ... 480 V 3 AC</b>						
110	229	230	1TE32-1AA3	<b>3RT1064-6AP36</b>	<b>3KL5530-1AB01</b>	<b>3KL5530-1GB01</b>
132	284	285	1TE32-6AA3	<b>3RT1065-6AP36</b>	<b>3KL5730-1AB01</b>	<b>3KL5730-1GB01</b>
160	338	340	1TE33-1AA3	<b>3RT1066-6AP36</b>	–	
200	395	–	1TE33-8AA3	<b>3RT1075-6AP36</b>	–	
250	509	540	1TE35-0AA3	<b>3RT1076-6AP36</b>	<b>3KL6130-1AB02</b>	<b>3KL6130-1GB02</b>

Type rating at 400 V	Rated input current		Suitable for Power Module, chassis format	Cable protection fuse		Cable protection fuse incl. semiconductor protection	
	Air-cooled	Liquid-cooled		Rated current	Rated current		
kW	A	A	6SL3310-... 6SL3315-... <sup>1) 2)</sup>	Order No.	A	Order No.	A
<b>Line voltage 380 ... 480 V 3 AC</b>							
110	229	230	1TE32-1AA3	<b>3NA3144</b>	250	<b>3NE1230-2</b>	315
132	284	285	1TE32-6AA3	<b>3NA3250</b>	300	<b>3NE1331-2</b>	350
160	338	340	1TE33-1AA3	<b>3NA3254</b>	355	<b>3NE1333-2</b>	450
200	395	–	1TE33-8AA3	<b>3NA3260</b>	400		
250	509	540	1TE35-0AA3	<b>3NA3372</b>	630	<b>3NE1230-2 or 3NE1436-2</b>	2 × 315/630

<sup>1)</sup> 6SL3310-... is the air-cooled version.

<sup>2)</sup> 6SL3315-... is the liquid-cooled version.

## Selection and ordering data

## Assignment of line-side power components to air-cooled and liquid-cooled Basic Line Modules, chassis format

Rated power at 400 V or 690 V	Rated input current	Suitable for Basic Line Module	Main contactor	Fixed-mounted circuit breaker	Switch disconnector without handle and shaft	Switch disconnector with handle and shaft
kW	A		Order No.	Order No.	Order No.	Order No.
<b>Line voltage 380 ... 480 V 3 AC</b>						
200	365	6SL3330-1TE34-2AA3 <sup>1)</sup>	<b>3RT1075-...</b>	–	<b>3KL6130-1AB02</b>	<b>3KL6130-1GB02</b>
250	460	6SL3330-1TE35-3AA3 <sup>1)</sup>	<b>3RT1076-...</b>	–	<b>3KL6130-1AB02</b>	<b>3KL6130-1GB02</b>
360	610	6SL3335-1TE37-4AA3 <sup>2)</sup>	<b>3RT1076-...</b>	–	<b>3KL6130-1AB02</b>	<b>3KL6130-1GB02</b>
400	710	6SL3330-1TE38-2AA3 <sup>1)</sup>	<b>3RT1066-...</b> (3 units)	–	<b>3KL6230-1AB02</b>	<b>3KL6230-1GB02</b>
560	1010	6SL3330-1TE41-2AA3 <sup>1)</sup>	–	<b>3WL1112-2BB34-4AN2-Z C22</b>	–	–
600	1000	6SL3335-1TE41-2AA3 <sup>2)</sup>	–	<b>3WL1112-2BB34-4AN2-Z C22</b>	–	–
710	1265	6SL3330-1TE41-5AA3 <sup>1)</sup>	–	<b>3WL1116-2BB34-4AN2-Z C22</b>	–	–
830	1420	6SL3335-1TE41-7AA3 <sup>2)</sup>	–	<b>3WL1116-2BB34-4AN2-Z C22</b>	–	–
<b>Line voltage 500 ... 690 V 3 AC</b>						
250	260	6SL3330-1TG33-0AA3 <sup>1)</sup>	<b>3RT1066-...</b>	–	<b>3KL5730-1AB01</b>	<b>3KL5730-1GB01</b>
355	375	6SL3330-1TG34-3AA3 <sup>1)</sup>	<b>3RT1075-...</b>	–	<b>3KL6130-1AB02</b>	<b>3KL6130-1GB02</b>
	340	6SL3335-1TG34-2AA3 <sup>2)</sup>				
560	575	6SL3330-1TG36-8AA3 <sup>1)</sup>	<b>3RT1076-...</b>	–	<b>3KL6130-1AB02</b>	<b>3KL6130-1GB02</b>
630	600	6SL3335-1TG37-3AA3 <sup>2)</sup>	<b>3RT1076-...</b>	–	<b>3KL6130-1AB02</b>	<b>3KL6130-1GB02</b>
900	925	6SL3330-1TG41-1AA3 <sup>1)</sup>	–	<b>3WL1210-4BB34-4AN2-Z C22</b>	–	–
1100	1180	6SL3330-1TG41-4AA3 <sup>1)</sup>	–	<b>3WL1212-4BB34-4AN2-Z C22</b>	–	–
	1070	6SL3335-1TG41-3AA3 <sup>2)</sup>				
1370	1350	6SL3335-1TG41-7AA3 <sup>2)</sup>	–	<b>3WL1216-4BB34-4AN2-Z C22</b>	–	–

<sup>1)</sup> 6SL3330-... is the air-cooled version.<sup>2)</sup> 6SL3335-... is the liquid-cooled version.

# SINAMICS S120 Chassis Format Units

## System components

### Line-side components Recommended line-side system components

#### Selection and ordering data

Rated power at 400 V or 690 V	Rated input current	Suitable for Basic Line Module	Cable protection fuse		Cable protection fuse incl. semiconductor protection	
			Order No.	Rated current A	Order No.	Rated current A
kW	A					
<b>Line voltage 380 ... 480 V 3 AC</b>						
200	365	6SL3330-1TE34-2AA3 <sup>1)</sup>	<b>3NA3365</b>	500	<b>3NE1333-2</b>	450
250	460	6SL3330-1TE35-3AA3 <sup>1)</sup>	<b>3NA3372</b>	630	<b>3NE1334-2</b>	500
360	610	6SL3335-1TE37-4AA3 <sup>2)</sup>	<b>3NA3352</b> (2 units)	2 × 315	<b>3NE1333-2</b> (2 units)	2 × 450
400	710	6SL3330-1TE38-2AA3 <sup>1)</sup>	<b>3NA3475</b>	800	<b>3NE1438-2</b> <sup>3)</sup>	800
560	1010	6SL3330-1TE41-2AA3 <sup>1)</sup>	<b>3NA3482</b>	1250	<b>3NE1435-2</b> (2 units)	2 × 560
600	1000	6SL3335-1TE41-2AA3 <sup>2)</sup>	<b>3NA3365</b> (2 units)	2 × 500	<b>3NE1435-2</b> (2 units)	2 × 560
710	1265	6SL3330-1TE41-5AA3 <sup>1)</sup>	<b>3NA3475</b> (2 units)	2 × 800	<b>3NE1437-2</b> (2 units)	2 × 710
830	1420	6SL3335-1TE41-7AA3 <sup>2)</sup>	<b>3NA3365</b> (3 units)	3 × 500	<b>3NE1438-2</b> (2 units)	2 × 800
<b>Line voltage 500 ... 690 V 3 AC</b>						
250	260	6SL3330-1TG33-0AA3 <sup>1)</sup>	<b>3NA3252-6</b>	315	<b>3NE1230-2</b>	315
355	375	6SL3330-1TG34-3AA3 <sup>1)</sup>	<b>3NA3365-6</b>	500	<b>3NE1333-2</b> <sup>3)</sup>	450
	340	6SL3335-1TG34-2AA3 <sup>2)</sup>	<b>3NA3354-6</b>	355		
560	575	6SL3330-1TG36-8AA3 <sup>1)</sup>	<b>3NA3252-6</b> (2 units)	2 × 315	<b>3NE1436-2</b> <sup>3)</sup>	630
630	600	6SL3335-1TG37-3AA3 <sup>2)</sup>	<b>3NA3250-6</b> (2 units)	2 × 300	<b>3NE1331-2</b> (2 units)	2 × 350
900	925	6SL3330-1TG41-1AA3 <sup>1)</sup>	<b>3NA3365-6</b> (2 units)	2 × 500	<b>3NE1334-2</b> (2 units)	2 × 500
1100	1180	6SL3330-1TG41-4AA3 <sup>1)</sup>	<b>3NA3365-6</b> (3 units)	3 × 500	<b>3NE1436-2</b> <sup>3)</sup> (2 units)	2 × 630
	1070	6SL3335-1TG41-3AA3 <sup>2)</sup>	<b>3NA3360-6</b> (3 units)	3 × 400	<b>3NE1447-2</b> (2 units)	2 × 670
1370	1350	6SL3335-1TG41-7AA3 <sup>2)</sup>	<b>3NA3365-6</b> (3 units)	3 × 500	<b>3NE1435-2</b> (3 units)	3 × 560

<sup>1)</sup> 6SL3330-... is the air-cooled version.

<sup>2)</sup> 6SL3335-... is the liquid-cooled version.

<sup>3)</sup> No semiconductor protection.

## Selection and ordering data

## Assignment of line-side power components to Smart Line Modules, chassis format

Rated power at 400 V or 690 V	Rated input current	Suitable for Smart Line Module	Main contactor	Fixed-mounted circuit breaker	Switch disconnecter without handle and shaft	Switch disconnecter with handle and shaft
kW	A	6SL3330-...	Order No.	Order No.	Order No.	Order No.
<b>Line voltage 380 ... 480 V 3 AC</b>						
250	463	6TE35-5AA3	<b>3RT1476-6AP36</b>	–	<b>3KL6130-1AB02</b>	<b>3KL6130-1GB02</b>
355	614	6TE37-3AA3	<b>3RT1476-6AP36</b>	–	<b>3KL6230-1AB02</b>	<b>3KL6230-1GB02</b>
500	883	6TE41-1AA3	–	<b>3WL1210-4CB34-4AN2-Z C22</b>	–	–
630	1093	6TE41-3AA3	–	<b>3WL1212-4CB34-4AN2-Z C22</b>	–	–
800	1430	6TE41-7AA3	–	<b>3WL1216-4CB34-4AN2-Z C22</b>	–	–
<b>Line voltage 500 ... 690 V 3 AC</b>						
450	463	6TG35-5AA3	<b>3RT1466-6AP36</b>	–	<b>3KL6130-1AB02</b>	<b>3KL6130-1GB02</b>
710	757	6TG38-8AA3	<b>3RT1466-6AP36</b> (3 units)	–	<b>3KL6230-1AB02</b>	<b>3KL6230-1GB02</b>
1000	1009	6TG41-2AA3	–	<b>3WL1212-4CB34-4AN2-Z C22</b>	–	–
1400	1430	6TG41-7AA3	–	<b>3WL1216-4CB34-4AN2-Z C22</b>	–	–

Rated power at 400 V or 690 V	Rated input current	Suitable for Smart Line Module	Cable protection fuse		Cable protection fuse incl. semiconductor protection	
kW	A	6SL3330-...	Order No.	Rated current A	Order No.	Rated current A
<b>Line voltage 380 ... 480 V 3 AC</b>						
250	463	6TE35-5AA3	<b>3NA3365</b>	500	<b>3NE1435-2</b>	560
355	614	6TE37-3AA3	<b>3NA3372</b>	630	<b>3NE1437-2</b>	710
500	883	6TE41-1AA3	<b>3NA3480</b>	1000	<b>3NE1334-2</b> (2 units)	2 × 500
630	1093	6TE41-3AA3	<b>3NA3482</b>	1250	<b>3NE1436-2</b> (2 units)	2 × 630
800	1430	6TE41-7AA3	<b>3NA3475</b> (2 units)	2 × 800	<b>3NE1448-2</b> (2 units)	2 × 850
<b>Line voltage 500 ... 690 V 3 AC</b>						
450	463	6TG35-5AA3	<b>3NA3365-6</b>	500	<b>3NE1435-2</b>	560
710	757	6TG38-8AA3	<b>3NA3360-6</b> (2 units)	2 × 400	<b>3NE1448-2</b>	850
1000	1009	6TG41-2AA3	<b>3NA3354-6</b> (3 units)	3 × 355	<b>3NE1435-2</b> (2 units)	2 × 560
1400	1430	6TG41-7AA3	<b>3NA3365-6</b> (3 units)	3 × 500	<b>3NE1448-2</b> (2 units)	2 × 850

# SINAMICS S120 Chassis Format Units

## System components

### Line-side components Recommended line-side system components

#### Selection and ordering data

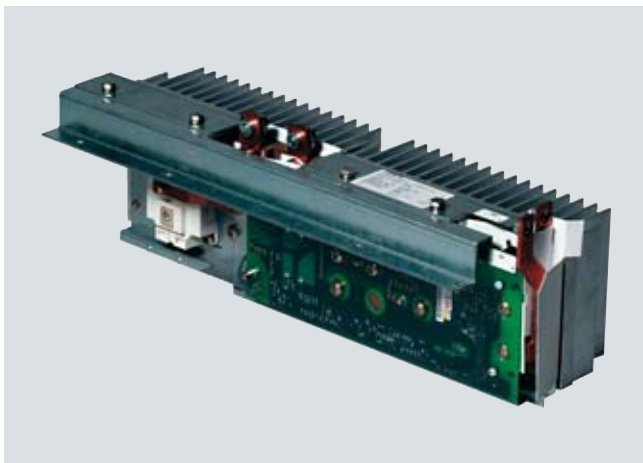
Assignment of line-side power components to air-cooled and liquid-cooled Active Line Modules or Active Interface Modules, chassis format

Rated power at 400 V or 690 V kW	Rated input current A	Suitable for Active Interface Module 6SL3300-...	Suitable for Active Line Module	Bypass contactor Order No.
<b>Line voltage 380 ... 480 V 3 AC</b>				
132	210	7TE32-6AA0	6SL3330-7TE32-1AA3	Included in Active Interface Module
160	260	7TE32-6AA0	6SL3330-7TE32-6AA3	Included in Active Interface Module
235	380	7TE33-8AA0	6SL3330-7TE33-8AA3	Included in Active Interface Module
300	490	7TE35-0AA0	6SL3330-7TE35-0AA3 6SL3335-7TE35-0AA3	Included in Active Interface Module
380	605	7TE38-4AA0	6SL3330-7TE36-1AA3	<b>3RT1476-6AP36</b>
500	840	7TE38-4AA0	6SL3330-7TE38-4AA3 6SL3335-7TE38-4AA3	<b>3WL1110-2BB34-4AN2-Z C22</b>
630	985	7TE41-4AA0	6SL3330-7TE41-0AA3	<b>3WL1112-2BB34-4AN2-Z C22</b>
900	1405	7TE41-4AA0	6SL3330-7TE41-4AA3	<b>3WL1116-2BB34-4AN2-Z C22</b>
<b>Line voltage 500 ... 690 V 3 AC</b>				
560	575	7TG35-8AA0	6SL3330-7TG35-8AA3 6SL3335-7TG35-8AA3	<b>3RT1476-6AP36</b>
800	735	7TG37-4AA0	6SL3330-7TG37-4AA3	<b>3RT1476-6AP36</b> (3 units)
1100	1025	7TG41-3AA0	6SL3330-7TG41-0AA3	<b>3WL1212-4BB34-4AN2-Z C22</b>
1400	1270	7TG41-3AA0	6SL3330-7TG41-3AA3 6SL3335-7TG41-3AA3	<b>3WL1216-4BB34-4AN2-Z C22</b>

Rated power at 400 V or 690 V kW	Rated input current A	Suitable for Active Interface Module 6SL3300-...	Suitable for Active Line Module 6SL3330-... 6SL3335-...	Switch disconnect- tor without handle and shaft Order No.	Switch disconnect- tor with handle and shaft Order No.	Cable protection fuse		Cable protection fuse incl. semiconductor protection	
						Order No.	Rated current A	Order No.	Rated current A
<b>Line voltage 380 ... 480 V 3 AC</b>									
132	210	7TE32-6AA0	7TE32-1AA3	<b>3KL5530-1AB01</b>	<b>3KL5530-1GB01</b>	<b>3NA3252</b>	315	<b>3NE1230-2</b>	315
160	260	7TE32-6AA0	7TE32-6AA3	<b>3KL5730-1AB01</b>	<b>3KL5730-1GB01</b>	<b>3NA3254</b>	355	<b>3NE1331-2</b>	350
235	380	7TE33-8AA0	7TE33-8AA3	<b>3KL5730-1AB01</b>	<b>3KL5730-1GB01</b>	<b>3NA3365</b>	500	<b>3NE1334-2</b>	500
300	490	7TE35-0AA0	7TE35-0AA3 7TE35-0AA3 <sup>1)</sup>	<b>3KL6130-1AB02</b>	<b>3KL6130-1GB02</b>	<b>3NA3372</b>	630	<b>3NE1436-2</b>	630
380	605	7TE38-4AA0	7TE36-1AA3	<b>3KL6230-1AB02</b>	<b>3KL6230-1GB02</b>	<b>3NA3475</b>	800	<b>3NE1438-2</b>	800
500	840	7TE38-4AA0	7TE38-4AA3 7TE38-4AA3 <sup>1)</sup>	–	–	<b>3NA3362</b> (2 units)	2 × 425	<b>3NE1334-2</b> (2 units)	2 × 500
630	985	7TE41-4AA0	7TE41-0AA3	–	–	<b>3NA3365</b> (2 units)	2 × 500	<b>3NE1436-2</b> (2 units)	2 × 630
900	1405	7TE41-4AA0	7TE41-4AA3	–	–	<b>3NA3365</b> (3 units)	3 × 500	<b>3NE1448-2</b> (3 units)	2 × 850
<b>Line voltage 500 ... 690 V 3 AC</b>									
560	575	7TG35-8AA0	7TG35-8AA3 7TG35-8AA3 <sup>1)</sup>	<b>3KL6130-1AB02</b>	<b>3KL6130-1GB02</b>	<b>3NA3352-6</b> (2 units)	2 × 315	<b>3NE1447-2</b>	670
800	735	7TG37-4AA0	7TG37-4AA3	<b>3KL6230-1AB02</b>	<b>3KL6230-1GB02</b>	<b>3NA3360-6</b> (2 units)	2 × 400	<b>3NE1448-2</b>	850
1100	1025	7TG41-3AA0	7TG41-0AA3	–	–	<b>3NA3354-6</b> (3 units)	3 × 355	<b>3NE1436-2</b> (2 units)	2 × 630
1400	1270	7TG41-3AA0	7TG41-3AA3 7TG41-3AA3 <sup>1)</sup>	–	–	<b>3NA3365-6</b> (3 units)	3 × 500	<b>3NE1438-2</b> (2 units)	2 × 800

<sup>1)</sup> Liquid-cooled version, 6SL3335-....

## Overview



A Braking Module and the matching external braking resistor are required to bring drives to a controlled standstill in the event of a power failure (e.g. with an EMERGENCY STOP) or to limit the DC link voltage for brief periods of regenerative operation, e.g. if the Line Module is not capable of energy recovery.

The Braking Module includes the power electronics and the associated control circuit. During operation, the DC link energy is converted to heat loss in an external braking resistor.

The Braking Module works autonomously from the converter control.

Several Braking Modules can be operated in parallel, but a separate braking resistor must be connected to each Braking Module.

Braking Modules are designed to be integrated into air-cooled Motor Modules, Line Modules or Power Modules and are cooled by the fans on these modules. The supply voltage for the electronics is taken from the DC link. The Braking Modules are connected to the DC link by means of the busbar sets included in the scope of supply or flexible cables and, in the case of Basic Line Modules of frame size GB, using a separate cable harness set.

The activation threshold of the Braking Module can be adjusted by means of a DIP switch. The braking power values specified in the technical specifications apply to the upper activation threshold.

## Design

The Braking Modules have the following interfaces as standard:

- 1 DC link connection
- 1 braking resistor connection
- 1 digital input (inhibit Braking Module/acknowledge error)
- 1 digital output (Braking Module inhibited)
- 1 DIP switch for adjusting the activation threshold

Information about Braking Module activation thresholds and other notes are included in the SINAMICS Low Voltage Engineering Manual.

## Selection and ordering data

Rated power $P_{DB}$ kW	Peak power $P_{15}$ kW	Frame size	Braking Module Order No.
<b>Line voltage 380 ... 480 V 3 AC</b> <b>DC link voltage 510 ... 720 V DC</b>			
25	125	FX/FB	<b>6SL3300-1AE31-3AA0</b>
50	250	GX/GB	<b>6SL3300-1AE32-5AA0</b>
50	250	HX/JX	<b>6SL3300-1AE32-5BA0</b>
<b>Line voltage 500 ... 600 V 3 AC</b> <b>DC link voltage 675 ... 900 V DC</b>			
25	125	FX/FB	<b>6SL3300-1AF31-3AA0</b>
50	250	GX/GB	<b>6SL3300-1AF32-5AA0</b>
50	250	HX/JX	<b>6SL3300-1AF32-5BA0</b>
<b>Line voltage 660 ... 690 V 3 AC</b> <b>DC link voltage 890 ... 1035 V DC</b>			
25	125	FX/FB	<b>6SL3300-1AH31-3AA0</b>
50	250	GX/GB	<b>6SL3300-1AH32-5AA0</b>
50	250	HX/JX	<b>6SL3300-1AH32-5BA0</b>

Description	Order No.
<b>Accessories</b>	
<b>Cable harness set</b> to install a Braking Module frame size GX in a Basic Line Module frame size GB	<b>6SL3366-2NG00-0AA0</b>
<b>Accessories for re-ordering</b>	
<b>Warning labels in 16 languages</b> Using this set of labels, another language can be placed over the German or English labels available as standard. A set of labels is provided with the devices. The following languages are available once in the set of labels: Chinese (simplified), Danish, Finnish, French, Greek, Italian, Japanese, Korean, Dutch, Polish, Portuguese/ Brazilian, Russian, Swedish, Spanish, Czech, Turkish	<b>6SL3166-3AB00-0AA0</b>

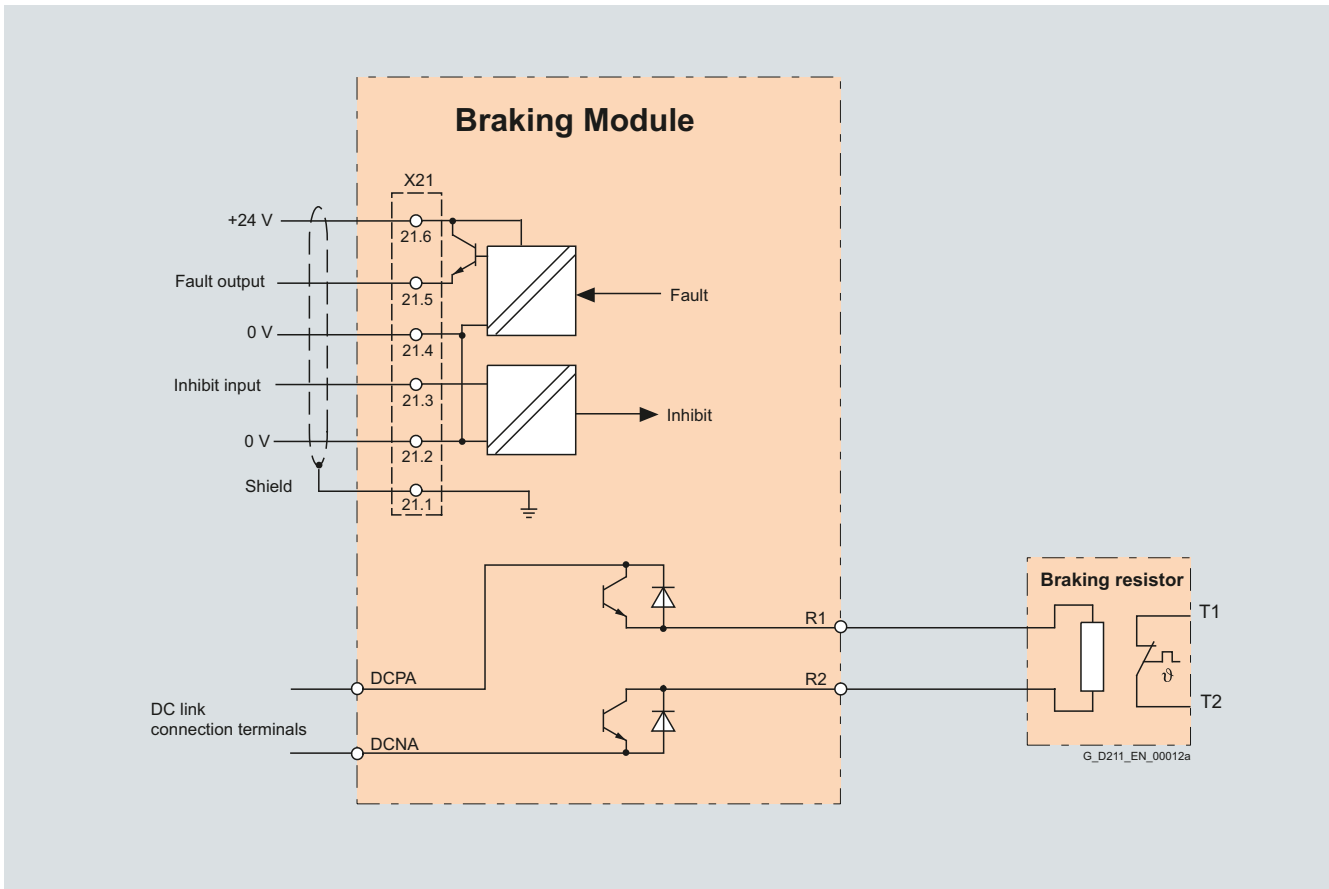
# SINAMICS S120 Chassis Format Units

## System components

### DC link components Braking Modules

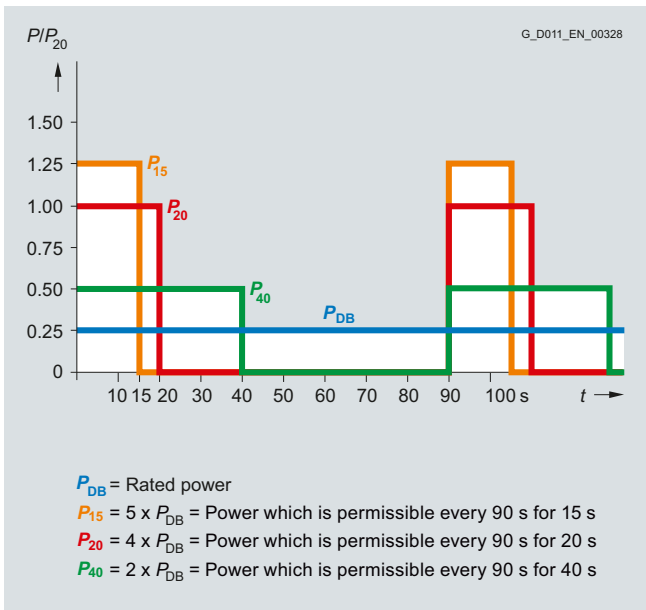
2

#### Integration



Connection example of a Braking Module

#### Characteristic curves



Load diagram for Braking Modules and braking resistor

## Technical data

Line voltage 380 ... 480 V 3 AC DC link voltage 510 ... 720 V DC		Braking Module		
		6SL3300-1AE31-3AA0	6SL3300-1AE32-5AA0	6SL3300-1AE32-5BA0
<b>Power</b>				
• Rated power $P_{DB}$	kW	25	50	50
• Peak power $P_{15}$	kW	125	250	250
• Power $P_{20}$	kW	100	200	200
• Power $P_{40}$	kW	50	100	100
<b>Activation thresholds</b> (adjustable via DIP switch)	V	774 (factory setting) or 673	774 (factory setting) or 673	774 (factory setting) or 673
<b>Digital inputs</b> In accordance with IEC 61131-2 Type 1				
• Voltage	V	24 DC	24 DC	24 DC
• Low level (an open digital input is interpreted as "low")	V	-3 ... +5	-3 ... +5	-3 ... +5
• High level	V	15 ... 30	15 ... 30	15 ... 30
• Current consumption at 24 V DC, typ.	mA	10	10	10
• Conductor cross-section, max.	mm <sup>2</sup>	1.5	1.5	1.5
<b>Digital outputs</b> (continuously short-circuit proof)				
• Voltage	V	24 DC	24 DC	24 DC
• Load current per digital output, max.	mA	500	500	500
• Conductor cross-section, max.	mm <sup>2</sup>	1.5	1.5	1.5
<b>R1/R2 connection</b>				
• Conductor cross-section, max.	mm <sup>2</sup>	35	50	50
<b>Weight, approx.</b>	kg	3.6	7.3	7.5
<b>Conformity</b>		CE	CE	CE
<b>Approvals, according to</b>		cURus	cURus	cURus
<b>Suitable for installation in air-cooled Power Modules, Line Modules or Motor Modules</b>				
• Air-cooled	Frame size	FX/FB	GX/GB <sup>1)</sup>	HX/JX

<sup>1)</sup> Cable harness set 6SL3366-2NG00-0AA0 is required to connect the Braking Module to a Basic Line Module of frame size GB.



# SINAMICS S120 Chassis Format Units

## System components

### DC link components Braking Modules

#### Technical data

Line voltage 500 ... 600 V 3 AC DC link voltage 675 ... 900 V DC		Braking Module		
		6SL3300-1AF31-3AA0	6SL3300-1AF32-5AA0	6SL3300-1AF32-5BA0
<b>Power</b>				
• Rated power $P_{DB}$	kW	25	50	50
• Peak power $P_{15}$	kW	125	250	250
• Power $P_{20}$	kW	100	200	200
• Power $P_{40}$	kW	50	100	100
<b>Activation thresholds</b> (adjustable via DIP switch)	V	967 (factory setting) or 841	967 (factory setting) or 841	967 (factory setting) or 841
<b>Digital inputs</b> In accordance with IEC 61131-2 Type 1				
• Voltage	V	24 DC	24 DC	24 DC
• Low level (an open digital input is interpreted as "low")	V	-3 ... +5	-3 ... +5	-3 ... +5
• High level	V	15 ... 30	15 ... 30	15 ... 30
• Current consumption at 24 V DC, typ.	mA	10	10	10
• Conductor cross-section, max.	mm <sup>2</sup>	1.5	1.5	1.5
<b>Digital outputs</b> (continuously short-circuit proof)				
• Voltage	V	24 DC	24 DC	24 DC
• Load current per digital output, max.	mA	500	500	500
• Conductor cross-section, max.	mm <sup>2</sup>	1.5	1.5	1.5
<b>R1/R2 connection</b>				
• Conductor cross-section, max.	mm <sup>2</sup>	M8 nut 35	M8 nut 50	M8 nut 50
<b>Weight, approx.</b>	kg	3.6	7.3	7.5
<b>Conformity</b>		CE	CE	CE
<b>Approvals, according to</b>		cURus	cURus	cURus
<b>Suitable for installation in air-cooled Power Modules, Line Modules or Motor Modules</b>				
• Air-cooled	Frame size	FX/FB	GX/GB <sup>1)</sup>	HX/JX

<sup>1)</sup> Cable harness set 6SL3366-2NG00-0AA0 is required to connect the Braking Module to a Basic Line Module of frame size GB.

## Technical data

Line voltage 660 ... 690 V 3 AC DC link voltage 890 ... 1035 V DC		Braking Module		
		6SL3300-1AH31-3AA0	6SL3300-1AH32-5AA0	6SL3300-1AH32-5BA0
<b>Power</b>				
• Rated power $P_{DB}$	kW	25	50	50
• Peak power $P_{15}$	kW	125	250	250
• Power $P_{20}$	kW	100	200	200
• Power $P_{40}$	kW	50	100	100
<b>Activation thresholds</b> (adjustable via DIP switch)	V	1153 (factory setting) or 1070	1153 (factory setting) or 1070	1153 (factory setting) or 1070
<b>Digital inputs</b> In accordance with IEC 61131-2 Type 1				
• Voltage	V	24 DC	24 DC	24 DC
• Low level (an open digital input is interpreted as "low")	V	-3 ... +5	-3 ... +5	-3 ... +5
• High level	V	15 ... 30	15 ... 30	15 ... 30
• Current consumption at 24 V DC, typ.	mA	10	10	10
• Conductor cross-section, max.	mm <sup>2</sup>	1.5	1.5	1.5
<b>Digital outputs</b> (continuously short-circuit proof)				
• Voltage	V	24 DC	24 DC	24 DC
• Load current per digital output, max.	mA	500	500	500
• Conductor cross-section, max.	mm <sup>2</sup>	1.5	1.5	1.5
<b>R1/R2 connection</b>				
• Conductor cross-section, max.	mm <sup>2</sup>	M8 nut 35	M8 nut 50	M8 nut 50
<b>Weight, approx.</b>	kg	3.6	7.3	7.5
<b>Conformity</b>		CE	CE	CE
<b>Approvals, according to</b>		–	–	–
<b>Suitable for installation in air-cooled Power Modules, Line Modules or Motor Modules</b>				
• Air-cooled	Frame size	FX/FB	GX/GB <sup>1)</sup>	HX/JX

<sup>1)</sup> Cable harness set 6SL3366-2NG00-0AA0 is required to connect the Braking Module to a Basic Line Module of frame size GB.

# SINAMICS S120 Chassis Format Units

## System components

### DC link components Braking resistors

#### Overview



Excess energy in the DC link is dissipated in the braking resistor. The braking resistor is connected to a Braking Module.

By positioning the braking resistor outside the cabinet or switch-gear room, it is possible to extract the heat losses away from the Line Modules/Motor Modules. The level of air conditioning required is therefore reduced.

The maximum permissible cable length between the Braking Module and braking resistor is 100 m.

2 braking resistors with different rated and peak power values are available for the units.

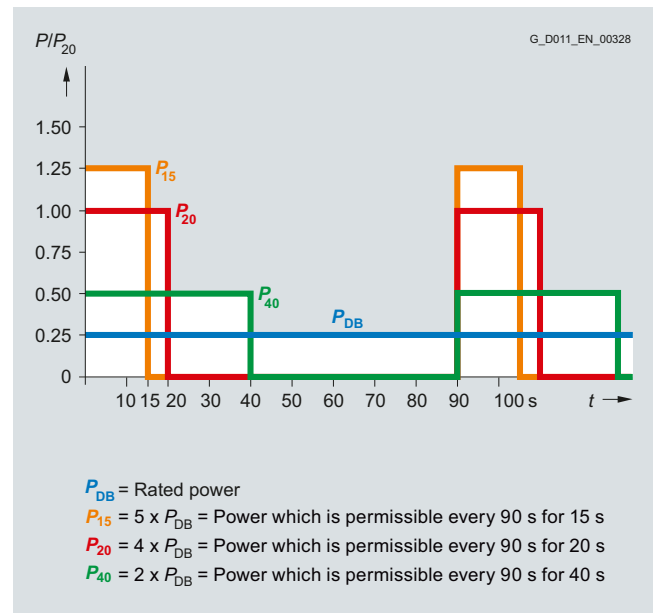
The braking resistor is monitored on the basis of the duty cycle. A temperature switch (NC contact) is also fitted. This responds when the maximum permissible temperature is exceeded and can be evaluated by a controller.

[Information about possible load cycles of the braking resistors and other notes are included in the SINAMICS Low Voltage Engineering Manual.](#)

#### Selection and ordering data

Rated power $P_{DB}$ kW	Suitable for Braking Module 6SL3300-...	Braking resistor Order No.
<b>Line voltage 380 ... 480 V 3 AC DC link voltage 510 ... 720 V DC</b>		
25	1AE31-3AA0	<b>6SL3000-1BE31-3AA0</b>
50	1AE32-5.A0	<b>6SL3000-1BE32-5AA0</b>
<b>Line voltage 500 ... 600 V 3 AC DC link voltage 675 ... 900 V DC</b>		
25	1AF31-3AA0	<b>6SL3000-1BF31-3AA0</b>
50	1AF32-5.A0	<b>6SL3000-1BF32-5AA0</b>
<b>Line voltage 660 ... 690 V 3 AC DC link voltage 890 ... 1035 V DC</b>		
25	1AH31-3AA0	<b>6SL3000-1BH31-3AA0</b>
50	1AH32-5.A0	<b>6SL3000-1BH32-5AA0</b>

#### Characteristic curves



Load diagram for Braking Modules and braking resistors

## Technical data

Line voltage 380 ... 480 V 3 AC DC link voltage 510 ... 720 V DC		Braking resistor	
		6SL3000-1BE31-3AA0	6SL3000-1BE32-5AA0
Resistance	Ω	4.4 (± 7.5 %)	2.2 (± 7.5 %)
Rated power $P_{DB}$ (continuous braking power)	kW	25	50
Power $P_{15}$	kW	125	250
Power $P_{20}$	kW	100	200
Power $P_{40}$	kW	50	100
Current, max.	A	189	378
Power connection		M10 stud	M10 stud
• Conductor cross-section, max. (IEC)	mm <sup>2</sup>	50	70
Degree of protection		IP20	IP20
Dimensions			
• Width	mm	740	810
• Height	mm	600	1325
• Depth	mm	486	486
Weight, approx.	kg	50	120
Conformity		CE	CE
Approvals, according to		cURus	cURus
Suitable for Braking Module	Type	6SL3300-1AE31-3AA0	6SL3300-1AE32-5 . A0

Line voltage 380 ... 480 V 3 AC DC link voltage 675 ... 900 V DC		Braking resistor	
		6SL3000-1BF31-3AA0	6SL3000-1BF32-5AA0
Resistance	Ω	6.8 (± 7.5 %)	3.4 (± 7.5 %)
Rated power $P_{DB}$ (continuous braking power)	kW	25	50
Power $P_{15}$	kW	125	250
Power $P_{20}$	kW	100	200
Power $P_{40}$	kW	50	100
Current, max.	A	189	378
Power connection		M10 stud	M10 stud
• Conductor cross-section, max. (IEC)	mm <sup>2</sup>	50	70
Degree of protection		IP20	IP20
Dimensions			
• Width	mm	740	810
• Height	mm	600	1325
• Depth	mm	486	486
Weight, approx.	kg	50	120
Conformity		CE	CE
Approvals, according to		cURus	cURus
Suitable for Braking Module	Type	6SL3300-1AF31-3AA0	6SL3300-1AF32-5 . A0

# SINAMICS S120 Chassis Format Units

## System components

### DC link components Braking resistors

#### Technical data

Line voltage 660 ... 690 V 3 AC DC link voltage 890 ... 1035 V DC		Braking resistor	
		6SL3000-1BH31-3AA0	6SL3000-1BH32-5AA0
<b>Resistance</b>	Ω	9.8 (± 7.5 %)	4.9 (± 7.5 %)
<b>Rated power <math>P_{DB}</math> (continuous braking power)</b>	kW	25	50
<b>Power <math>P_{15}</math></b>	kW	125	250
<b>Power <math>P_{20}</math></b>	kW	100	200
<b>Power <math>P_{40}</math></b>	kW	50	100
<b>Current, max.</b>	A	125	255
<b>Power connection</b>		M10 stud	M10 stud
• Conductor cross-section, max. (IEC)	mm <sup>2</sup>	50	70
<b>Degree of protection</b>		IP20	IP20
<b>Dimensions</b>			
• Width	mm	740	810
• Height	mm	600	1325
• Depth	mm	486	486
<b>Weight, approx.</b>	kg	50	120
<b>Conformity</b>		CE	CE
<b>Approvals, according to</b>		–	–
<b>Suitable for Braking Module</b>	Type	6SL3300-1AH31-3AA0	6SL3300-1AH32-5 . A0

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## Overview



Motor reactors reduce the voltage load on the motor windings by reducing the voltage gradients on the motor terminals generated when the converter is used. At the same time, the capacitive charge/discharge currents that place an additional load on the converter output when long motor cables are used are reduced. For group drives, output reactors should always be used. The maximum permissible output frequency when a motor reactor is used is 150 Hz.

The motor reactor must be installed as close as possible to the Motor Module or Power Module. Up to 2 motor reactors can be connected in series.

Motor reactors are approved for use only in conjunction with Vector and V/f control modes.

For additional notes on the use of motor reactors, please refer to the SINAMICS Low Voltage Engineering Manual.

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## Selection and ordering data

Suitable for Power Module		Suitable for Motor Module		Type rating at 400 V	Rated output current	Motor reactor
Air-cooled	Liquid-cooled	Air-cooled	Liquid-cooled			
<b>Line voltage 380 ... 480 V 3 AC</b>						
6SL3310-1TE32-1AA3	6SL3315-1TE32-1AA3	6SL3320-1TE32-1AA3	6SL3325-1TE32-1AA3	110	210	<b>6SL3000-2BE32-1AA0</b>
6SL3310-1TE32-6AA3	6SL3315-1TE32-6AA3	6SL3320-1TE32-6AA3	6SL3325-1TE32-6AA3	132	260	<b>6SL3000-2BE32-6AA0</b>
6SL3310-1TE33-1AA3	6SL3315-1TE33-1AA3	6SL3320-1TE33-1AA3	6SL3325-1TE33-1AA3	160	310	<b>6SL3000-2BE33-2AA0</b>
6SL3310-1TE33-8AA3	–	6SL3320-1TE33-8AA3	–	200	380	<b>6SL3000-2BE33-8AA0</b>
6SL3310-1TE35-0AA3	6SL3315-1TE35-0AA3	6SL3320-1TE35-0AA3	6SL3325-1TE35-0AA3	250	490	<b>6SL3000-2BE35-0AA0</b>
–	–	6SL3320-1TE36-1AA3	6SL3325-1TE36-1AA3	315	605	<b>6SL3000-2AE36-1AA0</b>
–	–	6SL3320-1TE37-5AA3	–	400	745	<b>6SL3000-2AE38-4AA0</b>
–	–	6SL3320-1TE38-4AA3	6SL3325-1TE38-4AA3	450	840	
–	–	6SL3320-1TE41-0AA3	6SL3325-1TE41-0AA3	560	985	<b>6SL3000-2AE41-0AA0</b>
–	–	6SL3320-1TE41-2AA3	–	710	1260	<b>6SL3000-2AE41-4AA0</b>
–	–	6SL3320-1TE41-4AA3	6SL3325-1TE41-4AA3	800	1405	
<b>Line voltage 500 ... 690 V 3 AC</b>						
–	–	6SL3320-1TG28-5AA3	–	75	85	<b>6SL3000-2AH31-0AA0</b>
–	–	6SL3320-1TG31-0AA3	6SL3325-1TG31-0AA3	90	100	
–	–	6SL3320-1TG31-2AA3	–	110	120	<b>6SL3000-2AH31-5AA0</b>
–	–	6SL3320-1TG31-5AA3	6SL3325-1TG31-5AA3	132	150	
–	–	6SL3320-1TG31-8AA3	–	160	175	<b>6SL3000-2AH31-8AA0</b>
–	–	6SL3320-1TG32-2AA3	6SL3325-1TG32-2AA3	200	215	<b>6SL3000-2AH32-4AA0</b>
–	–	6SL3320-1TG32-6AA3	–	250	260	<b>6SL3000-2AH32-6AA0</b>
–	–	6SL3320-1TG33-3AA3	6SL3325-1TG33-3AA3	315	330	<b>6SL3000-2AH33-6AA0</b>
–	–	6SL3320-1TG34-1AA3	–	400	410	<b>6SL3000-2AH34-5AA0</b>
–	–	6SL3320-1TG34-7AA3	–	450	465	<b>6SL3000-2AH34-7AA0</b>
–	–	6SL3320-1TG35-8AA3	6SL3325-1TG35-8AA3	560	575	<b>6SL3000-2AH35-8AA0</b>
–	–	6SL3320-1TG37-4AA3	–	710	735	<b>6SL3000-2AH38-1AA0</b>
–	–	6SL3320-1TG38-1AA3	6SL3325-1TG38-1AA3	800	810	
–	–	6SL3320-1TG38-8AA3	–	900	910	<b>6SL3000-2AH41-0AA0</b>
–	–	6SL3320-1TG41-0AA3	6SL3325-1TG41-0AA3	1000	1025	<b>6SL3000-2AH41-1AA0</b>
–	–	6SL3320-1TG41-3AA3	6SL3325-1TG41-3AA3	1200	1270	<b>6SL3000-2AH41-3AA0</b>

# SINAMICS S120 Chassis Format Units

## System components

### Motor-side components

#### Motor reactors

#### Technical data

Line voltage 380 ... 480 V 3 AC		Motor reactor (for pulse frequencies of 2 kHz to 4 kHz)									
		6SL3000-2BE32-1AA0		6SL3000-2BE32-6AA0		6SL3000-2BE33-2AA0		6SL3000-2BE33-8AA0		6SL3000-2BE35-0AA0	
<b>Rated current</b>	A	210	260	310	380	490					
<b>Power loss, max. <sup>1)</sup></b>	kW	0.486	0.5	0.47	0.5	0.5					
<b>Load connection</b>		1 × hole for M10		1 × hole for M10		1 × hole for M10		1 × hole for M10		1 × hole for M12	
<b>PE connection</b>		M8 screw		M8 screw		M8 screw		M8 screw		M8 screw	
<b>Cable length, max.</b> between the motor reactor and motor (number of reactors in series)		(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
• Shielded	m	300	525	300	525	300	525	300	525	300	525
• Unshielded	m	450	787	450	787	450	787	450	787	450	787
<b>Degree of protection</b>		IP00		IP00		IP00		IP00		IP00	
<b>Dimensions</b>											
• Width	mm	300	300	300	300	300	300	300	300	300	300
• Height	mm	285	315	285	285	285	285	285	285	365	365
• Depth	mm	257	277	257	257	257	277	277	277	277	277
<b>Weight, approx.</b>	kg	66	66	66	73	100					
<b>Conformity</b>		CE		CE		CE		CE		CE	
<b>Approvals, according to</b>		cURus		cURus		cURus		cURus		cURus	
<b>Suitable for Power Module</b>		6SL3310-1TE32-1AA3 6SL3315-1TE32-1AA3		6SL3310-1TE32-6AA3 6SL3315-1TE32-6AA3		6SL3310-1TE33-1AA3 6SL3315-1TE33-1AA3		6SL3310-1TE33-8AA3		6SL3310-1TE35-0AA3 6SL3315-1TE35-0AA3	
<b>Suitable for Motor Module</b>		6SL3320-1TE32-1AA3 6SL3325-1TE32-1AA3		6SL3320-1TE32-6AA3 6SL3325-1TE32-6AA3		6SL3320-1TE33-1AA3 6SL3325-1TE33-1AA3		6SL3320-1TE33-8AA3		6SL3320-1TE35-0AA3 6SL3325-1TE35-0AA3	
• Rated current of the Motor Module or Power Module	A	210	260	310	380	490					
• Type rating of the Motor Module or Power Module	kW	110	132	160	200	250					

<sup>1)</sup> The specified power loss represents the maximum value at 100 % utilization. The value is lower under normal operating conditions.

## Technical data

Line voltage 380 ... 480 V 3 AC		Motor reactor (for pulse frequencies of 1.25 kHz to 2.5 kHz)											
		6SL3000-2AE36-1AA0		6SL3000-2AE38-4AA0		6SL3000-2AE41-0AA0		6SL3000-2AE41-4AA0					
<b>Rated current</b>	A	605	745	840	985	1260	1405						
<b>Power loss, max. <sup>1)</sup></b>	kW	0.9	0.84	0.943	1.062	0.9	1.054						
<b>Load connection</b>		1 × hole for M12		1 × hole for M12		1 × hole for M12		1 × hole for M12		2 × hole for M12		2 × hole for M12	
<b>PE connection</b>		M10 screw		M10 screw		M10 screw		M10 screw		M10 screw		M10 screw	
<b>Cable length, max.</b> between the motor reactor and motor (number of reactors in series)		(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
• Shielded	m	300	525	300	525	300	525	300	525	300	525	300	525
• Unshielded	m	450	787	450	787	450	787	450	787	450	787	450	787
<b>Degree of protection</b>		IP00		IP00		IP00		IP00		IP00		IP00	
<b>Dimensions</b>													
• Width	mm	410		410		410		410		460		460	
• Height	mm	392		392		392		392		392		392	
• Depth	mm	292		292		292		302		326		326	
<b>Weight, approx.</b>	kg	130		140		140		146		179		179	
<b>Conformity</b>		CE		CE		CE		CE		CE		CE	
<b>Approvals, according to</b>		cURus		cURus		cURus		cURus		cURus		cURus	
<b>Suitable for Motor Module</b>		6SL3320-1TE36-1AA3 6SL3325-1TE36-1AA3		6SL3320-1TE37-5AA3		6SL3320-1TE38-4AA3 6SL3325-1TE38-4AA3		6SL3320-1TE41-0AA3 6SL3325-1TE41-0AA3		6SL3320-1TE41-2AA3		6SL3320-1TE41-4AA3 6SL3325-1TE41-4AA3	
• Rated current of the Motor Module	A	605		745		840		985		1260		1405	
• Type rating of the Motor Module	kW	315		400		450		560		710		800	

<sup>1)</sup> The specified power loss represents the maximum value at 100 % utilization. The value is lower under normal operating conditions.



# SINAMICS S120 Chassis Format Units

## System components

### Motor-side components

#### Motor reactors

#### Technical data

Line voltage 500 ... 690 V 3 AC		Motor reactor (for pulse frequencies of 1.25 kHz to 2.5 kHz)											
		6SL3000-2AH31-0AA0				6SL3000-2AH31-5AA0				6SL3000-2AH31-8AA0		6SL3000-2AH32-4AA0	
<b>Rated current</b>	A	85		100		120		150		175		215	
<b>Power loss, max. <sup>1)</sup></b>	kW	0.257		0.3		0.318		0.335		0.4		0.425	
<b>Load connection</b>		Flat connector for M10 screw		Flat connector for M10 screw		Flat connector for M10 screw		Flat connector for M10 screw		Flat connector for M10 screw		Flat connector for M10 screw	
<b>PE connection</b>		M6 screw		M6 screw		M6 screw		M6 screw		M6 screw		M6 screw	
<b>Cable length, max.</b> between the motor reactor and motor (number of reactors in series)		(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
• Shielded	m	300	525	300	525	300	525	300	525	300	525	300	525
• Unshielded	m	450	787	450	787	450	787	450	787	450	787	450	787
<b>Degree of protection</b>		IP00		IP00		IP00		IP00		IP00		IP00	
<b>Dimensions</b>													
• Width	mm	270		270		270		270		300		300	
• Height	mm	248		248		248		248		285		285	
• Depth	mm	200		200		200		200		212		212	
<b>Weight, approx.</b>	kg	25		25		25.8		25.8		34		34	
<b>Conformity</b>		CE		CE		CE		CE		CE		CE	
<b>Approvals, according to <sup>2)</sup></b>		cURus		cURus		cURus		cURus		cURus		cURus	
<b>Suitable for Motor Module</b>		6SL3320-1TG28-5AA3		6SL3320-1TG31-0AA3 6SL3325-1TG31-0AA3		6SL3320-1TG31-2AA3		6SL3320-1TG31-5AA3 6SL3325-1TG31-5AA3		6SL3320-1TG31-8AA3		6SL3320-1TG32-2AA3 6SL3325-1TG32-2AA3	
• Rated current of the Motor Module	A	85		100		120		150		175		215	
• Type rating of the Motor Module	kW	75		90		110		132		160		200	

<sup>1)</sup> The specified power loss represents the maximum value at 100 % utilization. The value is lower under normal operating conditions.

<sup>2)</sup> Only for line voltages 500 ... 600 V 3 AC.

## Technical data

Line voltage 500 ... 690 V 3 AC		Motor reactor (for pulse frequencies of 1.25 kHz to 2.5 kHz)											
		6SL3000-2AH32-6AA0		6SL3000-2AH33-6AA0		6SL3000-2AH34-5AA0		6SL3000-2AH34-7AA0		6SL3000-2AH35-8AA0		6SL3000-2AH38-1AA0	
<b>Rated current</b>	A	260		330		410		465		575		735	
<b>Power loss, max. <sup>1)</sup></b>	kW	0.44		0.45		0.545		0.72		0.8		0.96	
<b>Load connection</b>		Flat connector for M10 screw		Flat connector for M10 screw		Flat connector for M12 screw		Flat connector for M12 screw		Flat connector for M12 screw		Flat connector for M12 screw	
<b>PE connection</b>		M6 screw		M6 screw		M8 screw		M8 screw		M8 screw		M8 screw	
<b>Cable length, max.</b> between the motor reactor and motor (number of reactors in series)		(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
• Shielded	m	300	525	300	525	300	525	300	525	300	525	300	525
• Unshielded	m	450	787	450	787	450	787	450	787	450	787	450	787
<b>Degree of protection</b>		IP00		IP00		IP00		IP00		IP00		IP00	
<b>Dimensions</b>													
• Width	mm	300		300		350		410		410		410	
• Height	mm	285		285		330		392		392		392	
• Depth	mm	212		212		215		292		292		279	
<b>Weight, approx.</b>	kg	40		46		68		80		80		146	
<b>Conformity</b>		CE		CE		CE		CE		CE		CE	
<b>Approvals, according to <sup>2)</sup></b>		cURus		cURus		cURus		cURus		cURus		cURus	
<b>Suitable for Motor Module</b>		6SL3320-1TG32-6AA3		6SL3320-1TG33-3AA3 6SL3325-1TG33-3AA3		6SL3320-1TG34-1AA3		6SL3320-1TG34-7AA3		6SL3320-1TG35-8AA3 6SL3325-1TG35-8AA3		6SL3320-1TG37-4AA3	
• Rated current of the Motor Module	A	260		330		410		465		575		735	
• Type rating of the Motor Module	kW	250		315		400		450		560		710	

<sup>1)</sup> The specified power loss represents the maximum value at 100 % utilization. The value is lower under normal operating conditions.

<sup>2)</sup> Only for line voltages 500 ... 600 V 3 AC.

# SINAMICS S120 Chassis Format Units

## System components

### Motor-side components

#### Motor reactors

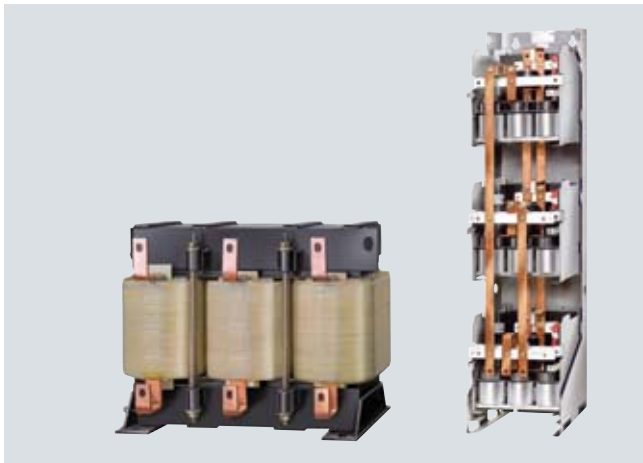
#### Technical data

Line voltage 500 ... 690 V 3 AC		Motor reactor (for pulse frequencies of 1.25 kHz to 2.5 kHz)							
		6SL3000-2AH38-1AA0		6SL3000-2AH41-0AA0		6SL3000-2AH41-3AA0			
<b>Rated current</b>	A	810		910		1025		1270	
<b>Power loss, max. <sup>1)</sup></b>	kW	1.0		0.97		1.05		0.95	
<b>Load connection</b>		Flat connector for M12 screw		Flat connector for M12 screw		Flat connector for M12 screw		Flat connector for M12 screw	
<b>PE connection</b>		M8 screw		M8 screw		M8 screw		M8 screw	
<b>Cable length, max.</b> between the motor reactor and motor (number of reactors in series)		(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
• Shielded	m	300	525	300	525	300	525	300	525
• Unshielded	m	450	787	450	787	450	787	450	787
<b>Degree of protection</b>		IP00		IP00		IP00		IP00	
<b>Dimensions</b>									
• Width	mm	410		410		410		460	
• Height	mm	392		392		392		392	
• Depth	mm	279		279		317		296	
<b>Weight, approx.</b>	kg	146		150		163		153	
<b>Conformity</b>		CE		CE		CE		CE	
<b>Approvals, according to <sup>2)</sup></b>		cURus		cURus		cURus		cURus	
<b>Suitable for Motor Module</b>		6SL3320-1TG38-1AA3 6SL3325-1TG38-1AA3		6SL3320-1TG38-8AA3		6SL3320-1TG41-0AA3 6SL3325-1TG41-0AA3		6SL3320-1TG41-3AA3 6SL3325-1TG41-3AA3	
• Rated current of the Motor Module	A	810		910		1025		1270	
• Type rating of the Motor Module	kW	800		900		1000		1200	

<sup>1)</sup> The specified power loss represents the maximum value at 100 % utilization. The value is lower under normal operating conditions.

<sup>2)</sup> Only for line voltages 500 ... 600 V 3 AC.

## Overview



dv/dt filters plus VPL (**V**oltage **P**eak **L**imiter) limits the voltage rate-of-rise to values  $< 500 \text{ V}/\mu\text{s}$ , and the typical voltage peaks to the following values according to the limit value curve to IEC/TS 60034-17: 2006:

$< 1000 \text{ V}$  at  $U_{\text{line}} < 575 \text{ V}$

$< 1250 \text{ V}$  at  $660 \text{ V} < U_{\text{line}} < 690 \text{ V}$

Standard motors with standard insulation and without insulated bearings with a supply voltage of up to 690 V can be used for converter operation if a dv/dt filter plus VPL is used.

dv/dt filters plus VPL are designed for the following maximum motor cable lengths:

- Shielded cables: 300 m (e.g. Protodur NYCWY)
- Unshielded cables: 450 m (e.g. Protodur NYY)

For shorter cable lengths (100 m shielded, 150 m unshielded) also refer to dv/dt filter compact plus VPL.

**Notice:** The maximum permissible cable length between the dv/dt filter plus VPL and the Power Module/Motor Module is 5 m.

## Design

The dv/dt filter plus VPL consists of two components, which are also separately supplied as mechanical units:

- dv/dt reactor
- Voltage limiting network, which cuts-off the voltage peaks and feeds the energy back into the DC link.

# SINAMICS S120 Chassis Format Units

## System components

### Motor-side components dv/dt filters plus VPL

#### Selection and ordering data

Suitable for Power Module		Suitable for Motor Module		Type rating at 400 V	Rated output current	dv/dt filter plus VPL
Air-cooled	Liquid-cooled	Air-cooled	Liquid-cooled			
<b>Line voltage 380 ... 480 V 3 AC</b>						
6SL3310-1TE32-1AA3	6SL3315-1TE32-1AA3	6SL3320-1TE32-1AA3	6SL3325-1TE32-1AA3	110	210	<b>6SL3000-2DE32-6AA0</b>
6SL3310-1TE32-6AA3	6SL3315-1TE32-6AA3	6SL3320-1TE32-6AA3	6SL3325-1TE32-6AA3	132	260	
6SL3310-1TE33-1AA3	6SL3315-1TE33-1AA3	6SL3320-1TE33-1AA3	6SL3325-1TE33-1AA3	160	310	<b>6SL3000-2DE35-0AA0</b>
6SL3310-1TE33-8AA3	–	6SL3320-1TE33-8AA3	–	200	380	
6SL3310-1TE35-0AA3	6SL3315-1TE35-0AA3	6SL3320-1TE35-0AA3	6SL3325-1TE35-0AA3	250	490	
–	–	6SL3320-1TE36-1AA3	6SL3325-1TE36-1AA3	315	605	<b>6SL3000-2DE38-4AA0</b>
–	–	6SL3320-1TE37-5AA3	–	400	745	
–	–	6SL3320-1TE38-4AA3	6SL3325-1TE38-4AA3	450	840	
–	–	6SL3320-1TE41-0AA3	6SL3325-1TE41-0AA3	560	985	<b>6SL3000-2DE41-4AA0</b>
–	–	6SL3320-1TE41-2AA3	–	710	1260	
–	–	6SL3320-1TE41-4AA3	6SL3325-1TE41-4AA3	800	1405	
<b>Line voltage 500 ... 690 V 3 AC</b>						
–	–	6SL3320-1TG28-5AA3	–	75	85	<b>6SL3000-2DH31-0AA0</b>
–	–	6SL3320-1TG31-0AA3	6SL3325-1TG31-0AA3	90	100	
–	–	6SL3320-1TG31-2AA3	–	110	120	<b>6SL3000-2DH31-5AA0</b>
–	–	6SL3320-1TG31-5AA3	6SL3325-1TG31-5AA3	132	150	
–	–	6SL3320-1TG31-8AA3	–	160	175	<b>6SL3000-2DH32-2AA0</b>
–	–	6SL3320-1TG32-2AA3	6SL3325-1TG32-2AA3	200	215	
–	–	6SL3320-1TG32-6AA3	–	250	260	<b>6SL3000-2DH33-3AA0</b>
–	–	6SL3320-1TG33-3AA3	6SL3325-1TG33-3AA3	315	330	
–	–	6SL3320-1TG34-1AA3	–	400	410	<b>6SL3000-2DH34-1AA0</b>
–	–	6SL3320-1TG34-7AA3	–	450	465	<b>6SL3000-2DH35-8AA0</b>
–	–	6SL3320-1TG35-8AA3	6SL3325-1TG35-8AA3	560	575	
–	–	6SL3320-1TG37-4AA3	–	710	735	<b>6SL3000-2DH38-1AA0</b>
–	–	6SL3320-1TG38-1AA3	6SL3325-1TG38-1AA3	800	810	
–	–	6SL3320-1TG38-8AA3	–	900	910	<b>6SL3000-2DH41-3AA0</b>
–	–	6SL3320-1TG41-0AA3	6SL3325-1TG41-0AA3	1000	1025	
–	–	6SL3320-1TG41-3AA3	6SL3325-1TG41-3AA3	1200	1270	

## Technical data

Line voltage 380 ... 480 V 3 AC		dv/dt filter plus VPL			
		6SL3000-2DE32-6AA0	6SL3000-2DE35-0AA0	6SL3000-2DE38-4AA0	6SL3000-2DE41-4AA0
$I_{th\ max}$	A	260	490	840	1405
<b>Degree of protection</b>		IP00	IP00	IP00	IP00
<b>Cable length, max.</b> between dv/dt filter and motor <sup>1)</sup>					
• Shielded	m	300	300	300	300
• Unshielded	m	450	450	450	450
<b>Conformity</b>		CE	CE	CE	CE
<b>Approvals, according to</b>		cURus	cURus	cURus	cURus
<b>dv/dt reactor</b>					
<b>Power loss</b>					
• At 50 Hz 400 V	kW	0.701	0.874	1.106	1.111
• At 60 Hz 460 V	kW	0.729	0.904	1.115	1.154
• At 150 Hz 400 V	kW	0.78	0.963	1.226	1.23
<b>Connections</b>					
• To the Power Module/ Motor Module		1 × hole M10	1 × hole M12	1 × hole M12	2 × hole M12
• To load		1 × hole M10	1 × hole M12	1 × hole M12	2 × hole M12
• PE		M6 screw	M6 screw	M6 screw	M6 screw
<b>Dimensions</b>					
• Width	mm	410	460	460	445
• Height	mm	370	370	385	385
• Depth	mm	229	275	312	312
<b>Weight, approx.</b>	kg	66	122	149	158
<b>Voltage Peak Limiter (VPL)</b>					
<b>Power loss</b>					
• At 50 Hz 400 V	kW	0.029	0.042	0.077	0.134
• At 60 Hz 460 V	kW	0.027	0.039	0.072	0.125
• At 150 Hz 400 V	kW	0.025	0.036	0.066	0.114
<b>Connections</b>					
• To dv/dt reactor		M8 nut	70 mm <sup>2</sup> terminals	1 × hole M8	1 × hole M10
• To DC link (DC)		M8 nut	70 mm <sup>2</sup> terminals	1 × hole M8	1 × hole M10
• PE		M8 stud	35 mm <sup>2</sup> terminals	M8 stud	M8 stud
<b>Dimensions</b>					
• Width	mm	263	392	309	309
• Height	mm	265	285	1313	1313
• Depth	mm	188	210	400	400
<b>Weight, approx.</b>	kg	6	16	48	72
<b>Suitable for Power Module</b> (type rating)		6SL3310-1TE32-1AA3 (110 kW)	6SL3310-1TE33-1AA3 (160 kW)		
		6SL3315-1TE32-1AA3 (110 kW)	6SL3315-1TE33-1AA3 (160 kW)		
		6SL3310-1TE32-6AA3 (132 kW)	6SL3310-1TE33-8AA3 (200 kW)		
		6SL3315-1TE32-6AA3 (132 kW)	6SL3310-1TE35-0AA3 (250 kW)		
			6SL3315-1TE35-0AA3 (250 kW)		
<b>Suitable for Motor Module</b> (type rating)		6SL3320-1TE32-1AA3 (110 kW)	6SL3320-1TE33-1AA3 (160 kW)	6SL3320-1TE36-1AA3 (605 kW)	6SL3320-1TE41-0AA3 (985 kW)
		6SL3325-1TE32-1AA3 (110 kW)	6SL3325-1TE33-1AA3 (160 kW)	6SL3325-1TE36-1AA3 (605 kW)	6SL3325-1TE41-0AA3 (985 kW)
		6SL3320-1TE32-6AA3 (132 kW)	6SL3320-1TE33-8AA3 (200 kW)	6SL3320-1TE37-5AA3 (745 kW)	6SL3320-1TE41-2AA3 (1260 kW)
		6SL3325-1TE32-6AA3 (132 kW)	6SL3320-1TE35-0AA3 (250 kW)	6SL3320-1TE38-4AA3 (840 kW)	6SL3320-1TE41-2AA3 (1405 kW)
			6SL3325-1TE35-0AA3 (250 kW)	6SL3325-1TE38-4AA3 (840 kW)	6SL3325-1TE41-2AA3 (1405 kW)

Note: For power ratings 560 kW (380 ... 480 V) or 710 kW (500 ... 690 V) and higher, a filter includes two dv/dt reactors.  
The listed technical data refer to one dv/dt reactor.

For additional information on dv/dt filters, please refer to the SINAMICS Low Voltage Engineering Manual.

<sup>1)</sup> Longer cable lengths for specific configurations are available on request.

# SINAMICS S120 Chassis Format Units

## System components

### Motor-side components dv/dt filters plus VPL

#### Technical data

Line voltage 500 ... 690 V 3 AC		dv/dt filter plus VPL			
		6SL3000-2DH31-0AA0	6SL3000-2DH31-5AA0	6SL3000-2DH32-2AA0	6SL3000-2DH33-3AA0
<b>I<sub>th max</sub></b>	A	100	150	215	330
<b>Degree of protection</b>		IP00	IP00	IP00	IP00
<b>Cable length, max.</b> between dv/dt filter and motor <sup>1)</sup>					
• Shielded	m	300	300	300	300
• Unshielded	m	450	450	450	450
<b>Conformity</b>		CE	CE	CE	CE
<b>Approvals, according to<sup>2)</sup></b>		cURus	cURus	cURus	cURus
<b>dv/dt reactor</b>					
<b>Power loss</b>					
• At 50 Hz 500/690 V	kW	0.49	0.389	0.578	0.595
• At 60 Hz 575 V	kW	0.508	0.408	0.604	0.62
• At 150 Hz 500/690 V	kW	0.541	0.436	0.645	0.661
<b>Connections</b>					
• To the Power Module/ Motor Module		1 × hole M10	1 × hole M10	1 × hole M10	1 × hole M10
• To load		1 × hole M10	1 × hole M10	1 × hole M10	1 × hole M10
• PE		M6 screw	M6 screw	M6 screw	M6 screw
<b>Dimensions</b>					
• Width	mm	350	350	460	460
• Height	mm	320	320	360	360
• Depth	mm	227	227	275	275
<b>Weight, approx.</b>	kg	48	50	83	135
<b>Voltage Peak Limiter (VPL)</b>					
<b>Power loss</b>					
• At 50 Hz 500/690 V	kW	0.016	0.02	0.032	0.042
• At 60 Hz 575 V	kW	0.015	0.019	0.03	0.039
• At 150 Hz 500/690 V	kW	0.013	0.018	0.027	0.036
<b>Connections</b>					
• To dv/dt reactor		M8 nut	M8 nut	70 mm <sup>2</sup> terminals	70 mm <sup>2</sup> terminals
• To DC link (DC)		M8 nut	M8 nut	70 mm <sup>2</sup> terminals	70 mm <sup>2</sup> terminals
• PE		M8 stud	M8 stud	35 mm <sup>2</sup> terminals	35 mm <sup>2</sup> terminals
<b>Dimensions</b>					
• Width	mm	263	263	392	392
• Height	mm	265	265	285	285
• Depth	mm	188	188	210	210
<b>Weight, approx.</b>	kg	6	6	16	16
<b>Suitable for Motor Module</b> (type rating)		6SL3320-1TG28-5AA3 (75 kW)	6SL3320-1TG31-2AA3 (110 kW)	6SL3320-1TG31-8AA3 (160 kW)	6SL3320-1TG32-6AA3 (250 kW)
		6SL3320-1TG31-0AA3 (90 kW)	6SL3320-1TG31-5AA3 (132 kW)	6SL3320-1TG32-2AA3 (200 kW)	6SL3320-1TG33-3AA3 (315 kW)
		6SL3325-1TG31-0AA3 (90 kW)	6SL3325-1TG31-5AA3 (132 kW)	6SL3325-1TG32-2AA3 (200 kW)	6SL3325-1TG33-3AA3 (315 kW)

Note: For power ratings 560 kW (380 ... 480 V) or 710 kW (500 ... 690 V) and higher, a filter includes two dv/dt reactors. The listed technical data refer to one dv/dt reactor.

For additional information on dv/dt filters, please refer to the SINAMICS Low Voltage Engineering Manual.

<sup>1)</sup> Longer cable lengths for specific configurations are available on request.

<sup>2)</sup> Only for line voltages 500 ... 600 V 3 AC.

## Technical data

Line voltage 500 ... 690 V 3 AC		dv/dt filter plus VPL			
		6SL3000-2DH34-1AA0	6SL3000-2DH35-8AA0	6SL3000-2DH38-1AA0	6SL3000-2DH41-4AA0
$I_{th\ max}$	A	410	575	810	1270
<b>Degree of protection</b>		IP00	IP00	IP00	IP00
<b>Cable length, max.</b> between dv/dt filter and motor <sup>1)</sup>					
• Shielded	m	300	300	300	300
• Unshielded	m	450	450	450	450
<b>Conformity</b>		CE	CE	CE	CE
<b>Approvals, according to <sup>2)</sup></b>		cURus	cURus	cURus	cURus
<b>dv/dt reactor</b>					
<b>Power loss</b>					
• At 50 Hz 500/690 V	kW	0.786	0.862	0.828	0.865
• At 60 Hz 575 V	kW	0.826	0.902	0.867	0.904
• At 150 Hz 500/690 V	kW	0.884	0.964	0.927	0.966
<b>Connections</b>					
• To the Power Module/ Motor Module		1 × hole M12	1 × hole M12	2 × hole M12	2 × hole M12
• To load		1 × hole M12	1 × hole M12	2 × hole M12	2 × hole M12
• PE		M6 screw	M6 screw	M6 screw	M6 screw
<b>Dimensions</b>					
• Width	mm	460	460	445	445
• Height	mm	385	385	385	385
• Depth	mm	312	312	312	312
<b>Weight, approx.</b>	kg	147	172	160	164
<b>Voltage Peak Limiter (VPL)</b>					
<b>Power loss</b>					
• At 50 Hz 500/690 V	kW	0.051	0.063	0.106	0.15
• At 60 Hz 575 V	kW	0.048	0.059	0.1	0.14
• At 150 Hz 500/690 V	kW	0.043	0.054	0.091	0.128
<b>Connections</b>					
• To dv/dt reactor		1 × hole M8	1 × hole M8	1 × hole M10	1 × hole M10
• To DC link (DC)		1 × hole M8	1 × hole M8	1 × hole M10	1 × hole M10
• PE		M8 stud	M8 stud	M8 stud	M8 stud
<b>Dimensions</b>					
• Width	mm	309	309	309	309
• Height	mm	1313	1313	1313	1313
• Depth	mm	400	400	400	400
<b>Weight, approx.</b>	kg	48	48	72	73
<b>Suitable for Motor Module</b> (type rating)		6SL3320-1TG34-1AA3 (400 kW)	6SL3320-1TG34-7AA3 (450 kW) 6SL3320-1TG35-8AA3 (560 kW) 6SL3325-1TG35-8AA3 (560 kW)	6SL3320-1TG37-4AA3 (710 kW) 6SL3320-1TG38-1AA3 (800 kW) 6SL3325-1TG38-1AA3 (800 kW)	6SL3320-1TG38-8AA3 (900 kW) 6SL3320-1TG41-0AA3 (1000 kW) 6SL3325-1TG41-0AA3 (1000 kW) 6SL3320-1TG41-3AA3 (1200 kW) 6SL3325-1TG41-3AA3 (1200 kW)

Note: For power ratings 560 kW (380 ... 480 V) or 710 kW (500 ... 690 V) and higher, a filter includes two dv/dt reactors.  
The listed technical data refer to one dv/dt reactor.

For additional information on dv/dt filters, please refer to the SINAMICS Low Voltage Engineering Manual.

<sup>1)</sup> Longer cable lengths for specific configurations are available on request.

<sup>2)</sup> Only for line voltages 500 ... 600 V 3 AC.



# SINAMICS S120 Chassis Format Units

## System components

### Motor-side components dv/dt filters compact plus VPL

#### Overview



dv/dt filters compact plus VPL (**V**oltage **P**eak **L**imiter) limits the voltage rate-of-rise  $dv/dt$  to values  $< 1600 \text{ V}/\mu\text{s}$ , and the typical voltage peaks to the following values according to the limit value curve A according to IEC 60034-25: 2007:

$< 1150 \text{ V}$  at  $U_{\text{line}} < 575 \text{ V}$

$< 1400 \text{ V}$  at  $660 \text{ V} < U_{\text{line}} < 690 \text{ V}$

Standard motors with standard insulation and without insulated bearings with a supply voltage of up to 690 V can be used for converter operation if a dv/dt filter compact plus VPL is used.

dv/dt filters compact plus VPL are designed for the following maximum motor cable lengths:

- Shielded cables: 100 m (e.g. Protodur NYCWY)
- Unshielded cables: 150 m (e.g. Protodur NYY)

For longer cable lengths ( $> 100 \text{ m}$  shielded,  $> 150 \text{ m}$  unshielded) refer to dv/dt filter plus VPL.

#### Notice:

- The max. permissible cable length between the dv/dt filter and Motor Module is 5 m
- Operation with output frequencies  $< 10 \text{ Hz}$  is permissible for max. 5 min

#### Design

The dv/dt filter compact plus VPL consists of two components, which are supplied together as a compact mechanical unit:

- dv/dt reactor
- Voltage limiting network, which cuts-off the voltage peaks and feeds the energy back into the DC link.

#### Selection and ordering data

Suitable for Motor Module chassis format	Type rating at 400 V or 690 V	dv/dt filter compact plus VPL
6SL3320-... (air-cooled)		Order No.
6SL3325-... (liquid-cooled)	kW	
Line voltage 380 ... 480 V 3 AC		
1TE32-1AA3	110	<b>6SL3000-2DE32-6EA0</b>
1TE32-6AA3	132	
1TE33-1AA3	160	<b>6SL3000-2DE35-0EA0</b>
1TE33-8AA3	200	
1TE35-0AA3	250	
1TE36-1AA3	315	<b>6SL3000-2DE38-4EA0</b>
1TE37-5AA3	400	
1TE38-4AA3	450	
1TE41-0AA3	560	<b>6SL3000-2DE41-4EA0</b>
1TE41-2AA3	710	
1TE41-4AA3	800	
Line voltage 500 ... 690 V 3 AC		
1TG28-5AA3	75	<b>6SL3000-2DG31-0EA0</b>
1TG31-0AA3	90	
1TG31-2AA3	110	<b>6SL3000-2DG31-5EA0</b>
1TG31-5AA3	132	
1TG31-8AA3	160	<b>6SL3000-2DG32-2EA0</b>
1TG32-2AA3	200	
1TG32-6AA3	250	<b>6SL3000-2DG33-3EA0</b>
1TG33-3AA3	315	
1TG34-1AA3	400	<b>6SL3000-2DG34-1EA0</b>
1TG34-7AA3	450	
1TG35-8AA3	560	<b>6SL3000-2DG35-8EA0</b>
1TG37-4AA3	710	
1TG38-1AA3	800	
1TG38-8AA3	900	<b>6SL3000-2DG41-3EA0</b>
1TG41-0AA3	1000	
1TG41-3AA3	1200	

For additional information on dv/dt filters, please refer to the SINAMICS Low Voltage Engineering Manual.

## Technical data

Line voltage 380 ... 480 V 3 AC		dv/dt filter compact plus VPL			
		6SL3000-2DE32-6EA0	6SL3000-2DE35-0EA0	6SL3000-2DE38-4EA0	6SL3000-2DE41-1EA0
<b>Rated current</b>	A	260	490	840	1405
<b><math>I_{th\ max}</math></b>	A	260	490	840	1405
<b>Power loss, max.</b>					
• At 50 Hz 400 V	kW	0.21	0.29	0.518	Reactor: 1.027 VPL: 0.127 Total: 1.154
• At 60 Hz 460 V	kW	0.215	0.296	0.529	Reactor: 1.077 VPL: 0.12 Total: 1.197
• At 150 Hz 400 V	kW	0.255	0.344	0.609	Reactor: 1.354 VPL: 0.09 Total: 1.444
<b>Power connection</b> input and output sides		Hole for M10	Hole for M10	Hole for M12	2 × elongated hole, 14 × 18 mm
• Conductor cross-section, max. (IEC)		Provided for busbar connection	Provided for busbar connection	Provided for busbar connection	Provided for busbar connection
<b>DC link connection</b> DCPS, DCNS		Threaded socket M8	Threaded socket M8	Hole for M8	Hole for M8
• Conductor cross-section, max. (IEC)	mm <sup>2</sup>	16	16	25	25
<b>PE/GND connection</b>		Threaded socket M6	Threaded socket M6	Threaded socket M6	Threaded socket M6 (reactor and VPL)
<b>Motor cable length, max.</b>					
• Shielded	m	100	100	100	100
• Unshielded	m	150	150	150	150
<b>Degree of protection</b>		IP00	IP00	IP00	IP00
<b>Dimensions</b>					
• Width	mm	310	350	440	Reactor: 430 VPL: 277
• Height	mm	283	317	369	Reactor: 385 VPL: 360
• Depth	mm	238	260	311	Reactor: 323 VPL: 291
<b>Weight, approx.</b>	kg	41	61	103	Reactor: 168.8 VPL: 19.2 Total: 188
<b>Conformity</b>		CE	CE	CE	CE
<b>Approvals, according to</b>		cURus	cURus	cURus	cURus
<b>Suitable for Motor Module</b> (type rating)		6SL332 . -1TE32-1AA3 (110 kW) 6SL332 . -1TE32-6AA3 (132 kW)	6SL332 . -1TE33-1AA3 (160 kW) 6SL3320-1TE33-8AA3 (200 kW) 6SL332 . -1TE35-0AA3 (250 kW)	6SL332 . -1TE36-1AA3 (315 kW) 6SL3320-1TE37-5AA3 (400 kW) 6SL332 . -1TE38-4AA3 (450 kW)	6SL332 . -1TE41-0AA3 (560 kW) 6SL3320-1TE41-2AA3 (710 kW) 6SL332 . -1TE41-4AA3 (800 kW)

# SINAMICS S120 Chassis Format Units

## System components

### Motor-side components dv/dt filters compact plus VPL

#### Technical data

Line voltage 500 ... 690 V 3 AC		dv/dt filter compact plus VPL			
		6SL3000-2DG31-0EA0	6SL3000-2DG31-5EA0	6SL3000-2DG32-2EA0	6SL3000-2DG33-3EA0
<b>Rated current</b>	A	100	150	215	330
<b><math>I_{th\ max}</math></b>	A	100	150	215	330
<b>Power loss, max.</b>					
• At 50 Hz 500/690 V	kW	0.227	0.27	0.305	0.385
• At 60 Hz 575 V	kW	0.236	0.279	0.316	0.399
• At 150 Hz 500/690 V	kW	0.287	0.335	0.372	0.48
<b>Power connection</b> input and output sides		Hole for M10	Hole for M10	Hole for M10	Hole for M10
• Conductor cross-section, max. (IEC)		Provided for busbar connection	Provided for busbar connection	Provided for busbar connection	Provided for busbar connection
<b>DC link connection</b> DCPS, DCNS		Threaded socket M8	Threaded socket M8	Hole for M8	Hole for M8
• Conductor cross-section, max. (IEC)	mm <sup>2</sup>	16	16	25	25
<b>PE/GND connection</b>		Threaded socket M6	Threaded socket M6	Threaded socket M6	Threaded socket M6
<b>Motor cable length, max.</b>					
• Shielded	m	100	100	100	100
• Unshielded	m	150	150	150	150
<b>Degree of protection</b>		IP00	IP00	IP00	IP00
<b>Dimensions</b>					
• Width	mm	310	310	350	350
• Height	mm	283	283	317	317
• Depth	mm	238	238	260	260
<b>Weight, approx.</b>	kg	34	36	51	60
<b>Conformity</b>		CE	CE	CE	CE
<b>Approvals, according to <sup>1)</sup></b>		cURus	cURus	cURus	cURus
<b>Suitable for Motor Module</b> (type rating)		6SL3320-1TG28-5AA3 (75 kW) 6SL332 . -1TG31-0AA3 (90 kW)	6SL3320-1TG31-2AA3 (110 kW) 6SL332 . -1TG31-5AA3 (132 kW)	6SL3320-1TG31-8AA3 (160 kW) 6SL332 . -1TG32-2AA3 (200 kW)	6SL3320-1TG32-6AA3 (250 kW) 6SL332 . -1TG33-3AA3 (315 kW)

<sup>1)</sup> Only for line voltages 500 ... 600 V 3 AC.

## Technical data

Line voltage 500 ... 690 V 3 AC		dv/dt filter compact plus VPL			
		6SL3000-2DG34-1EA0	6SL3000-2DG35-8EA0	6SL3000-2DG38-1EA0	6SL3000-2DG41-3EA0
<b>Rated current</b>	A	410	575	810	1270
<b><math>I_{th\ max}</math></b>	A	410	575	810	1270
<b>Power loss, max.</b>					
• At 50 Hz 500/690 V	kW	0.55	0.571	Reactor: 0.88 VPL: 0.084 Total: 0.964	Reactor: 0.926 VPL: 0.124 Total: 1.050
• At 60 Hz 575 V	kW	0.568	0.586	Reactor: 0.918 VPL: 0.08 Total: 0.998	Reactor: 0.993 VPL: 0.111 Total: 1.104
• At 150 Hz 500/690 V	kW	0.678	0.689	Reactor: 1.137 VPL: 0.059 Total: 1.196	Reactor: 1.23 VPL: 0.089 Total: 1.319
<b>Power connection</b> input and output sides		Hole for M12	Hole for M12	2 × elongated hole, 14 × 18 mm	2 × elongated hole, 14 × 18 mm
• Conductor cross-section, max. (IEC)		Provided for busbar connection	Provided for busbar connection	Provided for busbar connection	Provided for busbar connection
<b>DC link connection</b> DCPS, DCNS		Hole for M8	Hole for M8	Hole for M8	Hole for M8
• Conductor cross-section, max. (IEC)	mm <sup>2</sup>	50	50	95	95
<b>PE/GND connection</b>		Threaded socket M6	Threaded socket M6	Threaded socket M6 (reactor and VPL)	Threaded socket M6 (reactor and VPL)
<b>Motor cable length, max.</b>					
• Shielded	m	100	100	100	100
• Unshielded	m	150	150	150	150
<b>Degree of protection</b>		IP00	IP00	IP00	IP00
<b>Dimensions</b>					
• Width	mm	440	440	Reactor: 430 VPL: 277	Reactor: 430 VPL: 277
• Height	mm	369	369	Reactor: 385 VPL: 360	Reactor: 385 VPL: 360
• Depth	mm	311	311	Reactor: 323 VPL: 291	Reactor: 323 VPL: 291
<b>Weight, approx.</b>	kg	87	100	Reactor: 171.2 VPL: 18.8 Total: 190	Reactor: 175.8 VPL: 19.2 Total: 195
<b>Conformity</b>		CE	CE	CE	CE
<b>Approvals, according to <sup>1)</sup></b>		cURus	cURus	cURus	cURus
<b>Suitable for Motor Module</b> (type rating)		6SL3320-1TG34-1AA3 (400 kW)	6SL3320-1TG34-7AA3 (450 kW) 6SL332 . -1TG35-8AA3 (560 kW)	6SL3320-1TG37-4AA3 (710 kW) 6SL332 . -1TG38-1AA3 (800 kW)	6SL3320-1TG38-8AA3 (900 kW) 6SL332 . -1TG41-0AA3 (1000 kW) 6SL332 . -1TG41-3AA3 (1200 kW)

<sup>1)</sup> Only for line voltages 500 ... 600 V 3 AC.

# SINAMICS S120 Chassis Format Units

## System components

### Motor-side components

#### Sine-wave filters

#### Overview



If a sine-wave filter is connected to the output of the Power Module or Motor Module, the voltage between the motor terminals is virtually sinusoidal. This reduces the voltage load on the motor windings and prevents motor noise induced by the pulse frequency.

The pulse frequency of the modules must be set to 4 kHz for the sine-wave filters. The max. output frequency with sine-wave filter is limited to 150 Hz.

As a result, the max. possible output current and the max. achievable output voltage of the units are reduced. The voltage drops across the sine-wave filter, a factor which must also be taken into account in the drive design.

A sine-wave filter must be installed as close as possible to the Motor Module or Power Module.

It is only permissible to operate the sine-wave filter when the motor is connected (sine-wave filters are not no-load proof)!

[For additional information on sine-wave filters, please refer to the SINAMICS Low Voltage Engineering Manual.](#)

#### Selection and ordering data

Suitable for Power Module		Suitable for Motor Module		Type rating at 400 V	Rated output current	Sine-wave filter
Air-cooled	Liquid-cooled	Air-cooled	Liquid-cooled			
<b>Line voltage 380 ... 480 V 3 AC</b>						
6SL3310-1TE32-1AA3	6SL3315-1TE32-1AA3	6SL3320-1TE32-1AA3	6SL3325-1TE32-1AA3	110	210	<b>6SL3000-2CE32-3AA0</b>
6SL3310-1TE32-6AA3	6SL3315-1TE32-6AA3	6SL3320-1TE32-6AA3	6SL3325-1TE32-6AA3	132	260	
6SL3310-1TE33-1AA3	6SL3315-1TE33-1AA3	6SL3320-1TE33-1AA3	6SL3325-1TE33-1AA3	160	310	<b>6SL3000-2CE32-8AA0</b>
6SL3310-1TE33-8AA3	–	6SL3320-1TE33-8AA3	–	200	380	<b>6SL3000-2CE33-3AA0</b>
6SL3310-1TE35-0AA3	6SL3315-1TE35-0AA3	6SL3320-1TE35-0AA3	6SL3325-1TE35-0AA3	250	490	<b>6SL3000-2CE34-1AA0</b>

## Technical data

Line voltage 380 ... 480 V 3 AC		Sine-wave filter				
		6SL3000-2CE32-3AA0	6SL3000-2CE32-8AA0	6SL3000-2CE33-3AA0	6SL3000-2CE34-1AA0	
<b>Rated current</b>	A	225	276	333	408	
<b>Power loss</b>						
• At 50 Hz 400 V	kW	0.221	0.235	0.245	0.34	
• At 60 Hz 460 V	kW	0.265	0.282	0.294	0.408	
• At 150 Hz 400 V	kW	0.48	0.5	0.53	0.75	
<b>Load connection</b>		Flat connector for M10 screw	Flat connector for M10 screw	Flat connector for M10 screw	Flat connector for M10 screw	
<b>PE connection</b>		1 × hole M10	1 × hole M10	1 × hole M10	1 × hole M10	
<b>Cable length, max.</b> between sine-wave filter and motor						
• Shielded	m	300	300	300	300	
• Unshielded	m	450	450	450	450	
<b>Degree of protection</b>		IP00	IP00	IP00	IP00	
<b>Dimensions</b>						
• Width	mm	620	620	620	620	
• Height	mm	300	300	370	370	
• Depth	mm	320	320	360	360	
<b>Weight, approx.</b>	kg	124	127	136	198	
<b>Conformity</b>		CE	CE	CE	CE	
<b>Approvals, according to</b>		cURus	cURus	cURus	cURus	
<b>Suitable for Power Module</b>		6SL3310-1TE32-1AA3 6SL3315-1TE32-1AA3	6SL3310-1TE32-6AA3 6SL3315-1TE32-6AA3	6SL3310-1TE33-1AA3 6SL3315-1TE33-1AA3	6SL3310-1TE33-8AA3	6SL3310-1TE35-0AA3 6SL3315-1TE35-0AA3
<b>Suitable for Motor Module</b>		6SL3320-1TE32-1AA3 6SL3325-1TE32-1AA3	6SL3320-1TE32-6AA3 6SL3325-1TE32-6AA3	6SL3320-1TE33-1AA3 6SL3325-1TE33-1AA3	6SL3320-1TE33-8AA3	6SL3320-1TE35-0AA3 6SL3325-1TE35-0AA3
• Rated current of the Motor Module or Power Module at a pulse frequency of 4 kHz	A	170	215	270	330	380
• Type rating of the Motor Module or Power Module at a pulse frequency of 4 kHz	kW	90	110	132	160	200

# SINAMICS S120 Chassis Format Units

## System components

### Control Units

#### Overview



#### New system architecture with a central control module

In multi-axis drives, the individual drives are controlled from the higher-level control systems in such a way as to achieve the desired coordinated movement. This requires cyclic data exchange between the controller and the drives. In previous drive designs, this exchange took place via a field bus, requiring complex installation and configuration. SINAMICS takes a new approach in this respect: A central control module 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 module, 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.

#### 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
<b>Vector control</b>	<ul style="list-style-type: none"> <li>Induction motor               <ul style="list-style-type: none"> <li>Torque control with/without encoder</li> <li>Speed control with/without encoder</li> </ul> </li> <li>Torque motor               <ul style="list-style-type: none"> <li>Torque control with encoder</li> <li>Speed control with/without encoder</li> </ul> </li> <li>For induction and torque motors               <ul style="list-style-type: none"> <li>Position control with encoder</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>Linear <math>V/f</math> characteristic</li> <li>Constant-frequency <math>V/f</math> characteristic (textile)</li> <li>Independent voltage setpoint input</li> </ul>	<ul style="list-style-type: none"> <li>Data set changeover</li> <li>Extended setpoint input</li> <li>Motor identification</li> <li>Current/speed controller optimization</li> <li>Technology controller</li> <li>Basic positioner</li> <li>Automatic restart</li> <li>Flying restart with/without encoder</li> <li>Kinetic buffering</li> <li>Synchronization</li> <li>Droop</li> <li>Brake control</li> </ul>	<p>Mixed operation with <math>V/f</math> control modes is possible; it is for this reason that the <math>V/f</math> control modes are stored only once in the "Vector control" drive object</p> <p>Position control can be selected as a function module from both Servo and Vector mode</p> <p>Permanent-magnet 1FW4 synchronous motors can be operated over the complete operating range in <u>Vector control</u>.</p>
<b>Servo control</b>	<ul style="list-style-type: none"> <li>Induction motor               <ul style="list-style-type: none"> <li>Torque control with/without encoder</li> <li>Speed control with/without encoder</li> </ul> </li> <li>Synchronous motor, linear motor and torque motor               <ul style="list-style-type: none"> <li>Torque control with encoder</li> <li>Speed control with encoder</li> </ul> </li> <li>For all motor types               <ul style="list-style-type: none"> <li>Position control with encoder</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>Linear <math>V/f</math> characteristic</li> <li>Constant-frequency <math>V/f</math> characteristic (textile)</li> <li>Independent voltage setpoint input</li> </ul>	<ul style="list-style-type: none"> <li>Data set changeover</li> <li>Setpoint input</li> <li>Motor identification</li> <li>Damping application</li> <li>Technology controller</li> <li>Basic positioner</li> <li>Brake control</li> </ul>	<p>Mixed operation with <math>V/f</math> control modes is possible; it is for this reason that the <math>V/f</math> control modes are stored only once in the "Vector control" drive object</p> <p>Position control can be selected as a function module from both Servo and Vector mode.</p>

- The SINAMICS control module can handle simple technological tasks by itself
- The **CU320-2 DP** or **CU320-2 PN** Control Units are used in conjunction with all Motor Modules or Line Modules for single or multi-motor drives. The **CU310 DP** or **CU310 PN** Control Units are used together with the Power Modules and single drives.
- Sophisticated motion control tasks can be implemented with the support of the more powerful, performance-graded Control Units **D410**, **D425**, **D435** and **D445** of **SIMOTION D**. Refer to Catalog PM 21 for information on SIMOTION

Each of these Control Units is based on an object-oriented SINAMICS standard firmware, which contains all 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:

- Vector control
  - Speed-controlled drives with high speed and torque stability in general mechanical engineering systems
  - Particularly suitable for induction motors
- Servo control
  - Drives with highly dynamic motion control
  - Angular-locked synchronism with isochronous PROFIBUS/PROFINET
  - For use in machine tools and clocked production machines

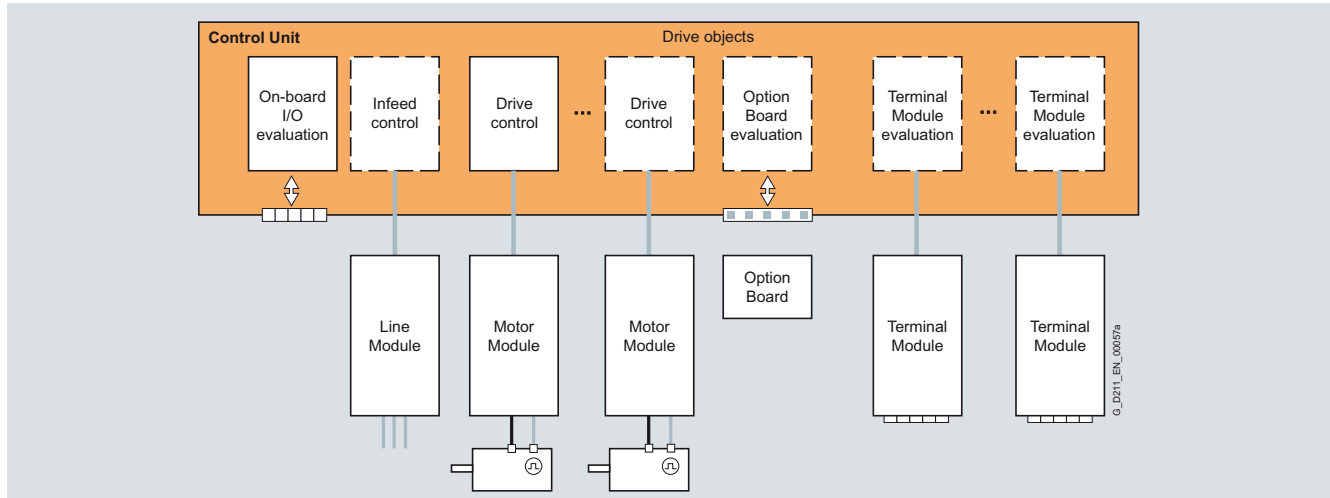
The most commonly used  $V/f$  control modes are stored in the "Vector control" drive object and are ideal for implementing even simple applications such as group drives with SIEMOSYN motors.



### Overview

#### Drive objects

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



#### 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, kinetic buffering, etc. ensure a high degree of functional reliability and excellent flexibility when addressing the application.

#### 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)

Drive Control Chart (DCC) is an additional option for the easy configuration of technological functions for SINAMICS.

The block library encompasses a large selection of closed-loop, arithmetic and logic blocks, as well as a more comprehensive range of open-loop and closed-loop control functions. 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. DCC is an add-on to the STARTER commissioning tool.

#### CompactFlash card

The functions of the 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 is 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.

#### Integral safety functions (Safety Integrated)

The Control Units support an extensive range of safety functions.

The integrated safety functions are the Safety Integrated Basic functions

- STO = Safe Torque Off
- SBC = Safe Brake Control
- SS1 = Safe Stop 1 (Time controlled)

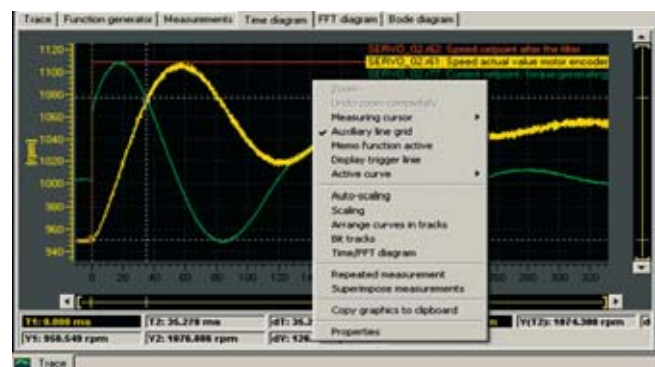
and the Safety Integrated Extended functions that require a license

- STO = Safe Torque Off
- SS1 = Safe Stop 1 (time and acceleration controlled)
- SS2 = Safe Stop 2
- SOS = Safe Operating Stop
- SLS = Safely Limited Speed
- SSM = Safe Speed Monitor
- SDI = Safe Direction

If the integrated safety functions are used, licenses, supplementary system components such as TM54F Terminal Modules, or suitable safety controls may be necessary.

#### 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. Several signals can be simultaneously traced. A recording can be triggered as a function of freely selectable boundary conditions, e.g. the value of an input or output variable.





# SINAMICS S120 Chassis Format Units

## System components

### Control Units

#### CU320-2 DP Control Unit

#### Overview



The communication, open-loop and closed-loop control functions for one or more Line Modules and/or Motor Modules are executed in the CU320-2 DP Control Unit. It communicates with the higher-level control via PROFIBUS DP.

#### Design

The CU320-2 DP Control Unit has the following interfaces as standard:

- 4 x DRIVE-CLiQ sockets for communication with other DRIVE-CLiQ nodes, e.g. Motor Modules, Active Line Modules, Sensor Modules, Terminal Modules
- 1 PROFIBUS interface with PROFIdrive profile
- 12 parameterizable digital inputs (isolated)
- 8 parameterizable bidirectional digital inputs/digital outputs (non-floating)
- 1 serial RS232 interface (e.g. to connect the AOP30 Advanced Operator Panel)
- 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 supply connector
- 1 PE/protective conductor connection
- 1 ground connection

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

The available option slot is used to expand the interfaces, e.g. terminals or communication.

The status of the CU320-2 DP 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 DP Control Unit can be mounted on the side of the Line Module via brackets integrated in a Line Module. The CU320-2 DP Control Unit can also be fixed to the wall of the control cabinet using the integrated fixing lugs.

#### Selection and ordering data

Description	Order No.
<b>CU320-2 DP Control Unit</b>	<b>6SL3040-1MA00-0AA0</b>
Without CompactFlash card	
<b>Accessories</b>	
<b>PROFIBUS connector</b>	
• Without PG/PC connection	<b>6ES7972-0BA42-0XA0</b>
• With PG/PC connection	<b>6ES7972-0BB42-0XA0</b>
<b>Spacers</b> (2 units)	<b>6SL3064-1BB00-0AA0</b>
Increases the depth of the CU320-2 DP Control Unit to 270 mm (if the integrated brackets are not to be used, but the depth still has to be 270 mm)	
<b>STARTER commissioning tool</b>	<b>6SL3072-0AA00-0AG0</b>
<b>Accessories for re-ordering</b>	
<b>Dust protection blanking plugs</b> (50 units)	<b>6SL3066-4CA00-0AA0</b>
For DRIVE-CLiQ port	

#### Integration

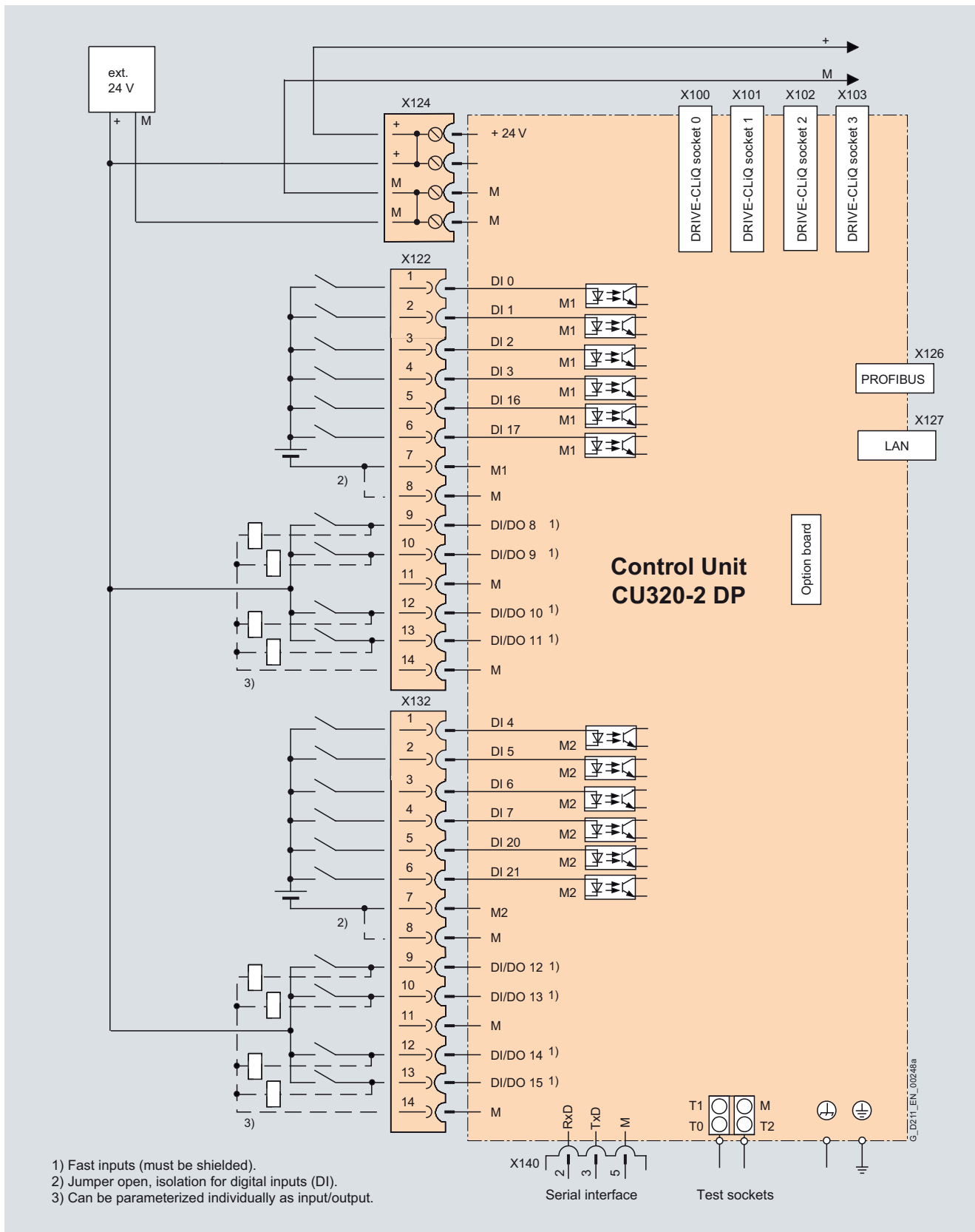
DRIVE-CLiQ components such as Motor Modules and Active Line Modules can be connected to a CU320-2 DP Control Unit. The number of modules depends on the performance required, including duty type and additional functions.

The CU320-2 DP Control Unit and other connected components are commissioned and diagnosed using the STARTER commissioning tool from Version 4.1 SP5 and the installed SINAMICS Support Package SSP\_SINAMICS\_V4\_3\_2 or the AOP30 Advanced Operator Panel.

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

The CU320-2 DP Control Unit requires a CompactFlash card with firmware version 4.3 or higher.

### Integration



Connection example of a CU320-2 DP Control Unit

# SINAMICS S120 Chassis Format Units

## System components

### Control Units

#### CU320-2 DP Control Unit

#### Technical data

##### CU320-2 DP Control Unit

6SL3040-1MA00-0AA0

<b>Current demand, max.</b> At 24 V DC, without taking into account digital outputs, expansion option slot and DRIVE-CLiQ supply	1.0 A
<b>Conductor cross-section, max.</b>	2.5 mm <sup>2</sup>
<b>Fuse protection, max.</b>	20 A
<b>Digital inputs</b>	In accordance with IEC 61131-2 Type 1 12 isolated digital inputs 8 bidirectional non-isolated 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 <sup>1)</sup> , approx.	
- L → H	50 μs
- H → L	100 μs
• Delay time of high-speed digital inputs <sup>1)</sup> , approx.	
- L → H	5 μs
- H → L	50 μs
• Conductor cross-section, max.	1.5 mm <sup>2</sup>
<b>Digital outputs</b>	8 bidirectional non-isolated digital inputs/digital outputs
Continuously short-circuit proof	
• Voltage	24 V DC
• Load current per digital output, max.	500 mA
• Delay time <sup>1)</sup> , typ./max.	
- L → H	150 μs/400 μs
- H → L	75 μs/100 μs
• Conductor cross-section, max.	1.5 mm <sup>2</sup>
<b>Power loss</b>	24 W
<b>PE connection</b>	M5 screw
<b>Ground connection</b>	M5 screw
<b>Dimensions</b>	
• Width	50 mm
• Height	300 mm
• Depth	226 mm
<b>Weight, approx.</b>	2.3 kg
<b>Conformity</b>	CE
<b>Approvals, according to</b>	cULus

<sup>1)</sup> The specified delay times refer to the hardware. The actual reaction time depends on the time slot in which the digital input or output is processed.

## Overview



The communication, open-loop and closed-loop control functions for the chassis units are executed in the CU320-2 PN Control Unit.

It communicates with the higher-level control via PROFINET IO.

## Design

The CU320-2 PN Control Unit features the following connections and interfaces as standard:

- 4 DRIVE-CLiQ sockets for communication with other DRIVE-CLiQ devices, e.g. chassis units or Terminal Modules
- 2 PROFINET interfaces with PROFIdrive profile
- 12 parameterizable digital inputs (isolated)
- 8 parameterizable bidirectional digital inputs/outputs (non-isolated)
- 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 to install an option module for the interface extension
- 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 supply connector
- 1 PE/protective conductor connection
- 1 ground connection

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

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

The status of the CU320-2 PN Control Unit is indicated using 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 PN Control Unit can be mounted on the side of the Line Module via brackets integrated in a Line Module. The CU320-2 PN Control Unit can also be fixed to the wall of the control cabinet using the integrated fixing lugs.

## Selection and ordering data

Description	Order No.
<b>CU320-2 PN Control Unit</b>	<b>6SL3040-1MA01-0AA0</b>
Without CompactFlash card	
<b>Accessories</b>	
<b>Industrial Ethernet FC</b>	
• RJ45 Plug 145 (1 unit)	<b>6GK1901-1BB30-0AA0</b>
• RJ45 Plug 145 (10 units)	<b>6GK1901-1BB30-0AB0</b>
• Stripping tool	<b>6GK1901-1GA00</b>
• Standard cable GP 2x2	<b>6XV1840-2AH10</b>
• Flexible cable GP 2x2	<b>6XV1870-2B</b>
• Trailing cable GP 2x2	<b>6XV1870-2D</b>
• Trailing cable 2x2	<b>6XV1840-3AH10</b>
• Marine cable 2x2	<b>6XV1840-4AH10</b>
<b>Accessories for re-ordering</b>	
<b>Dust protection blanking plugs</b> (50 units)	<b>6SL3066-4CA00-0AA0</b>
For DRIVE-CLiQ port	

## Integration

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

The CU320-2 PN Control Unit and other connected components are commissioned and diagnosed using the STARTER commissioning tool from Version 4.1 SP5 and the installed SINAMICS Support Package SSP\_SINAMICS\_V4\_3\_2 or the AOP30 Advanced Operator Panel.

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

The CU320-2 PN Control Unit requires a CompactFlash card with firmware version 4.3 or higher.

[For additional information on CU320-2 PN Control Units, please refer to the SINAMICS Low Voltage Engineering Manual.](#)

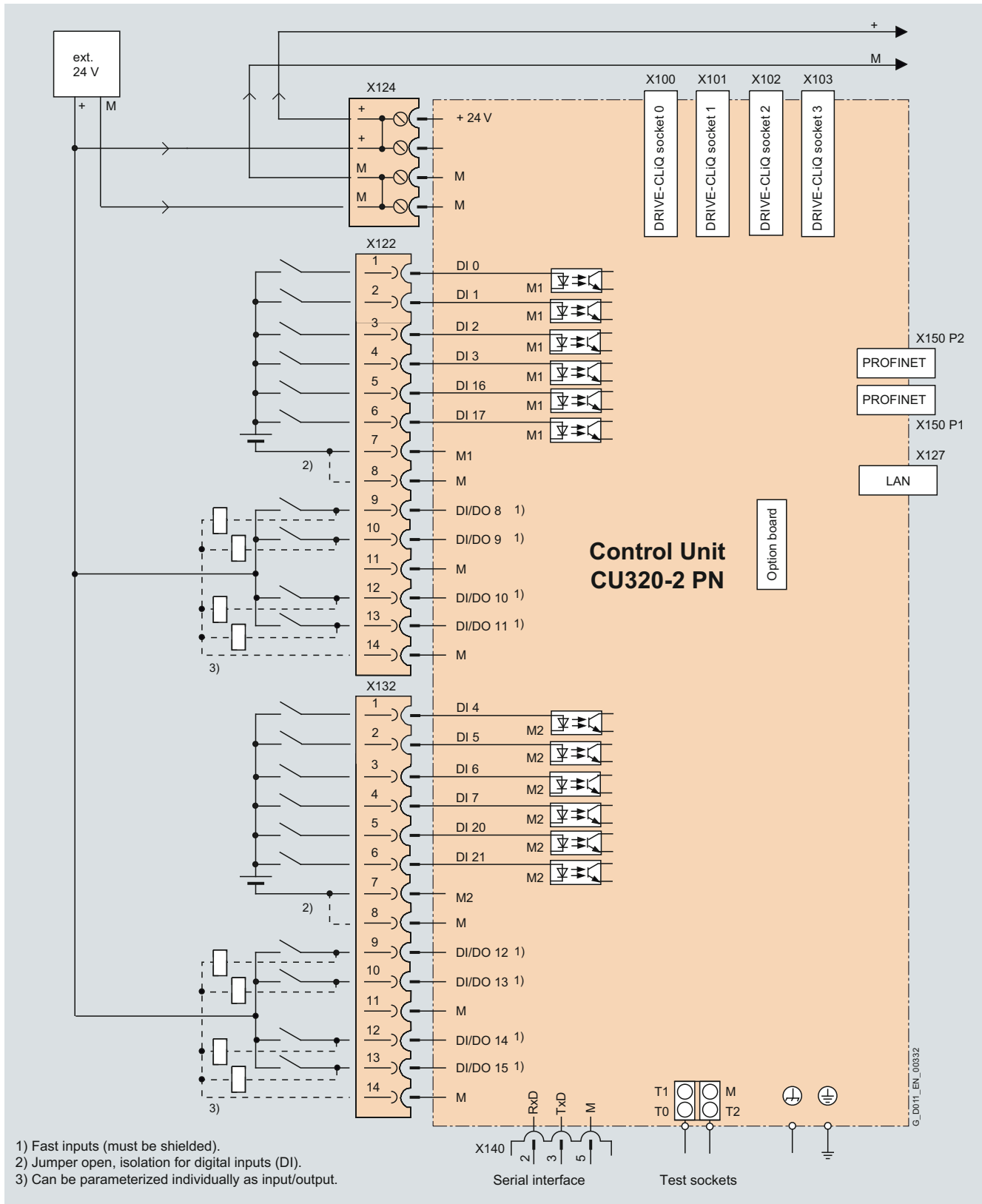
# SINAMICS S120 Chassis Format Units

## System components

### Control Units CU320-2 PN Control Unit

#### Integration

2



Connection example of a CU320-2 PN Control Unit

## Technical data

**CU320-2 PN Control Unit**  
6SL3040-1MA01-0AA0

<b>Current demand, max.</b> At 24 V DC, without taking into account digital outputs, expansion option slot and DRIVE-CLiQ supply	1.0 A
<b>Conductor cross-section, max.</b>	2.5 mm <sup>2</sup>
<b>Fuse protection, max.</b>	20 A
<b>Digital inputs</b>	In accordance with IEC 61131-2 Type 1 12 isolated digital inputs 8 bidirectional non-isolated 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 <sup>1)</sup> , approx.	
- L → H	50 μs
- H → L	100 μs
• Delay time of high-speed digital inputs <sup>1)</sup> , approx.	
- L → H	5 μs
- H → L	50 μs
• Conductor cross-section, max.	1.5 mm <sup>2</sup>
<b>Digital outputs</b>	8 bidirectional non-isolated digital inputs/digital outputs
Continuously short-circuit proof	
• Voltage	24 V DC
• Load current per digital output, max.	500 mA
• Delay time <sup>1)</sup> , typ./max.	
- L → H	150 μs/400 μs
- H → L	75 μs/100 μs
• Conductor cross-section, max.	1.5 mm <sup>2</sup>
<b>Power loss</b>	24 W
<b>PE connection</b>	M5 screw
<b>Ground connection</b>	M5 screw
<b>Dimensions</b>	
• Width	50 mm
• Height	300 mm
• Depth	226 mm
<b>Weight, approx.</b>	2.3 kg
<b>Conformity</b>	CE
<b>Approvals, according to</b>	cULus

<sup>1)</sup> The specified delay times refer to the hardware. The actual reaction time depends on the time slot in which the digital input or output is processed.

# SINAMICS S120 Chassis Format Units

## System components

### Control Units 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 power units. The computing capacity requirement increases in proportion to the number of power units and system components and in relation to the dynamic response required. The computing capacity requirement and utilization of the CU320-2 Control Unit can be calculated with the SIZER for Siemens Drives engineering tool. The full computing capacity of the CU320-2 Control Unit is only available on systems with performance expansion. For the CU320-2 Control Unit, the performance expansion is necessary from the 4th axis.

In addition to the firmware, the CompactFlash card also contains licensing codes that are required to enable firmware options (currently, the performance expansion and the Safety Integrated Extended Functions). The Safety Integrated Extended Functions must be ordered for each axis via order codes (**F.**) in addition to the order number.

The firmware options can also be enabled on-site, for example, if the performance expansions required are not known at the time of ordering or the Safety Integrated Extended functions are to be enabled retrospectively. You will need the serial number of the CompactFlash card and the order number 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.
<b>CompactFlash card for CU320-2 DP, CU320-2 PN Control Units</b>	
With firmware version 4.3 including Certificate of License	
• Without performance expansion	<b>6SL3054-0EQ00-1BA0</b>
• With performance expansion firmware option	<b>6SL3054-0EQ01-1BA0</b>
• With safety license for 1 axis	<b>6SL3054-0EQ0Q-1BA0-Z F01</b>
• With safety license for 2 axes	<b>6SL3054-0EQ0Q-1BA0-Z F02</b>
• With safety license for 3 axes	<b>6SL3054-0EQ0Q-1BA0-Z F03</b>
• With safety license for 4 axes	<b>6SL3054-0EQ01-1BA0-Z F04</b>
• With safety license for 5 axes	<b>6SL3054-0EQ01-1BA0-Z F05</b>
<u>Version</u>	↑
.1	<b>B</b>
.2	<b>C</b>
.3	<b>D</b>
.4	<b>E</b>
.5	<b>F</b>
.6	<b>G</b>
<u>Without performance expansion</u>	↑
<u>With performance expansion firmware option</u>	<b>0</b>
	<b>1</b>
<b>Firmware license</b>	
• <b>Performance expansion</b> option including Certificate of License for upgrading the license of a CompactFlash card	<b>6SL3074-0AA01-0AA0</b>
• <b>Safety Integrated Extended Functions</b> 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. 5x for a CompactFlash card	<b>6SL3074-0AA10-0AA0</b>

**More information***Firmware version*

The firmware version is encoded as follows in the order number printed on the CompactFlash card:

Order No.:	6SL3054-0□□□0□-1BA0	
Firmware version	4	↑ E
Version		↑
	.1	B
	.2	C
	.3	D
	.4	E
	.5	F
	.6	G
<u>Without</u> performance expansion		↑ 0
<u>With</u> performance expansion firmware option		1

Firmware version  $\geq 4.3$  is required for the CU320-2 Control Unit.

The current firmware version at the time of printing this catalog is version 4.4.



# SINAMICS S120 Chassis Format Units

## System components

### Control Units

#### CU310 DP Control Unit

#### Overview



The CU310 DP Control Unit for the communication and open-loop/closed-loop control functions of a Power Module is combined with the Power Module to create a powerful single drive.

#### Design

The CU310 DP Control Unit has the following interfaces as standard:

- 1 DRIVE-CLiQ socket to allow communication with other DRIVE-CLiQ nodes
- 1 PM-IF interface for communication with Power Modules in blocksize format
- 1 interface to the BOP20 Basic Operator Panel
- 1 PROFIBUS interface with PROFIdrive profile
- 1 encoder evaluation  
The following encoder signals can be evaluated:
  - Incremental encoder TTL/HTL
  - SSI encoder without incremental signals
- 4 parameterizable digital inputs (isolated)
- 4 parameterizable bidirectional digital inputs/digital outputs (non-floating)
- 1 serial RS232 interface
- 1 slot for the CompactFlash card on which firmware and parameters are stored
- 3 test sockets and one reference ground for commissioning support
- 1 connection for the electronics power supply via the 24 V DC supply connector
- 1 PE/protective conductor connection
- 1 connection for Safety Integrated
- 1 temperature sensor input (KTY84-130 or PTC)

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

A BOP20 Basic Operator Panel can be snapped directly onto the CU310 DP Control Unit, e.g. for diagnostic purposes.

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.

#### Selection and ordering data

Description	Order No.
<b>CU310 DP Control Unit</b>	<b>6SL3040-0LA00-0AA1</b>
Without CompactFlash card	
<b>Accessories</b>	
<b>PROFIBUS connector</b>	
• Without PG/PC connection	<b>6ES7972-0BA42-0XA0</b>
• With PG/PC connection	<b>6ES7972-0BB42-0XA0</b>
<b>STARTER commissioning tool</b>	<b>6SL3072-0AA00-0AG0</b>
<b>Accessories for re-ordering</b>	
<b>Dust protection blanking plugs</b> (50 units)	<b>6SL3066-4CA00-0AA0</b>
For DRIVE-CLiQ port	

For more information on connectors and cables, please refer to Catalog IK PI or the Siemens Industry Mall: [www.siemens.com/industrymall](http://www.siemens.com/industrymall)

#### Integration

Power Modules, chassis format are controlled from the CU310 DP Control Unit via the DRIVE-CLiQ interface. Sensor Modules and Terminal Modules must be connected to the free DRIVE-CLiQ sockets of the Power Module.

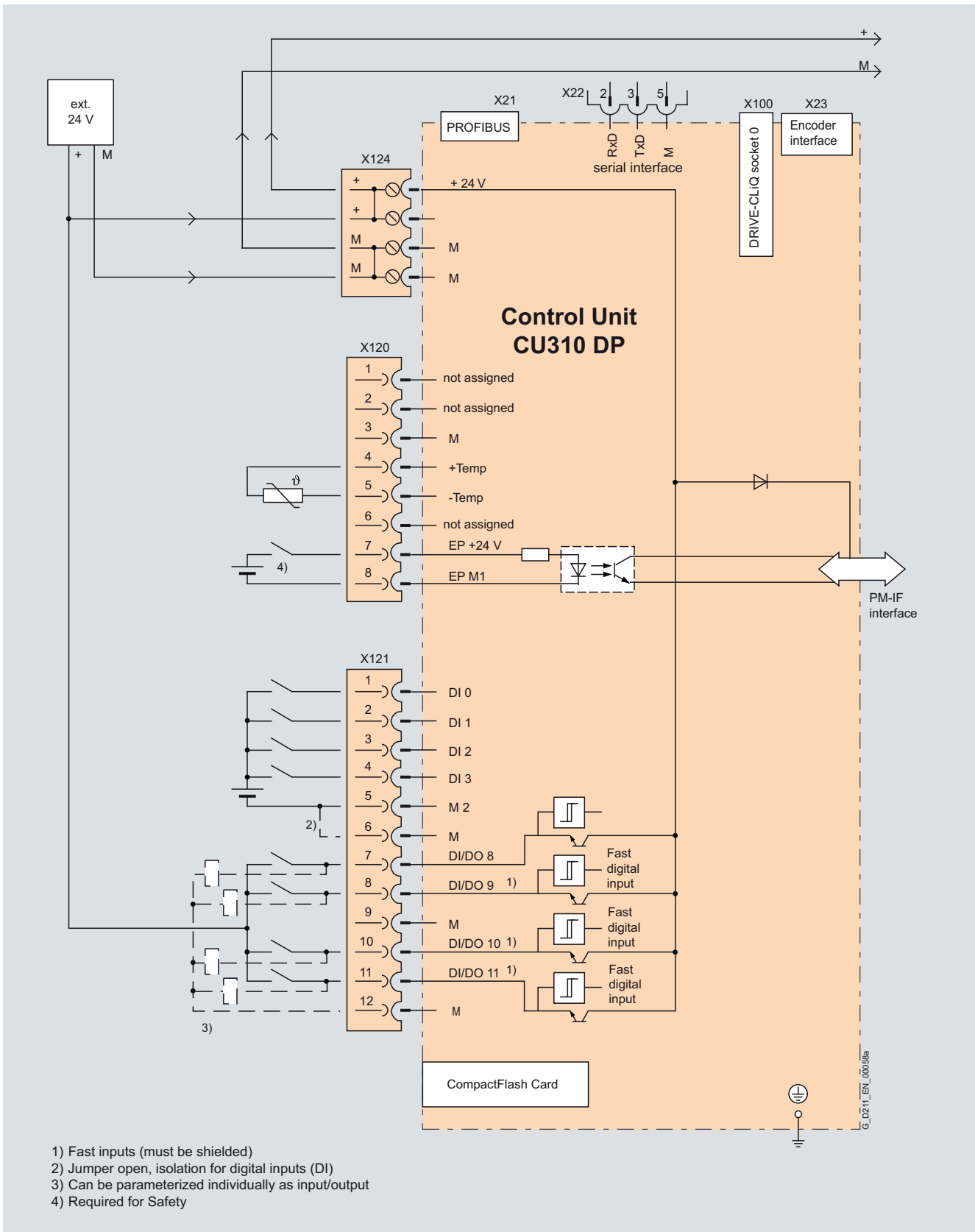
Parameter settings can be changed with the BOP20 Basic Operator Panel. The BOP20 panel can also be snapped onto the CU310 DP Control Unit during operation to perform troubleshooting procedures.

The CU310 DP Control Unit and other connected components are commissioned and diagnosed with the STARTER commissioning tool.

A CU310 DP Control Unit communicates with the higher-level control system using PROFIBUS according to the PROFIdrive profile.

### Integration

2



Connection example of a CU310 DP Control Unit

# SINAMICS S120 Chassis Format Units

## System components

### Control Units

#### CU310 DP Control Unit

#### Technical data

##### CU310 DP Control Unit

6SL3040-0LA00-0AA1

**Current demand, max.** 0.35 A for CU310 DP + 0.5 A for PM340 Power Module  
At 24 V DC, without taking into account the digital outputs and DRIVE-CLiQ supply

**Conductor cross-section, max.** 2.5 mm<sup>2</sup>

**Fuse protection, max.** 20 A

**Digital inputs** In accordance with IEC 61131-2 Type 1  
4 isolated digital inputs  
4 bidirectional non-isolated 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. 10 mA
- Delay time of digital inputs <sup>1)</sup>, approx.
  - L → H 50 μs
  - H → L 100 μs
- Delay time of high-speed digital inputs <sup>1)</sup>, approx. (high-speed digital inputs can be used for position detection)
  - L → H 5 μs
  - H → L 50 μs
- Conductor cross-section, max. 0.5 mm<sup>2</sup>

**Digital outputs** 4 bidirectional non-isolated digital inputs/digital outputs

Continuously short-circuit proof

- Voltage 24 V DC
- Load current per digital output <sup>2)</sup>, max. 500 mA
- Delay time <sup>1)</sup>, typ./max.
  - L → H 150 μs/400 μs
  - H → L 75 μs/100 μs
- Conductor cross-section, max. 0.5 mm<sup>2</sup>

##### 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 (only bipolar signals permitted)<sup>3)</sup>
  - HTL encoder 100 m for unipolar signals  
300 m for bipolar signals<sup>3)</sup>
  - SSI encoder 100 m

**Power loss** < 20 W

**PE connection** M5 screw

##### Dimensions

- Width 73 mm
- Height 183.2 mm
- Depth 89.6 mm

**Weight, approx.** 0.95 kg

**Conformity** CE

**Approvals, according to** cULus

<sup>1)</sup> The specified delay times refer to the hardware. The actual reaction time depends on the time slot in which the digital input or output is processed.

<sup>2)</sup> In order to use the digital outputs, an external 24 V power supply must be connected to terminal X124.

<sup>3)</sup> Signal cables twisted in pairs and shielded.

## Overview



The CU310 PN Control Unit for the communication and open-loop/closed-loop control functions of a Power Module is combined with the Power Module to create a powerful single drive. It communicates with the higher-level control via PROFINET IO.

## Design

CU310 PN Control Units feature the following interfaces as standard:

- 1 DRIVE-CLiQ socket to allow communication with other DRIVE-CLiQ nodes
- 1 PM-IF interface for communication with Power Modules in blocksize format
- 1 interface to the BOP20 Basic Operator Panel
- 1 PROFINET interface with 2 ports (RJ45 sockets) with PROFIdrive profile
- 1 encoder evaluation  
The following encoder signals can be evaluated:
  - Incremental encoder TTL/HTL
  - SSI encoder without incremental signals
- 4 parameterizable digital inputs (isolated)
- 4 parameterizable bidirectional digital inputs/digital outputs (non-floating)
- 1 serial RS232 interface
- 1 slot for the CompactFlash card on which firmware and parameters are stored
- 3 test sockets and one reference ground for commissioning support
- 1 connection for the electronics power supply via the 24 V DC supply connector
- 1 connection for Safety Integrated
- 1 temperature sensor input (KTY84-130 or PTC)
- 1 PE/protective conductor connection

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

A BOP20 Basic Operator Panel can be snapped directly onto the CU310 PN Control Unit, e.g. for diagnostic purposes. 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.

## Selection and ordering data

Description	Order No.
<b>CU310 PN Control Unit</b>	<b>6SL3040-0LA01-0AA1</b>
Without CompactFlash card	
<b>Accessories</b>	
<b>STARTER commissioning tool</b>	<b>6SL3072-0AA00-0AG0</b>
<b>Industrial Ethernet FC</b>	
• RJ45 Plug 180 (1 unit)	<b>6GK1901-1BB10-2AA0</b>
• RJ45 Plug 180 (10 units)	<b>6GK1901-1BB10-2AB0</b>
• Stripping tool	<b>6GK1901-1GA00</b>
• Standard cable GP 2x2	<b>6XV1840-2AH10</b>
• Flexible cable GP 2x2	<b>6XV1870-2B</b>
• Trailing cable GP 2x2	<b>6XV1870-2D</b>
• Trailing cable 2x2	<b>6XV1840-3AH10</b>
• Marine cable 2x2	<b>6XV1840-4AH10</b>
<b>Accessories for re-ordering</b>	
<b>Dust protection blanking plugs</b> (50 units)	<b>6SL3066-4CA00-0AA0</b>
For DRIVE-CLiQ port	

For more information on connectors and cables, please refer to Catalog IK PI or the Siemens Industry Mall: [www.siemens.com/industrymall](http://www.siemens.com/industrymall)

## Integration

Power Modules, chassis format are controlled from the CU310 DP Control Unit via the DRIVE-CLiQ interface. Sensor Modules and Terminal Modules must be connected to the free DRIVE-CLiQ sockets of the Power Module.

Parameter settings can be changed with the BOP20 Basic Operator Panel. The BOP20 panel can also be snapped onto the CU310 PN Control Unit during operation to perform trouble-shooting procedures.

The CU310 PN Control Unit and other connected components are commissioned and diagnosed with the STARTER commissioning tool. The CU310 PN Control Unit requires a CompactFlash card with firmware version 2.4 or higher.

A CU310 PN Control Unit communicates with the higher-level control system using PROFINET IO corresponding to the PROFIdrive profile.

The SINAMICS S120 drive system with CU310 PN 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 500µs
- 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 2 RJ45 sockets based on the ERTEC ASIC. The optimum topology (line, star, tree) can therefore be configured without additional external switches.

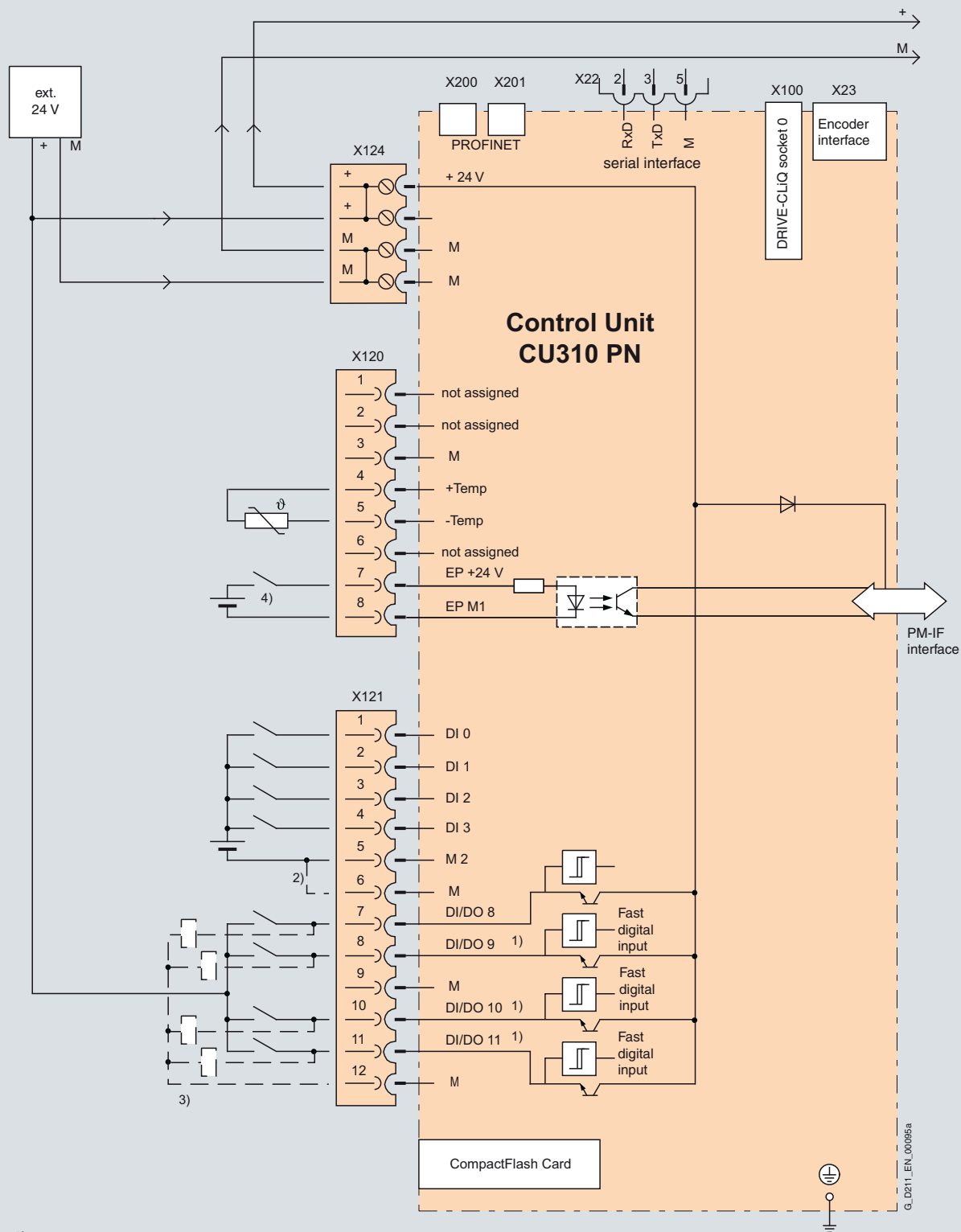
# SINAMICS S120 Chassis Format Units

## System components

### Control Units CU310 PN Control Unit

#### Integration

2



- 1) Fast inputs (must be shielded)
- 2) Jumper open, isolation for digital inputs (DI)
- 3) Can be parameterized individually as input/output
- 4) Required for Safety

Connection example of a CU310 PN Control Unit

G...D211\_EN\_00095a

## Technical data

<b>CU310 PN Control Unit</b> 6SL3040-0LA01-0AA1	
<b>Current demand, max.</b> At 24 V DC, without taking into account the digital outputs and DRIVE-CLiQ supply	0.4 A for CU310 PN
<b>Conductor cross-section, max.</b>	2.5 mm <sup>2</sup>
<b>Fuse protection, max.</b>	20 A
<b>Digital inputs</b>	In accordance with IEC 61131-2 Type 1 4 isolated digital inputs 4 bidirectional non-isolated 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.	10 mA
• Delay time of digital inputs <sup>1)</sup> , approx.	
- L → H	50 μs
- H → L	100 μs
• Delay time of high-speed digital inputs <sup>1)</sup> , approx. (high-speed digital inputs can be used for position detection)	
- L → H	5 μs
- H → L	50 μs
• Conductor cross-section, max.	0.5 mm <sup>2</sup>
<b>Digital outputs</b> Continuously short-circuit proof	4 bidirectional non-isolated digital inputs/digital outputs
• Voltage	24 V DC
• Load current per digital output <sup>2)</sup> , max.	500 mA
• Delay time <sup>1)</sup> , typ./max.	
- L → H	150 μs/400 μs
- H → L	75 μs/100 μs
• Conductor cross-section, max.	0.5 mm <sup>2</sup>
<b>Encoder evaluation</b>	<ul style="list-style-type: none"> <li>• Incremental encoder TTL/HTL</li> <li>• SSI encoder without incremental signals</li> </ul>
• 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 (only bipolar signals permitted) <sup>3)</sup>
- HTL encoder	100 m for unipolar signals 300 m for bipolar signals <sup>3)</sup>
- SSI encoder	100 m
<b>Power loss</b>	< 20 W
<b>PE connection</b>	M5 screw
<b>Dimensions</b>	
• Width	73 mm
• Height	183.2 mm
• Depth	89.6 mm
<b>Weight, approx.</b>	0.95 kg
<b>Conformity</b>	CE
<b>Approvals, according to</b>	cULus

<sup>1)</sup> The specified delay times refer to the hardware. The actual reaction time depends on the time slot in which the digital input or output is processed.

<sup>2)</sup> In order to use the digital outputs, an external 24 V power supply must be connected to terminal X124.

<sup>3)</sup> Signal cables twisted in pairs and shielded.

# SINAMICS S120 Chassis Format Units

## System components

### Control Units

#### CompactFlash card for CU310

#### Overview



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

#### Design

A CU310 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 that are required to enable firmware options (currently, the performance expansion and the Safety Integrated Extended Functions). The Safety Integrated Extended Functions (Safe Stop 2, Safe Operating Stop, Safely Limited Speed, Safe Speed Monitor) must be ordered for each axis via order codes (**F..**) in addition to the order number.

The firmware options can also be enabled on-site, for example, if the performance expansions required are not known at the time of ordering or the Safety Integrated Extended functions are to be enabled retrospectively. You will need the serial number of the CompactFlash card and the order number 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.
<b>CompactFlash card for CU310 DP, CU310 PN Control Units</b>	<b>6SL3054-0CG00-1AA0</b>
With current firmware version including Certificate of License	
• With safety license for 1 axis	<b>6SL3054-0CG00-1AA0-Z F01</b>
<b>Firmware license</b>	<b>6SL3074-0AA10-0AA0</b>
<b>Safety Integrated Extended Functions</b> option including Certificate of License for one axis for upgrading the license of a CompactFlash card.	

#### More information

##### Firmware version

The firmware version is encoded as follows in the order number printed on the CompactFlash card:

Order No.:	6SL3054-0□□00-1AA0
Firmware version	↑
1	B
2	C
Version	↑
.1	B
.2	C
.3	D
.4	E
.5	F
.6	G

Example:

A CompactFlash card with firmware version 2.5 and a safety license for a CU310 PN Control Unit are required:

Order No.:  
**6SL3054-0CF00-1AA0-Z F01**

**Overview**

BOP20 Basic Operator Panel

The BOP20 Basic Operator Panel can be snapped onto any CU310 or CU320-2 Control Unit and may be used to acknowledge faults, set parameters and read diagnostic information (e.g. alarm and fault messages).

**Design**

The BOP20 Basic Operator Panel has a backlit two-line display area and 6 keys.

The integrated plug connector on the rear side of the BOP20 Basic Operator Panel provides the power to the BOP20 Basic Operator Panel and the communication with the CU310 or CU320-2 Control Unit.

**Selection and ordering data**

Description	Order No.
<b>BOP20 Basic Operator Panel</b>	<b>6SL3055-0AA00-4BA0</b>

**Integration**

CU310 DP Control Unit with attached BOP20 Basic Operator Panel



CU320-2 Control Unit with inserted BOP20 Basic Operator Panel



# SINAMICS S120 Chassis Format Units

## System components

### Supplementary system components

#### AOP30 Advanced Operator Panel

#### Overview



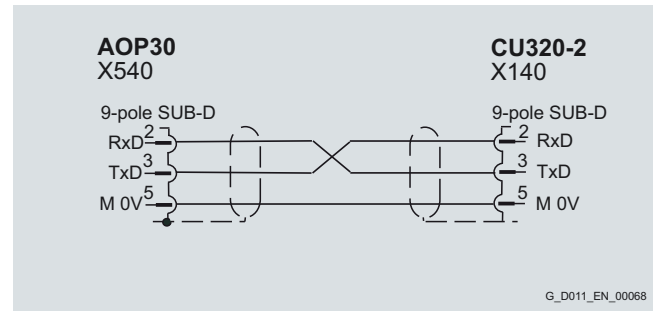
The AOP30 Advanced Operator Panel is an input/output device for the SINAMICS series, preferably for cabinet mounting.

It has the following features and characteristics:

- Graphical backlit LCD display for plain text display and a bar display of process variables
- LEDs for display of operating modes
- Help function describing causes of and remedies for faults and alarms
- Keypad for operational control of a drive
- Local/remote switchover for selecting the operating location (priority assigned to operator panel or customer terminal block/PROFIBUS/PROFINET)
- Numeric keypad for input of setpoint or parameter values
- Function keys for prompted navigation in the menu
- Two-stage safety concept to protect against accidental or unauthorized changes to settings.
  - Operation of the drive from the operator panel can be disabled by the keyboard lock so that only parameter values and process variables can be displayed on the operating panel.
  - A password can be used to prevent the unauthorized modification of converter parameters.
- Front panel with degree of protection IP55

If just one CU320-2 Control Unit controls several power units (multi-motor operation), then the parameters, alarms and faults relating to all the devices connected can be simultaneously displayed and processed. The AOP30 communicates with the SINAMICS drive via the serial RS232 interface and PPI protocol.

The AOP30 may be omitted if the drive is only operated via PROFIBUS, for example, and no local display is required on the cabinet. The AOP30 can then be used simply for commissioning purposes and to obtain diagnostic information, in which case, it is plugged into the RS232 interface on the CU320-2 Control Unit. In this case, an external 24 V power supply (max. current requirement 200 mA) is required.



Assignment of the serial plug-in cable

#### Design

The AOP30 is an operator panel with graphical display and membrane keyboard. The device can be installed in a cabinet door (thickness: between 2 mm and 4 mm).

Features:

- Display with green backlighting, resolution 240 × 64 pixels
- 26-key membrane keyboard
- Connection for a 24 V power supply
- RS232 interface
- Time and date memory with internal battery backup
- 4 LEDs to signal the operating state of the drive:
  - RUN: green
  - ALARM: yellow
  - FAULT: red
  - Local/Remote: green

#### Function

The current operating states, setpoints and actual values, parameters, indices, faults and alarms are displayed on the display panel.

Chinese, German, English, French, Italian and Spanish are stored on the CU320-2 Control Unit CompactFlash card as operator panel languages. The desired language must be downloaded to the AOP30 prior to commissioning.

On request, Russian, Polish, and Czech are available in addition to these languages installed as standard. These can be downloaded free of charge from the Internet under the following link: <http://support.automation.siemens.com/>

# SINAMICS S120 Chassis Format Units

## System components

### Supplementary system components AOP30 Advanced Operator Panel

#### Selection and ordering data

For the SINAMICS S120 Cabinet Modules system, the AOP30 can be ordered as an option by specifying order code **K08**. No further connections need to be made and no other materials are required.

For the SINAMICS S150 system, the AOP30 is installed in the cabinet door as standard.

Description	Order No.
<b>AOP30 Advanced Operator Panel</b>	<b>6SL3055-0AA00-4CA4</b>
<b>Accessories</b>	
<b>RS232 plug-in cable</b> for connecting the AOP30 to the CU320-2	
1 m long	<b>6FX8002-1AA01-1AB0</b>
2 m long	<b>6FX8002-1AA01-1AC0</b>
3 m long	<b>6FX8002-1AA01-1AD0</b>
4 m long	<b>6FX8002-1AA01-1AE0</b>
5 m long	<b>6FX8002-1AA01-1AF0</b>
6 m long	<b>6FX8002-1AA01-1AG0</b>
7 m long	<b>6FX8002-1AA01-1AH0</b>
8 m long	<b>6FX8002-1AA01-1AJ0</b>
9 m long	<b>6FX8002-1AA01-1AK0</b>
10 m long	<b>6FX8002-1AA01-1BA0</b>

#### Technical data

<b>AOP30 Advanced Operator Panel</b> 6SL3055-0AA00-4CA4	
<b>Power supply</b>	24 V DC (20.4 ... 28.8 V)
<b>Current demand</b>	<ul style="list-style-type: none"> <li>• Without backlighting &lt; 100 mA</li> <li>• For max. backlighting &lt; 200 mA</li> </ul>
<b>Data interface</b>	RS232 interface, PPI protocol
<b>Backup battery</b>	3 V lithium CR2032
<b>Operating temperature</b>	0 ... 55 °C
<b>Storage and transport temperature</b>	-25 ... +70 °C
<b>Degree of protection</b>	IP20 from the inside of the cabinet IP55 from the outside of the cabinet
<b>Dimensions</b>	<ul style="list-style-type: none"> <li>• Width 212 mm</li> <li>• Height 156 mm</li> <li>• Depth 31 mm</li> </ul>
<b>Weight, approx.</b>	0.55 kg
<b>Conformity</b>	CE
<b>Approvals, according to</b>	cULus

# SINAMICS S120 Chassis Format Units

## System components

### Supplementary system components CBC10 Communication Board

#### Overview



The CBC10 Communication Board is used to interface the CU320-2 Control Unit to the CAN (Controller Area Network) protocol. The board's driver software fulfills the standards of the following CANopen specification of the CiA organization (CAN in Automation):

- Communication profiles in accordance with DS 301
- Drive profile in accordance with DSP 402 (in this case Profile Velocity Mode)
- EDS (Electronic Data Sheet) in accordance with DSP 306
- Operational status signaling in accordance with DSP 305

#### Design

The CBC10 Communication Board plugs into the option slot on the CU320-2 Control Unit. The CAN interface on the CBC10 has 2 SUB-D connections for input and output.

#### Selection and ordering data

Description	Order No.
<b>CBC10 Communication Board</b>	<b>6SL3055-0AA00-2CA0</b>
<b>Accessories</b>	
<b>SUB-D connector</b> , 9-pin, female (3 units)	<b>6FC9341-2AE</b>
<b>SUB-D connector</b> , 9-pin, male (3 units)	<b>6FC9341-2AF</b>

For the SINAMICS S150 and SINAMICS S120 Cabinet Modules, the CBC10 can be ordered as an option by specifying order code **G20**.

#### Technical data

<b>CBC10 Communication Board</b> 6SL3055-0AA00-2CA0	
<b>Current demand, max.</b> At 24 V DC via CU320-2 Control Unit	0.05 A
<b>Power loss</b>	< 3 W
<b>Weight, approx.</b>	0.1 kg
<b>Conformity</b>	CE
<b>Approvals, according to</b>	cULus

# SINAMICS S120 Chassis Format Units

## System components

### Supplementary system components CBE20 Communication Board

#### Overview



The CBE20 Communication Board is required, if

- a SINAMICS S120 or SINAMIC S150 converter, equipped with a CU320-2 DP (PROFIBUS) Control Unit, is to be connected to a PROFINET-IO network
- SINAMICS Link is to be used to directly exchange data between several CU320-2 DP (PROFIBUS) or CU320-2 PN (PROFINET) Control Units without using a higher-level control system.

With the CBE20 Communication Board, SINAMICS S120 or SINAMICS S150 is a PROFINET IO device in the sense of PROFINET 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  $\mu$ s
- Connects to controls as PROFINET IO devices according to the PROFIdrive profile
- Standard TCP/IP communication for engineering processes using the STARTER commissioning tool
- Integrated 4-port switch with four RJ45 sockets based on the PROFINET ASIC ERTEC400. The optimum topology (line, star, tree) can therefore be configured without additional external switches.

#### SINAMICS Link

SINAMICS Link can be used to directly exchange data between several CU320-2 DP (PROFIBUS) or CU320-2 PN (PROFINET) Control Units without using a higher-level control system. In this case, the CBE20 Communication Board is required. Possible applications for the SINAMICS Link include:

- Torque distribution for several drives
- Setpoint cascading for several drives
- Load distribution for drives coupled through a material web
- Couplings between SINAMICS G or SINAMICS S with the CU320-2 Control Unit and SINAMICS DC Master with CUD Control Units.

Participants other than the CU320-2 Control Units or the CUD Control Units of the SINAMICS DC Master cannot be integrated into this communication network.

SINAMICS Link is activated by appropriately parameterizing the Control Units of the participants.

#### Integration

The CBE20 Communication Board plugs into the option slot on the CU320-2 Control Unit.

#### Selection and ordering data

Description	Order No.
<b>CBE20 Communication Board</b>	<b>6SL3055-0AA00-2EB0</b>
<b>Accessories</b>	
<b>Industrial Ethernet FC</b>	
• RJ45 Plug 180 (1 unit)	<b>6GK1901-1BB10-2AA0</b>
• RJ45 Plug 180 (10 units)	<b>6GK1901-1BB10-2AB0</b>
• Stripping tool	<b>6GK1901-1GA00</b>
• Standard cable GP 2x2	<b>6XV1840-2AH10</b>
• Flexible cable GP 2x2	<b>6XV1870-2B</b>
• Trailing cable GP 2x2	<b>6XV1870-2D</b>
• Trailing cable 2x2	<b>6XV1840-3AH10</b>
• Marine cable 2x2	<b>6XV1840-4AH10</b>

For more information on connectors and cables, please refer to Catalog IK PI or the Siemens Industry Mall:

[www.siemens.com/industrymall](http://www.siemens.com/industrymall)

For the SINAMICS S150 and SINAMICS S120 Cabinet Modules, the CBE20 can be ordered as an option by specifying order code **G33**.

#### Technical data

<b>CBE20 Communication Board</b> 6SL3055-0AA00-2EB0	
<b>Current demand</b> at 24 V DC	0.16 A
<b>Ambient temperature, permissible</b>	
• Storage and transport	-40 ... +70 °C
• Operation	0 ... 55 °C
<b>Dimensions</b>	130 mm × 78 mm
<b>Weight, approx.</b>	76 g
<b>Conformity</b>	CE
<b>Approvals, according to</b>	cULus

# SINAMICS S120 Chassis Format Units

## System components

### Supplementary system components DMC20 DRIVE-CLiQ Hub Module

#### Overview



The DMC20 DRIVE-CLiQ Hub Module is used to implement a star-shaped configuration of a DRIVE-CLiQ line. Two DMC20 DRIVE-CLiQ Hub Modules can be connected in series (cascaded).

#### Design

The DMC20 DRIVE-CLiQ Hub Module in degree of protection IP20 is suitable for installation in control cabinets.

The following are located on the DMC20 DRIVE-CLiQ Hub Module:

- 6 DRIVE-CLiQ sockets for connecting 5 DRIVE-CLiQ devices
- 1 connection for the electronics power supply via the 24 V DC supply connector

The status of the DMC20 DRIVE-CLiQ Hub Module is indicated via a multi-color LED.

#### Selection and ordering data

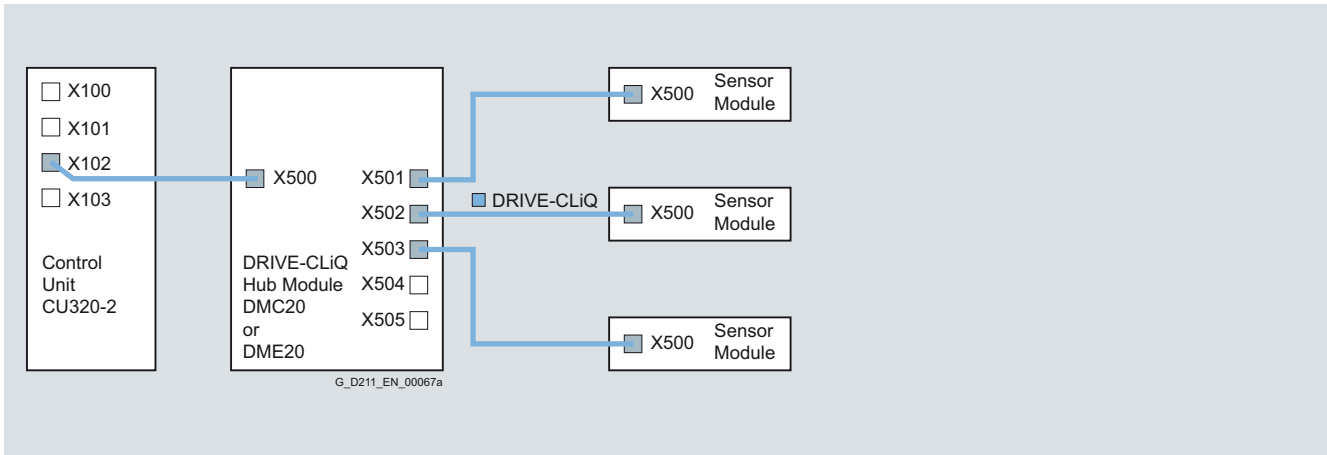
Description	Order No.
<b>DMC20 DRIVE-CLiQ Hub Module</b> Without DRIVE-CLiQ cable	<b>6SL3055-0AA00-6AA0</b>
<b>Accessories</b>	
<b>Dust protection blanking plugs</b> (50 units) For DRIVE-CLiQ port	<b>6SL3066-4CA00-0AA0</b>

#### Technical data

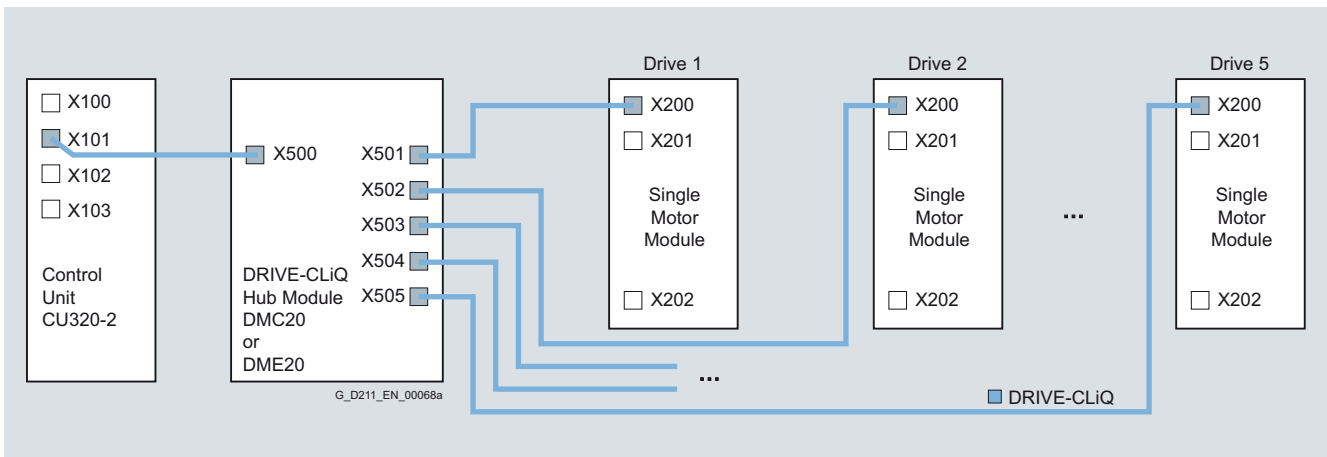
<b>DMC20 DRIVE-CLiQ Hub Module</b> 6SL3055-0AA00-6AA0	
<b>Current demand, max.</b> At 24 V DC without DRIVE-CLiQ supply	0.15 A
• Conductor cross-section, max.	2.5 mm <sup>2</sup>
<b>Degree of protection</b>	IP20
<b>Dimensions</b>	
• Width	50 mm
• Height	150 mm
• Depth	111 mm
<b>Weight, approx.</b>	0.8 kg
<b>Conformity</b>	CE
<b>Approvals, according to</b>	cULus

### Integration

Signals from more than one encoder can be collected with the DRIVE-CLiQ Hub Module and forwarded to the Control Unit through a single DRIVE-CLiQ cable.



With a DRIVE-CLiQ Hub Module, individual DRIVE-CLiQ nodes can be removed without interrupting the data exchange with the remaining devices in the DRIVE-CLiQ line.



# SINAMICS S120 Chassis Format Units

## System components

### Supplementary system components DME20 DRIVE-CLiQ Hub Module

#### Overview



The DME20 DRIVE-CLiQ Hub Module is used to implement a star-shaped topology of a DRIVE-CLiQ line. Two DME20 DRIVE-CLiQ Hub Modules can be connected in series (cascaded).

#### Design

The DME20 DRIVE-CLiQ Hub Module in degree of protection IP67 is suitable for installation outside the control cabinets.

The following are located on the DME20 DRIVE-CLiQ Hub Module:

- 6 DRIVE-CLiQ sockets for connecting 5 DRIVE-CLiQ devices
- 1 connection for the electronics power supply via the 24 V DC round supply connector with conductor cross-section  $4 \times 0.75 \text{ mm}^2$  (pins 1+2 internally jumpered; pins 3+4 internally jumpered)

The scope of supply of the DME20 DRIVE-CLiQ Hub Modules includes:

- 6 blanking plugs for closing unused DRIVE-CLiQ sockets

#### Selection and ordering data

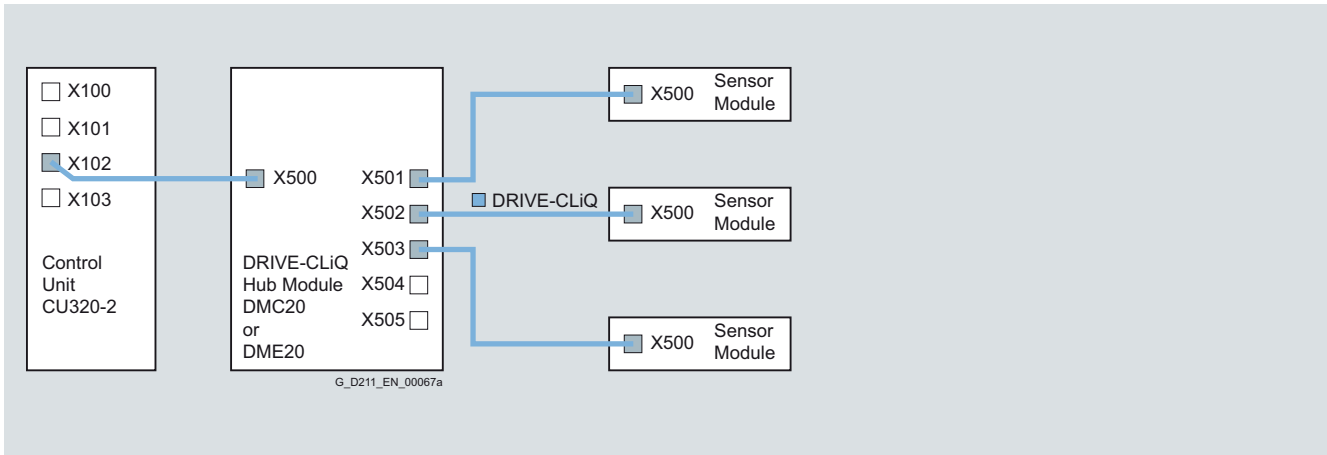
Description	Order No.
<b>DME20 DRIVE-CLiQ Hub Module</b> Without DRIVE-CLiQ cable; without electronics power supply and round connector for 24 V DC	<b>6SL3055-0AA00-6AB0</b>
<b>Accessories</b>	
<b>24 V DC power supply cable</b> Order and delivery Phoenix Contact <a href="http://www.phoenixcontact.de">www.phoenixcontact.de</a>	
• Shielded connector, 5-pole, can be assembled by the user	Art No. 1508365
• Unshielded connector, 4-pole, can be assembled by the user, Speedcon quick release	Art No. 1521601
<b>Accessories for re-ordering</b>	
<b>Dust protection blanking plugs IP67</b> (6 units) For DRIVE-CLiQ port	<b>6SL3066-4CA01-0AA0</b>

#### Technical data

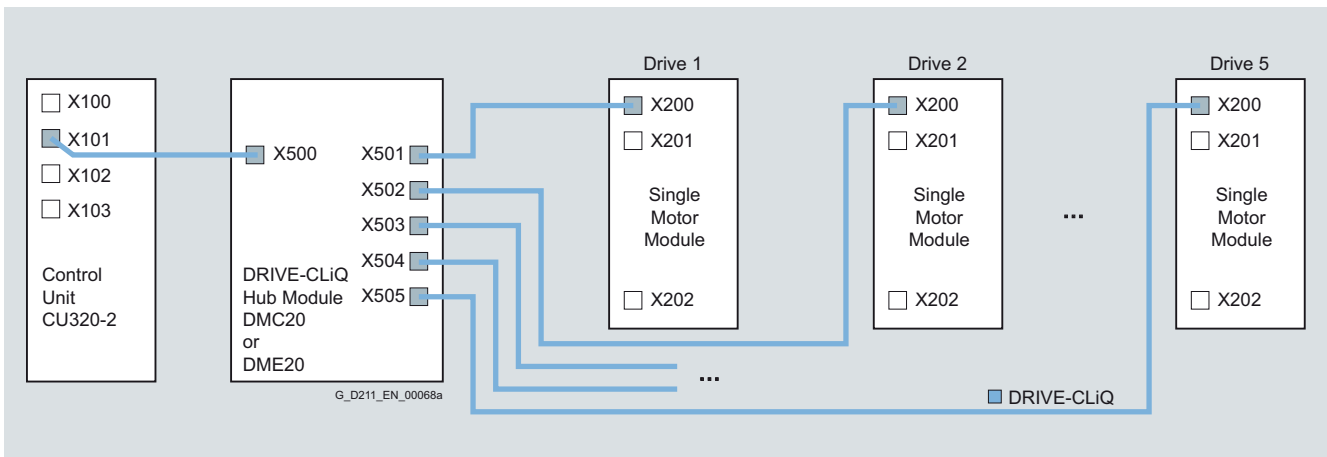
<b>DME20 DRIVE-CLiQ Hub Module</b> 6SL3055-0AA00-6AB0	
<b>Current demand, max.</b> At 24 V DC without DRIVE-CLiQ supply	0.15 A
• Conductor cross-section, max.	$4 \times 0.75 \text{ mm}^2$
<b>Degree of protection</b>	IP67
<b>Dimensions</b>	
• Width	99 mm
• Height	149 mm
• Depth	55.7 mm (without connector)
<b>Weight, approx.</b>	0.8 kg
<b>Conformity</b>	CE
<b>Approvals, according to</b>	cULus

### Integration

Signals from more than one encoder can be collected with the DRIVE-CLiQ Hub Module and forwarded to the Control Unit through a single DRIVE-CLiQ cable.



With a DRIVE-CLiQ Hub Module, individual DRIVE-CLiQ nodes can be removed without interrupting the data exchange with the remaining devices in the DRIVE-CLiQ line.





# SINAMICS S120 Chassis Format Units

## System components

### Supplementary system components TB30 Terminal Board

#### Overview



The TB30 Terminal Board supports the addition of digital inputs/digital outputs and analog inputs/analog outputs to the CU320-2 Control Unit.

#### Design

The following are located on the TB30 Terminal Board:

- Power supply for digital inputs/digital outputs
- 4 digital inputs
- 4 digital outputs
- 2 analog inputs
- 2 analog outputs

The TB30 Terminal Board plugs into the option slot on a Control Unit.

A shield connection for the signal cable shield is located on the Control Unit.

#### Selection and ordering data

Description	Order No.
<b>TB30 Terminal Board</b>	<b>6SL3055-0AA00-2TA0</b>

#### Technical data

##### TB30 Terminal Board

6SL3055-0AA00-2TA0

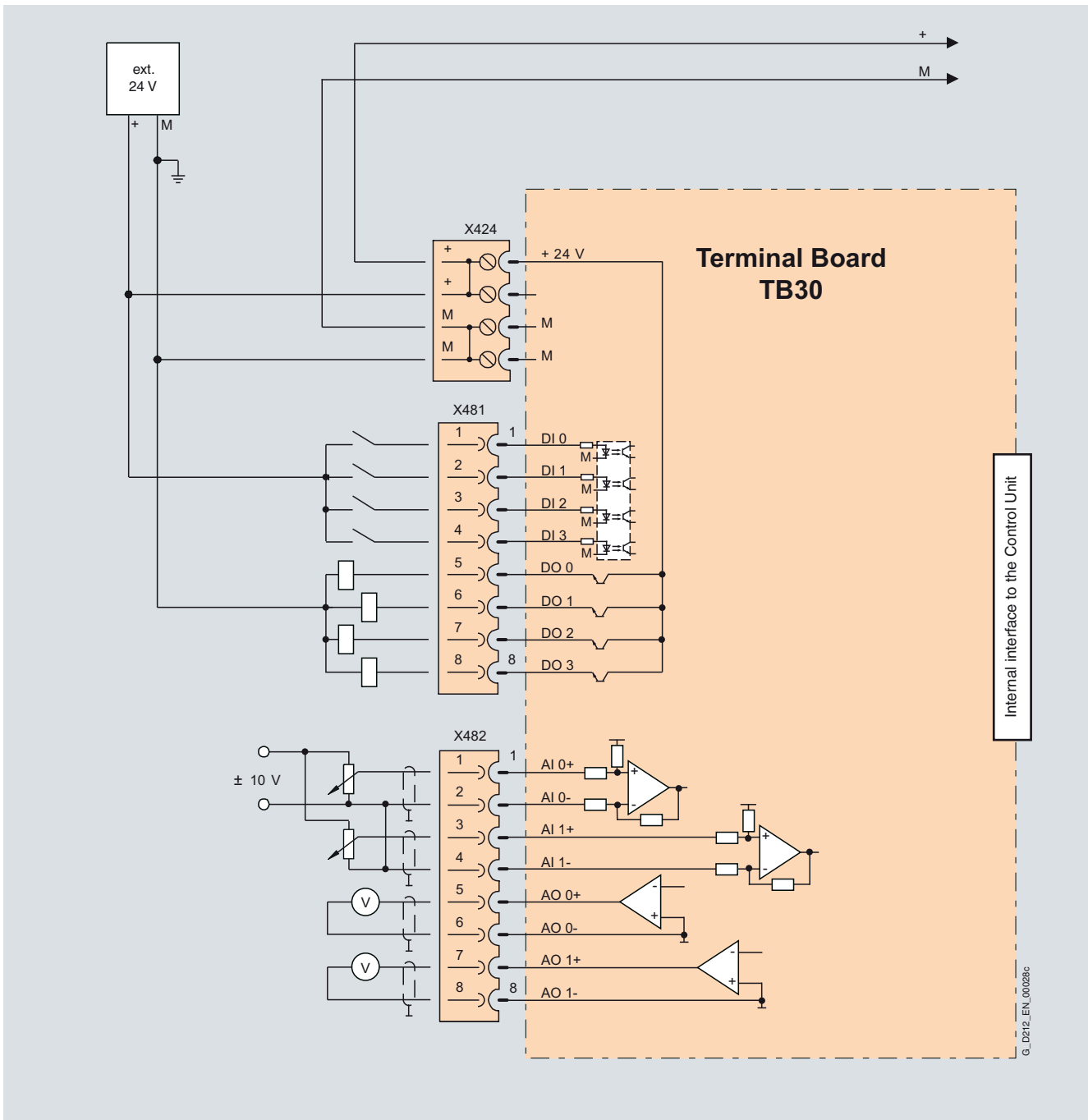
<b>Current demand, max.</b>	0.05 A
At 24 V DC via the CU320-2 Control Unit without taking into account the digital outputs	
• Conductor cross-section, max.	2.5 mm <sup>2</sup>
• Fuse protection, max.	20 A
<b>Digital inputs</b>	
In accordance with IEC 61131-2 Type 1	
• Voltage	-3 ... +30 V
• Low level (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 <sup>1)</sup> , approx.	
- L → H	50 μs
- H → L	100 μs
• Conductor cross-section, max.	0.5 mm <sup>2</sup>
<b>Digital outputs</b>	
Continuously short-circuit proof	
• Voltage	24 V DC
• Load current per digital output, max.	500 mA
• Delay time of digital outputs <sup>1)</sup> , approx.	150 μs
• Conductor cross-section, max.	0.5 mm <sup>2</sup>
<b>Analog inputs</b>	
Difference	
• Voltage range (an open analog input is interpreted as 0 V)	-10 ... +10 V
• Internal resistance $R_i$	65 kΩ
• Resolution <sup>2)</sup>	13 bit + sign
• Conductor cross-section, max.	0.5 mm <sup>2</sup>
<b>Analog outputs</b>	
Continuously short-circuit proof	
• Voltage range	-10 ... +10 V
• Load current, max.	-3 ... +3 mA
• Resolution	11 bit + sign
• Settling time, approx.	200 μs
• Conductor cross-section, max.	0.5 mm <sup>2</sup>
<b>Power loss</b>	< 3 W
<b>Weight, approx.</b>	0.1 kg
<b>Conformity</b>	CE
<b>Approvals, according to</b>	cULus

<sup>1)</sup> The specified delay times refer to the hardware. The actual reaction time depends on the time slot in which the digital input is processed.

<sup>2)</sup> If the analog input is to be operated in the signal processing sense with continuously variable input voltage, the sampling frequency  $f_a = 1/t_{\text{time slice}}$  must be at least twice the value of the highest signal frequency  $f_{\text{max}}$ .

#### Integration

2



Connection example of a TB30 Terminal Board

# SINAMICS S120 Chassis Format Units

## System components

### Supplementary system components

#### TM15 Terminal Module

#### Overview



The number of available digital inputs and outputs within a drive system can be expanded with the TM15 Terminal Module.

#### Design

The following are located on the TM15 Terminal Module:

- 24 bidirectional digital inputs/outputs (isolation in 3 groups with 8 channels each)
- 24 green status LEDs for indicating the logical signal status of the relevant terminal
- 2 DRIVE-CLiQ sockets
- 1 connection for the electronics power supply via the 24 V DC supply connector
- 1 PE/protective conductor connection

The TM15 Terminal Module can be snapped onto a TH 35 top-hat rail to EN 60715 (IEC 60715).

The signal cable shield can be connected to the TM15 Terminal Module via a shield connection terminal, e.g. Phoenix Contact type SK8 or Weidmüller type KLBÜ CO 1. The shield connection terminal must not be used for strain relief.

The status of the TM15 Terminal Module is indicated via a multi-color LED.

#### Selection and ordering data

Description	Order No.
<b>TM15 Terminal Module</b>	<b>6SL3055-0AA00-3FA0</b>
Without DRIVE-CLiQ cable	
<b>Accessories</b>	
<b>Dust protection blanking plugs</b> (50 units)	<b>6SL3066-4CA00-0AA0</b>
For DRIVE-CLiQ port	

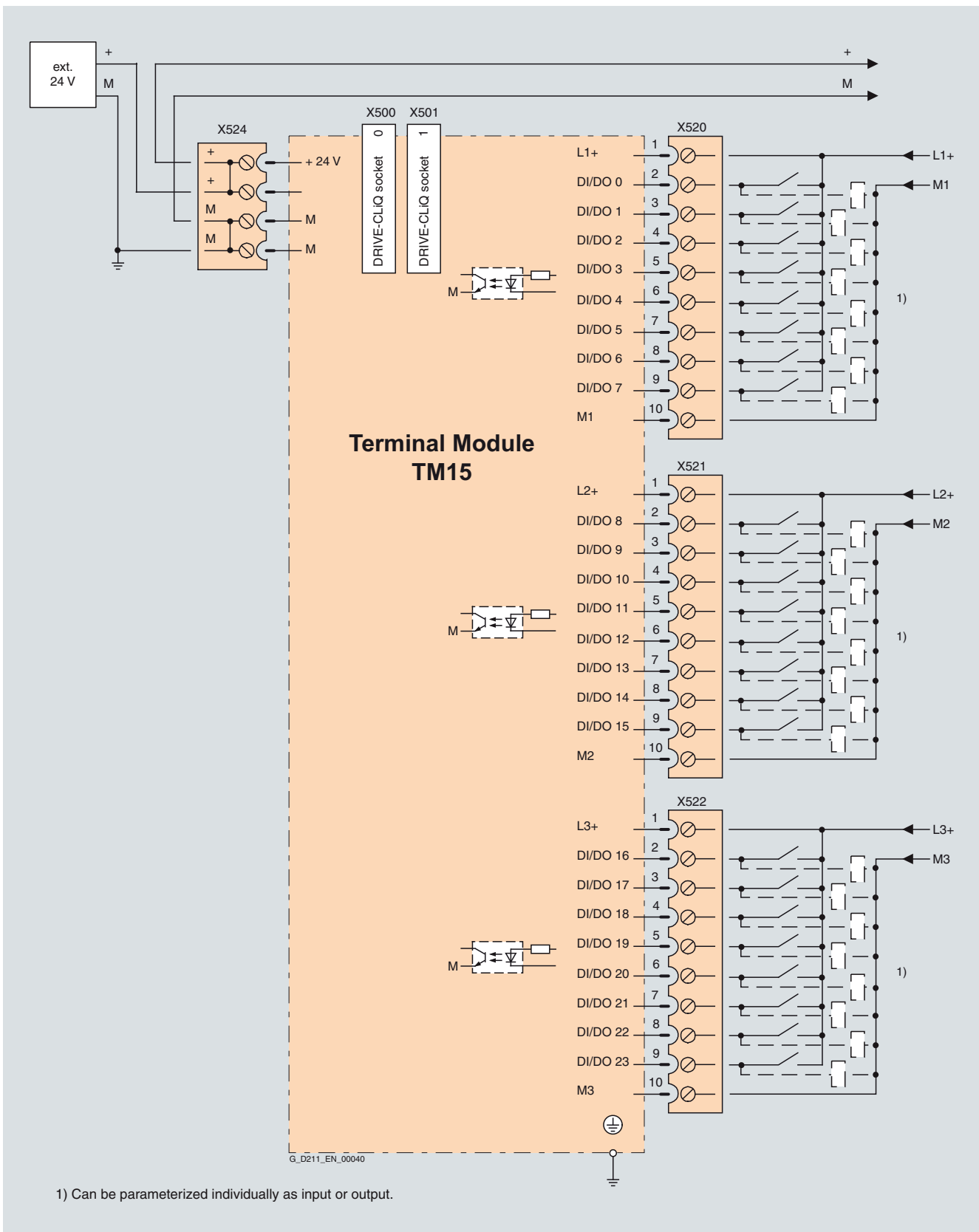
#### Technical data

<b>TM15 Terminal Module</b> 6SL3055-0AA00-3FA0	
<b>Current demand, max.</b>	0.15 A
With 24 V DC without load	
• Conductor cross-section, max.	2.5 mm <sup>2</sup>
• Fuse protection, max.	20 A
<b>Number of DRIVE-CLiQ sockets</b>	2
<b>I/O devices</b>	
• Digital inputs/outputs	Can be parameterized channel-by-channel as DI or DO
• Number of digital inputs/outputs	24
• Galvanic isolation	Yes, in groups of 8
• Connection system	Plug-in screw-type terminals
• Conductor cross-section, max.	1.5 mm <sup>2</sup>
<b>Digital inputs</b>	
• 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	5 ... 11 mA
• Delay times of digital inputs, typ. <sup>1)</sup>	
- L → H	50 μs
- H → L	100 μs
<b>Digital outputs</b>	
Continuously short-circuit proof	
• Voltage	24 V DC
• Load current per digital output, max.	0.5 A
• Delay times (resistive load) <sup>1)</sup>	
- L → H, typ.	50 μs
- L → H, max.	100 μs
- H → L, typ.	150 μs
- H → L, max.	225 μs
• Total current of outputs (per group), max.	
- Up to 60 °C	2 A
- Up to 50 °C	3 A
- Up to 40 °C	4 A
<b>Power loss</b>	< 3 W
<b>PE connection</b>	M4 screw
<b>Dimensions</b>	
• Width	50 mm
• Height	150 mm
• Depth	111 mm
<b>Weight, approx.</b>	0.86 kg
<b>Conformity</b>	CE
<b>Approvals, according to</b>	cULus

<sup>1)</sup> The specified delay times refer to the hardware. The actual reaction time depends on the time slot in which the digital input/output is processed.

### Integration

The TM15 Terminal Module communicates with the CU310 or CU320-2 Control Unit via DRIVE-CLiQ.



Example connection of a TM15 Terminal Module

# SINAMICS S120 Chassis Format Units

## System components

### Supplementary system components TM31 Terminal Module

#### Overview



The TM31 Terminal Module can be used to increase the number of available digital inputs and outputs and the number of analog inputs and outputs within a drive system.

The TM31 Terminal Module also features relay outputs with changeover contact and a temperature sensor input.

#### Design

The following are located on the TM31 Terminal Module:

- 8 digital inputs
- 4 bidirectional digital inputs/outputs
- 2 relay outputs with changeover contact
- 2 analog inputs
- 2 analog outputs
- 1 temperature sensor input (KTY84-130 or PTC)
- 2 DRIVE-CLiQ sockets
- 1 connection for the electronics power supply via the 24 V DC supply connector
- 1 PE/protective conductor connection

The TM31 Terminal Module can be snapped onto a TH 35 top-hat rail to EN 60715 (IEC 60715).

The signal cable shield can be connected to the TM31 Terminal Module via a shield connection terminal, e.g. Phoenix Contact type SK8 or Weidmüller type KLBÜ CO 1. The shield connection terminal must not be used for strain relief.

The status of the TM31 Terminal Module is indicated via a multi-color LED.

#### Selection and ordering data

Description	Order No.
<b>TM31 Terminal Module</b> Without DRIVE-CLiQ cable	<b>6SL3055-0AA00-3AA1</b>
<b>Accessories</b>	
<b>Dust protection blanking plugs</b> (50 units) For DRIVE-CLiQ port	<b>6SL3066-4CA00-0AA0</b>

#### Technical data

##### TM31 Terminal Module

6SL3055-0AA00-3AA1

<b>Current demand, max.</b>	0.2 A
At 24 V DC without taking into account the digital outputs and the DRIVE-CLiQ supply	
• Conductor cross-section, max.	2.5 mm <sup>2</sup>
• Fuse protection, max.	20 A
<b>Digital inputs</b>	
In accordance with IEC 61131-2 Type 1	
• 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 times of digital inputs <sup>1)</sup> , approx.	
- L → H	50 μs
- H → L	100 μs
• Conductor cross-section, max.	1.5 mm <sup>2</sup>
<b>Digital outputs</b>	
Continuously short-circuit proof	
• Voltage	24 V DC
• Load current per digital output, max.	100 mA
• Aggregate current of digital outputs, max.	400 mA
• Delay times of digital outputs <sup>1)</sup>	
- Typ.	150 μs at 0.5 A resistive load
- max.	500 μs
• Conductor cross-section, max.	1.5 mm <sup>2</sup>
<b>Analog inputs</b>	
A switch is used to toggle between voltage and current input	
• As voltage input	
- Voltage range	-10 ... +10 V
- Internal resistance $R_i$	100 kΩ
• As current input	
- Current range	4 ... 20 mA, -20 ... +20 mA, 0 ... 20 mA
- Internal resistance $R_i$	250 Ω
- Resolution <sup>2)</sup>	11 bit + sign
• Conductor cross-section, max.	1.5 mm <sup>2</sup>

##### TM31 Terminal Module

6SL3055-0AA00-3AA1

<b>Analog outputs</b>	
Continuously short-circuit proof	
• Voltage range	-10 ... +10 V
• Load current, max.	-3 ... +3 mA
• Current range	4 ... 20 mA, -20 ... +20 mA, 0 ... 20 mA
• Load resistance, max.	500 Ω for outputs in the range -20 ... +20 mA
• Resolution	11 bit + sign
• Conductor cross-section, max.	1.5 mm <sup>2</sup>
<b>Relay outputs</b>	
Changeover contacts	
• Load current, max.	8 A
• Operating voltage, max.	250 V AC, 30 V DC
• Switching capacity, max.	
- At 250 V AC	2000 VA (cos φ = 1) 750 VA (cos φ = 0.4)
- at 30 V DC	240 W (resistive load)
• Required minimum current	100 mA
• Conductor cross-section, max.	2.5 mm <sup>2</sup>
<b>Power loss</b>	< 5 W
<b>PE connection</b>	M4 screw
<b>Dimensions</b>	
• Width	50 mm
• Height	150 mm
• Depth	111 mm
<b>Weight, approx.</b>	0.87 kg
<b>Conformity</b>	CE
<b>Approvals, according to</b>	cULus

<sup>1)</sup> The specified delay times refer to the hardware. The actual reaction time depends on the time slot in which the digital input is processed.

<sup>2)</sup> If the analog input is to be operated in the signal processing sense with continuously variable input voltage, the sampling frequency  $f_a = 1/t_{\text{time slice}}$  must be at least twice the value of the highest signal frequency  $f_{\text{max}}$ .

# SINAMICS S120 Chassis Format Units

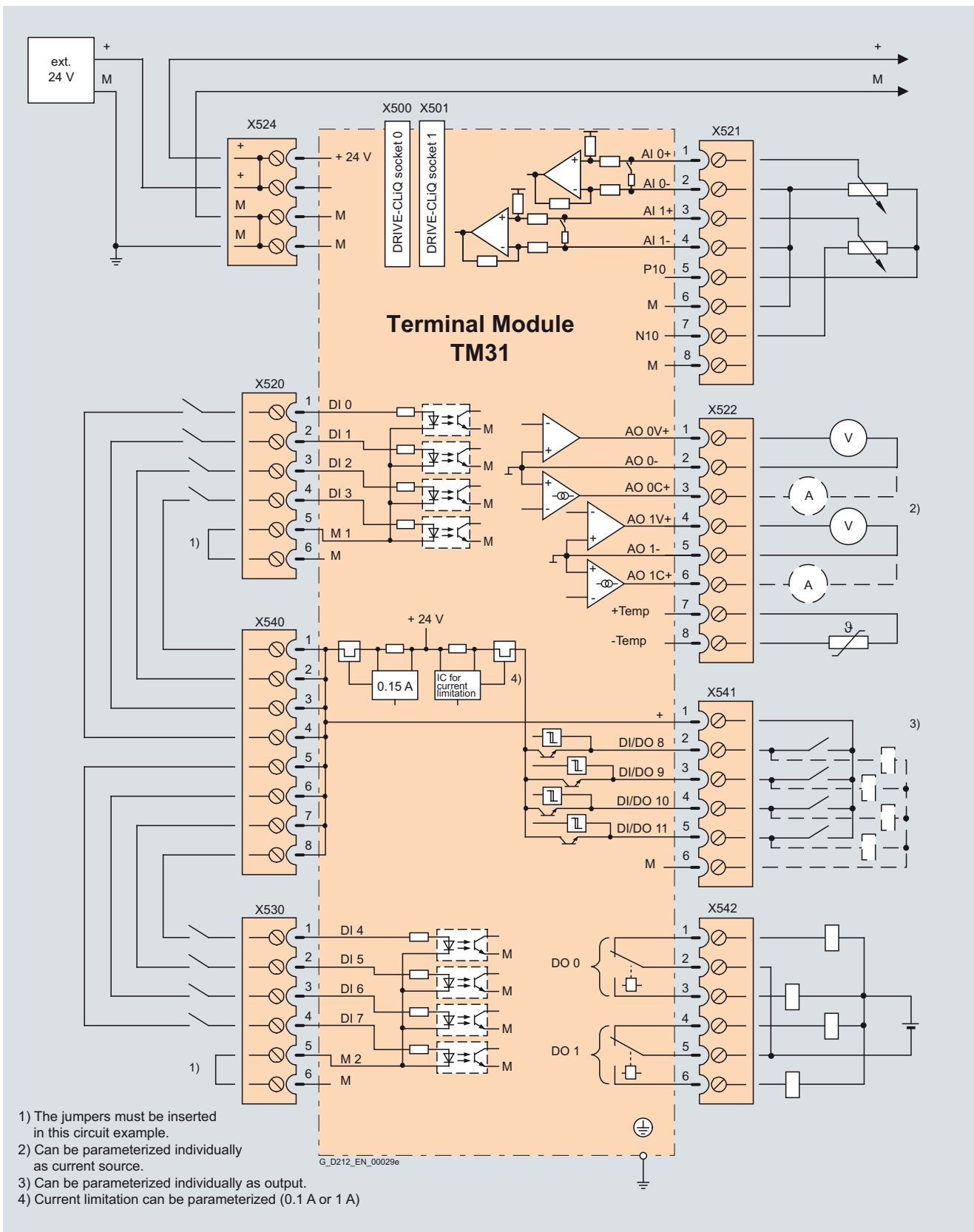
## System components

### Supplementary system components TM31 Terminal Module

#### Integration

The TM31 Terminal Module communicates with the CU310 or CU320-2 Control Unit via DRIVE-CLiQ.

2



Example connection of a TM31 Terminal Module

## Overview



The TM41 Terminal Module supplies TTL signals which emulate an incremental encoder, e.g. to a higher-level control. The encoder interface (incremental encoder emulation) can be linked to an encoder signal from the Control Unit, e.g. incremental encoder sin/cos, by parameter assignment.

The TM41 Terminal Module increases the number of digital inputs/outputs and analog inputs that are available in the drive system.

## Design

The following are located on the TM41 Terminal Module:

- 4 bidirectional digital inputs/outputs
- 4 digital inputs (with electrical isolation)
- 1 analog input
- 1 interface for emulation of TTL incremental encoder (RS422)
- 1 LED for signaling zero mark detection for encoder interface
- 2 DRIVE-CLiQ sockets
- 1 connection for the 24 V DC supply of the digital outputs
- 1 connection for the electronics power supply via the 24 V DC supply connector
- 1 PE/protective conductor connection

The TM41 Terminal Module can be snapped onto a TH 35 top-hat rail to EN 60715 (IEC 60715).

The signal cable shield can be connected to the TM41 Terminal Module via a shield connection terminal, e.g. Phoenix Contact type SK8 or Weidmüller type KLBÜ CO 1. The shield connection terminal must not be used for strain relief.

The status of the TM41 Terminal Module is indicated via a multi-color LED.

An LED next to the interface for TTL pulse encoder emulation is illuminated as soon as a zero mark is detected.

## Selection and ordering data

Description	Order No.
<b>TM41 Terminal Module</b>	<b>6SL3055-0AA00-3PA1</b>
Without DRIVE-CLiQ cable	
<b>Accessories</b>	
<b>Dust protection blanking plugs</b> (50 units)	<b>6SL3066-4CA00-0AA0</b>
For DRIVE-CLiQ port	



# SINAMICS S120 Chassis Format Units

## System components

### Supplementary system components

#### TM41 Terminal Module

#### Technical data

<b>TM41 Terminal Module</b> 6SL3055-0AA00-3PA1	
<b>Current demand</b> (X524 at 24 V DC) without DRIVE-CLiQ supply or digital outputs (X514)	0.2 A
• Conductor cross-section, max.	2.5 mm <sup>2</sup>
• Fuse protection, max.	20 A
<b>I/O devices</b>	
• Digital inputs/outputs	Individually parameterizable as DI or DO
• Number of digital inputs/outputs	4
• Number of digital input/outputs (with isolation)	4
• Connection system	Plug-in screw-type terminals
• Conductor cross-section, max.	1.5 mm <sup>2</sup>
<b>Digital inputs</b>	
• Voltage	
- Without electrical isolation	-3 ... +30 V
- With electrical isolation	-30 ... +30 V
• Low level (an open digital input is interpreted as "low")	
- Without electrical isolation	-3 ... +5 V
- With electrical isolation	-30 ... +5 V
• High level	15 ... 30 V
• Current consumption at 24 V DC, typ.	< 9 mA
• Delay times of digital inputs, max. <sup>1)</sup>	
- L → H	3 ms
- H → L	3 ms
<b>Digital outputs</b> Continuously short-circuit proof	
• Voltage	24 V DC
• Load current per digital output, max.	0.5 A
• Delay times (resistive load) <sup>1)</sup>	
- L → H, typ.	50 μs
- L → H, max.	100 μs
- H → L, typ.	75 μs
- H → L, max.	150 μs
<b>Analog input</b> Difference	
• Voltage range	-10 ... +10 V
• Internal resistance	≥ 40 kΩ
• Resolution <sup>2)</sup>	13 bit + sign

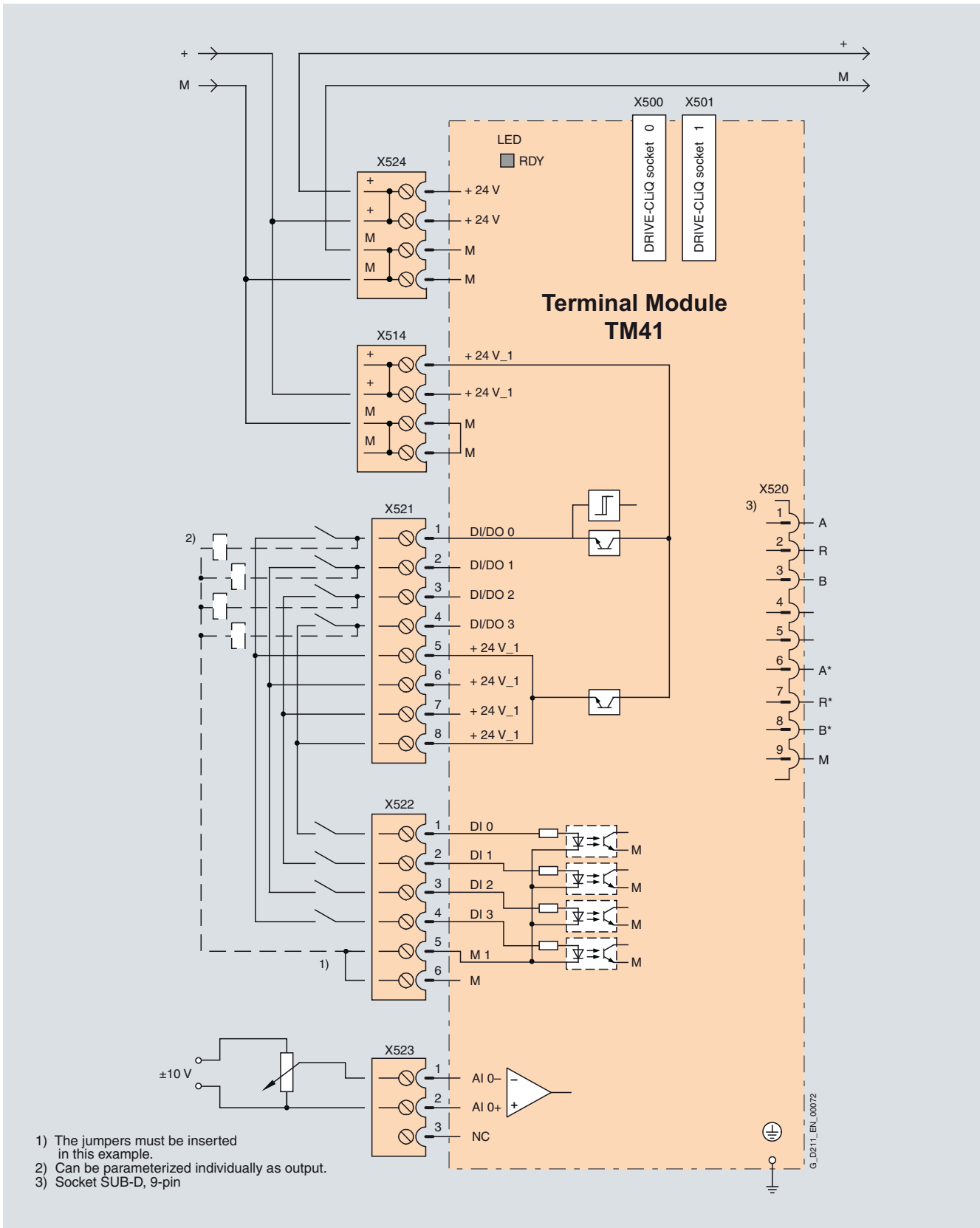
<b>TM41 Terminal Module</b> 6SL3055-0AA00-3PA1	
<b>Pulse encoder emulation</b>	
• Level	TTL (RS422), A+, A-, B+, B-, zero track N+, N-
• Limit frequency $f_{max}$ .	512 kHz
• Ratio Encoder pulses: Encoder emulation	1 : 1 for incremental encoder sin/cos and TTL/HTL (evaluation for resolver being prepared)
<b>PE connection</b>	
	M4 screw
<b>Dimensions</b>	
• Width	50 mm
• Height	150 mm
• Depth	111 mm
<b>Weight, approx.</b>	
	0.85 kg
<b>Conformity</b>	
	CE
<b>Approvals, according to</b>	
	cULus

<sup>1)</sup> The specified delay times refer to the hardware. The actual reaction time depends on the time slot in which the digital input/output is processed.

<sup>2)</sup> If the analog input is to be operated in the signal processing sense with continuously variable input voltage, the sampling frequency  $f_a = 1/t_{\text{time slice}}$  must be at least twice the value of the highest signal frequency  $f_{max}$ .

### Integration

The TM41 Terminal Module communicates with the CU310 or CU320-2 Control Unit via DRIVE-CLiQ.



Example of connection of a TM41 Terminal Module

# SINAMICS S120 Chassis Format Units

## System components

### Supplementary system components TM54F Terminal Module

#### Overview



The TM54F Terminal Module is a dual-processor I/O interface with 4 fail-safe digital outputs and 10 fail-safe digital inputs for using Safety Integrated functions of the SINAMICS S120 drive system via external actuators and sensors.

All of the available safety functions integrated in the drive can be controlled via the fail-safe digital inputs of the TM54F Terminal Module. For the case that the parameterized safety functions of several drives operated together on a CU320-2 or SIMOTION D4x5 are to be executed together, then these drives can be grouped in the TM54F Terminal Module. This has the advantage that only one fail-safe digital input has to be connected for these drives.

The fail-safe digital outputs and inputs have two channels with an internal crosswise data comparison via the two processors. A fail-safe digital output consists of one P-switching and one M-switching output as well as one digital input to read back the switching state. A fail-safe digital input consists of two digital inputs.

Safety sensors can be connected over two switchable 24 V sensor supplies and evaluated via the fail-safe digital inputs. The switchable 24 V sensor supply ensures that the fail-safe digital inputs can be dynamized to detect dormant errors (this dynamization is used to check the shutdown paths). An non-switchable 24 V sensor supply is additionally provided by the TM54F Terminal Module for connecting safety sensors that cannot be dynamized.

The TM54F Terminal Module should be connected directly to a Control Unit via DRIVE-CLiQ. Each Control Unit can only be assigned to one TM54F Terminal Module.

Additional DRIVE-CLiQ nodes such as Sensor Modules and Terminal Modules (however no additional TM54F Terminal Module) can be operated on the TM54F Terminal Module. Motor Modules and Line Modules must not be connected to a TM54F Terminal Module.

#### Design

The following are located on the TM54F Terminal Module:

- 4 fail-safe digital outputs
- 10 fail-safe digital inputs
- 4 LEDs, single color for indicating the status of the read back channel of the fail-safe digital outputs
- 4 LEDs, dual-color for indicating the status of the fail-safe digital outputs
- 20 LEDs, dual-color for indicating the status of the fail-safe digital inputs
- 3 LEDs, single color for indicating the status of the 24 V sensor supplies
- 2 DRIVE-CLiQ sockets
- 2 connections for 24 V sensor supply, switchable
- 1 connection for 24 V sensor supply, non-switchable
- 1 connection for the electronics power supply via the 24 V DC supply connector
- 1 connection for the 24 V power supply to digital outputs and sensors
- 1 PE/protective conductor connection

The TM54F Terminal Module can be snapped onto a TH 35 top-hat rail according to EN 60715 (IEC 60715).

The signal cable shield can be connected to the TM54F Terminal Module via a shield connection terminal, e.g. Phoenix Contact type SK8 or Weidmüller type KLBÜ CO 1. The shield connection terminal must not be used for strain relief.

The status of the TM54F Terminal Module is indicated via a multi-color LED.

Pins for connector coding are included in the TM54F Terminal Module scope of delivery.

#### Selection and ordering data

Description	Order No.
<b>TM54F Terminal Module</b>	<b>6SL3055-0AA00-3BA0</b>
Without DRIVE-CLiQ cable	
<b>Accessories</b>	
<b>Dust protection blanking plugs</b> (50 units)	<b>6SL3066-4CA00-0AA0</b>
For DRIVE-CLiQ port	

## Technical data

**TM54F Terminal Module**  
6SL3055-0AA00-3BA0

<b>Current demand</b> (X524 at 24 V DC) without DRIVE-CLiQ supply	0.2 A
• Conductor cross-section, max.	2.5 mm <sup>2</sup>
• Fuse protection, max.	20 A
<b>Max. current demand ext. 24 V</b> for supplying the digital outputs and 24 V sensor supply (X514 at 24 V DC)	4 A
• Conductor cross-section, max.	2.5 mm <sup>2</sup>
• Fuse protection, max.	20 A
<b>I/O devices</b>	
• Number of fail-safe digital inputs	10
• Number of fail-safe digital outputs	4
• 24 V sensor supply	3, of which 2 can be internally shut down to dynamize fail-safe digital inputs, current carrying capacity of input is 0.5 A
• Connection system	Plug-in screw-type terminals
• Conductor cross-section, max.	1.5 mm <sup>2</sup>
<b>Digital inputs</b> According to IEC 61131-2 Type 1, with electrical isolation	
• 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.	> 2 mA
• Delay time of digital inputs, approx. <sup>1)</sup>	
- L → H, typ.	30 μs
- H → L, typ.	60 μs
• Safe state	Low level (for inputs that can be inverted: without inversion)
<b>Digital outputs</b> Continuously short-circuit proof	
• Voltage	24 V DC
• Load current per fail-safe digital output, max. <sup>2)</sup>	0.5 A
• Delay times (resistive load) <sup>1)</sup>	
- L → H, typ.	300 μs
- H → L, typ.	350 μs
• Safe state	Output switched off

**TM54F Terminal Module**  
6SL3055-0AA00-3BA0

<b>Scanning cycle <math>t_{SI}</math></b> for fail-safe digital inputs or fail-safe digital outputs	4 ... 25 ms (adjustable)
<b>PE connection</b>	M4 screw
<b>Dimensions</b>	
• Width	50 mm
• Height	150 mm
• Depth	111 mm
<b>Weight, approx.</b>	0.9 kg
<b>Conformity</b>	CE
<b>Approvals, according to</b>	cULus
<b>Safety Integrated</b>	Safety Integrity Level 2 (SIL2) acc. to IEC 61508, Performance Level d (PLd) acc. to ISO 13849-1 and Control Category 3 acc. to EN ISO 13849-1 (previously EN 954-1)

<sup>1)</sup> The specified delay times refer to the hardware. The actual reaction time depends on the time slot in which the digital input/output is processed.

<sup>2)</sup> The total current of all fail-safe digital outputs must not exceed 5.33 A.

# SINAMICS S120 Chassis Format Units

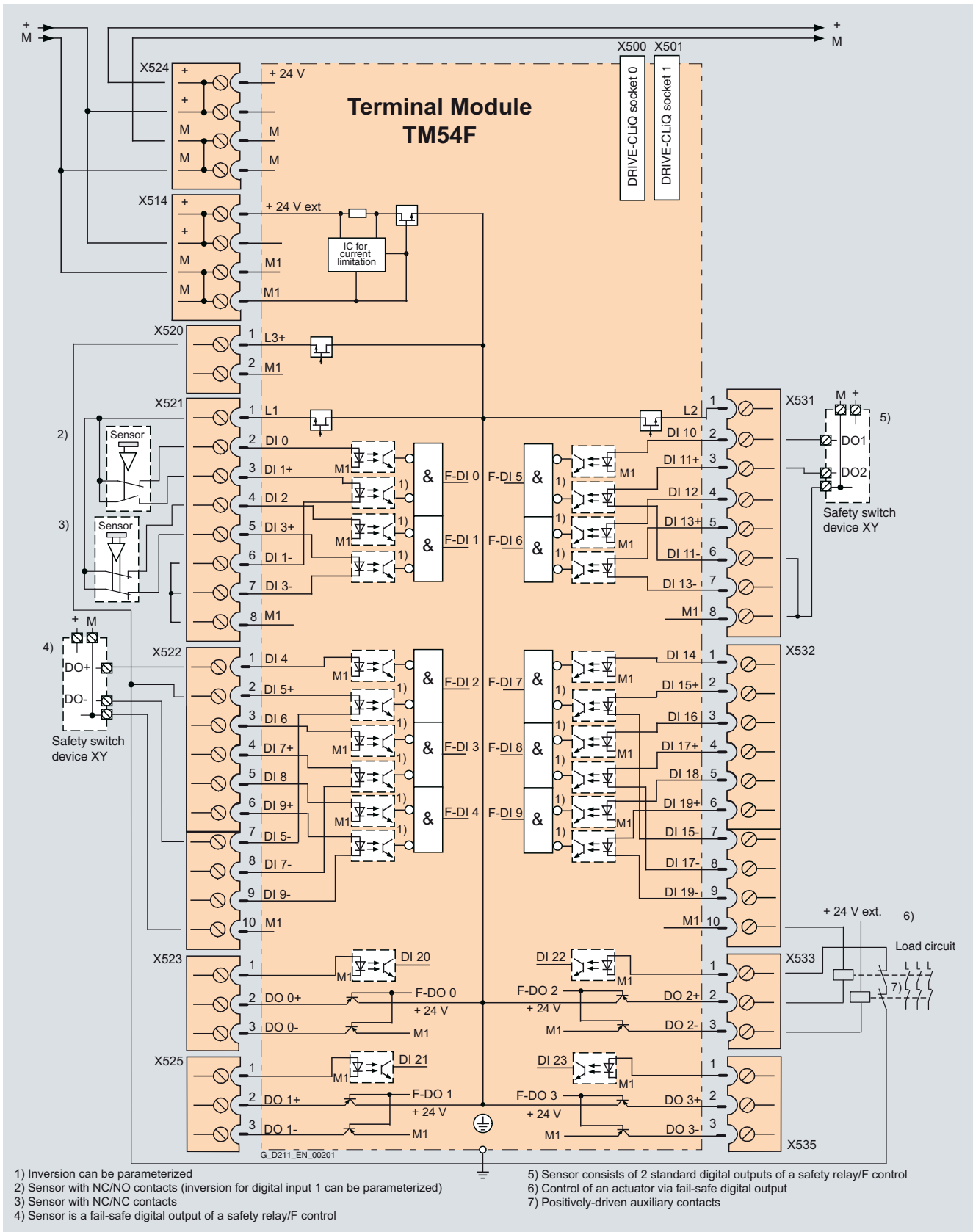
## System components

### Supplementary system components TM54F Terminal Module

#### Integration

The TM54F Terminal Module communicates with the CU310 or CU320-2 Control Unit via DRIVE-CLiQ.

2



Example of connection of a TM54F Terminal Module

## Overview



4 temperature sensors (KTY84-130 or PTC) can be evaluated via the TM120 Terminal Module. With respect to the evaluation electronics in the TM120 Terminal Module, the temperature sensor inputs have safe separation and are suitable for the temperature evaluation of special motors, e.g. 1FN linear motors and 1FW6 built-in torque motors.

The TM120 Terminal Module can be operated on a CU320-2 Control Unit from firmware version 4.3 and higher.

## Design

The following are located on the TM120 Terminal Module:

- 4 temperature sensor inputs (KTY84-130 or PTC)
- 2 DRIVE-CLiQ sockets

The status of the TM120 Terminal Module is indicated via a multi-color LED.

The TM120 Terminal Module can be snapped onto a TH 35 mounting rail according to EN 60715 (IEC 60715).

## Selection and ordering data

Description	Order No.
<b>TM120 Terminal Module</b> Without DRIVE-CLiQ cable	<b>6SL3055-0AA00-3KA0</b>
<b>Accessories</b>	
<b>Dust protection blanking plugs</b> (50 units) For DRIVE-CLiQ port	<b>6SL3066-4CA00-0AA0</b>

## Technical data

<b>TM120 Terminal Module</b> 6SL3055-0AA00-3KA0	
<b>Current demand, max.</b> at 24 V DC	0.5 A
• Conductor cross-section, max.	2.5 mm <sup>2</sup>
• Fuse protection, max.	20 A
<b>Temperature sensor inputs</b> The inputs can be parameterized separately for the evaluation of KTY84-130 or PTC sensors or temperature switches.	
• Conductor cross-section	0.2 ... 6 mm <sup>2</sup>
• Constant current per sensor, approx.	2 mA
• Safe electrical separation up to the line voltage, max.	480 V AC
<b>PE connection</b>	M4 screw
<b>Dimensions</b>	
• Width	30 mm
• Height	150 mm
• Depth	111 mm
<b>Weight, approx.</b>	0.41 kg
<b>Conformity</b>	CE

# SINAMICS S120 Chassis Format Units

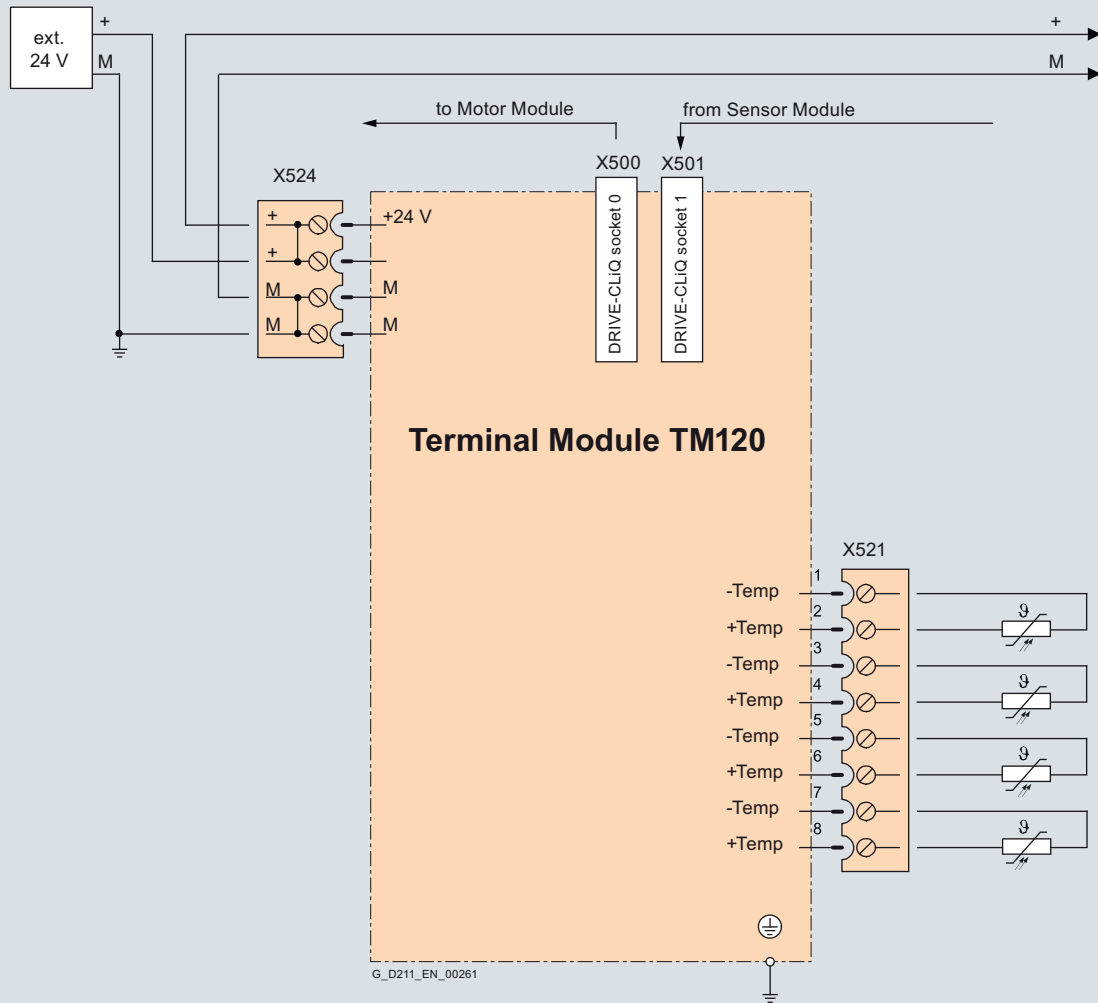
## System components

### Supplementary system components

#### TM120 Terminal Module

#### Integration

A TM120 Terminal Module is automatically assigned to an SMCxx Sensor Module by connecting the Sensor Module to the Motor Module via DRIVE-CLiQ via a TM120 Terminal Module. A manual assignment is also possible.



Example connection of a TM120 Terminal Module

# SINAMICS S120 Chassis Format Units

## System components

### Supplementary system components VSM10 Voltage Sensing Module

#### Overview



The VSM10 Voltage Sensing Module allows the line supply or motor voltage characteristic to be precisely sensed. The VSM10 Voltage Sensing Module is integrated in Active Interface Modules chassis format and in Smart Line Modules chassis format.

In addition, the VSM10 is used to switch to a rotating synchronous motor (flying restart function).

#### Design

The VSM10 Voltage Sensing Module has the following interfaces:

- 1 connection for direct voltage sensing up to 690 V
- 1 connection for voltage sensing using voltage transformers, max. 100 V
- 2 analog inputs (reserved for resonance monitoring in Active Interface Modules, chassis format)
- 1 temperature sensor input (KTY84-130 or PTC)
- 1 DRIVE-CLiQ socket
- 1 connection for the electronics power supply via the 24 V DC supply connector
- 1 PE/protective conductor connection

The VSM10 Voltage Sensing Module can be snapped onto a TH 35 top-hat rail to EN 60715 (IEC 60715).

The status of the VSM10 Voltage Sensing Module is indicated by a two-color LED.

#### Selection and ordering data

Description	Order No.
<b>VSM10 Voltage Sensing Module</b> Without DRIVE-CLiQ cable	<b>6SL3053-0AA00-3AA0</b>

For SINAMICS S150 and SINAMICS S120 Cabinet Modules, to implement the flying restart function, VSM10 can be ordered as option with order code **K51**.

#### Technical data

<b>VSM10 Voltage Sensing Module</b> 6SL3053-0AA00-3AA0	
<b>Current demand, max.</b> at 24 V DC	0.2 A
• Conductor cross-section, max.	2.5 mm <sup>2</sup>
<b>Power loss</b>	< 5 W
<b>Line voltage detection</b>	
• Input resistance	
- Terminal X521	> 362 kΩ/phase
- Terminal X522	> 2.5 MΩ/phase
<b>Analog inputs</b> (reserved for monitoring an Active Interface Module, chassis format)	
• Internal resistance, approx. (between differential inputs)	100 kΩ
• Resolution	12 bit
<b>PE connection</b>	M4 screw
<b>Dimensions</b>	
• Width	50 mm
• Height	150 mm
• Depth	111 mm
<b>Weight, approx.</b>	0.9 kg
<b>Conformity</b>	CE
<b>Approvals, according to</b>	cULus



# SINAMICS S120 Chassis Format Units

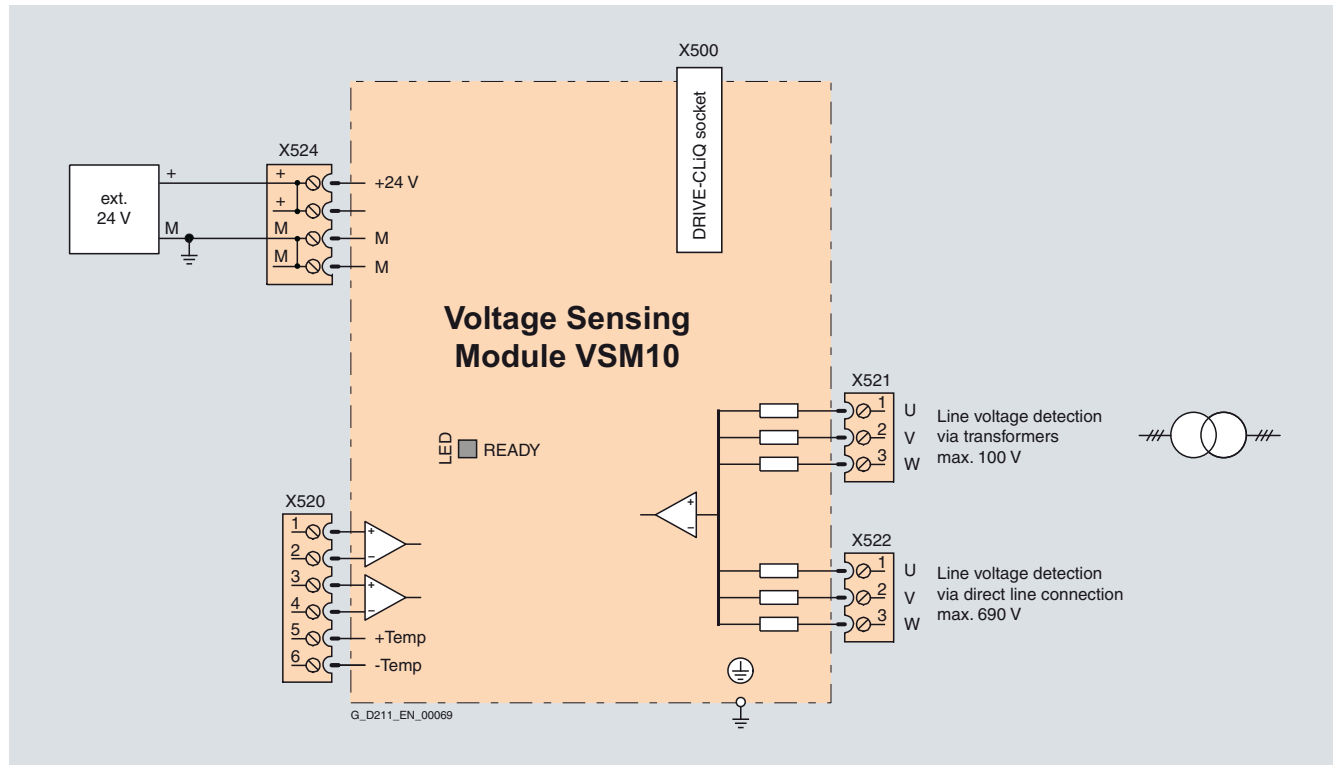
## System components

### Supplementary system components

#### VSM10 Voltage Sensing Module

#### Integration

The VSM10 Voltage Sensing Module communicates via DRIVE-CLiQ with the CU320-2 or SIMOTION D D4x5 Control Unit.



Example of connection of a VSM10 Voltage Sensing Module

## Overview



For SINAMICS S120, S150, G130 and G150 units, a Safe Brake Adapter SBA is required to safely control a motor holding brake via the Safe Brake Control (SBC) safety function according to IEC 61800-5-2.

The Safe Brake Adapter is available for 24 V DC and 230 V AC brake control voltages.

It can be ordered as supplementary component for SINAMICS S120 Chassis Format Units as well as for SINAMICS G130 Chassis Units.

It is available as option (**K88, K89**) for SINAMICS S120 Cabinet Modules and SINAMICS S150 or G150 Cabinet Units.

**Note:** The SBA approval is currently only valid for IEC regions (still open for UL regions).

## Selection and ordering data

Description	Order No.
<b>Safe Brake Adapter</b> • 230 V AC/2 A • 24 V DC/5 A	<b>6SL3355-2DX00-1AA0</b> <b>6SL3355-2DX01-1AA0</b>
<b>Accessories</b>	
<b>Pre-assembled interface cables to connect the SBA to the electronics module</b>	<b>6SL3060-4DX04-0AA0</b>

## Technical data

Safe Brake Adapter	6SL3355-2DX00-1AA0	6SL3355-2DX01-1AA0
<b>Electronics power supply</b>		
• Supply voltage (via the Control Interface Module)	24 V DC (20.4 ... 28.8 V)	24 V DC (20.4 ... 28.8 V)
<b>Supply voltage of the motor holding brake</b>	230 V AC	24 V DC
<b>Max. permissible current consumption of the</b>		
• Motor holding brake	2 A	5 A
• Fast de-energization	2 A	–
<b>Max. permissible cable lengths</b>		
• to the Control Interface Module	10 m	10 m
• to the brake	300 m	30 m
<b>Max. conductor cross-section</b>	2.5 mm <sup>2</sup>	2.5 mm <sup>2</sup>
<b>Dimensions</b>		
• Width	75 mm	75 mm
• Height	111 mm	111 mm
• Depth	89 mm	89 mm
<b>Weight, approx.</b>	0.25 kg	0.25 kg
<b>Safety Integrated</b>	Safety Integrity Level 2 (SIL2) acc. to IEC 61508, Performance Level d (PLd) acc. to ISO 13849-1 and Control Category 3 acc. to EN ISO 13849-1 (previously EN 954-1)	

## Integration

The SBC function is controlled and monitored by the SINAMICS Drives firmware. The control and feedback signal regarding the switching state of the SBA relay is realized via terminals of the Control Interface Module (CIM). The excitation coil of the holding brake is connected directly at the SBA.

For SINAMICS G130 chassis units and SINAMICS S120 Chassis Format Units, the brake supply voltage must be connected externally at the SBA.

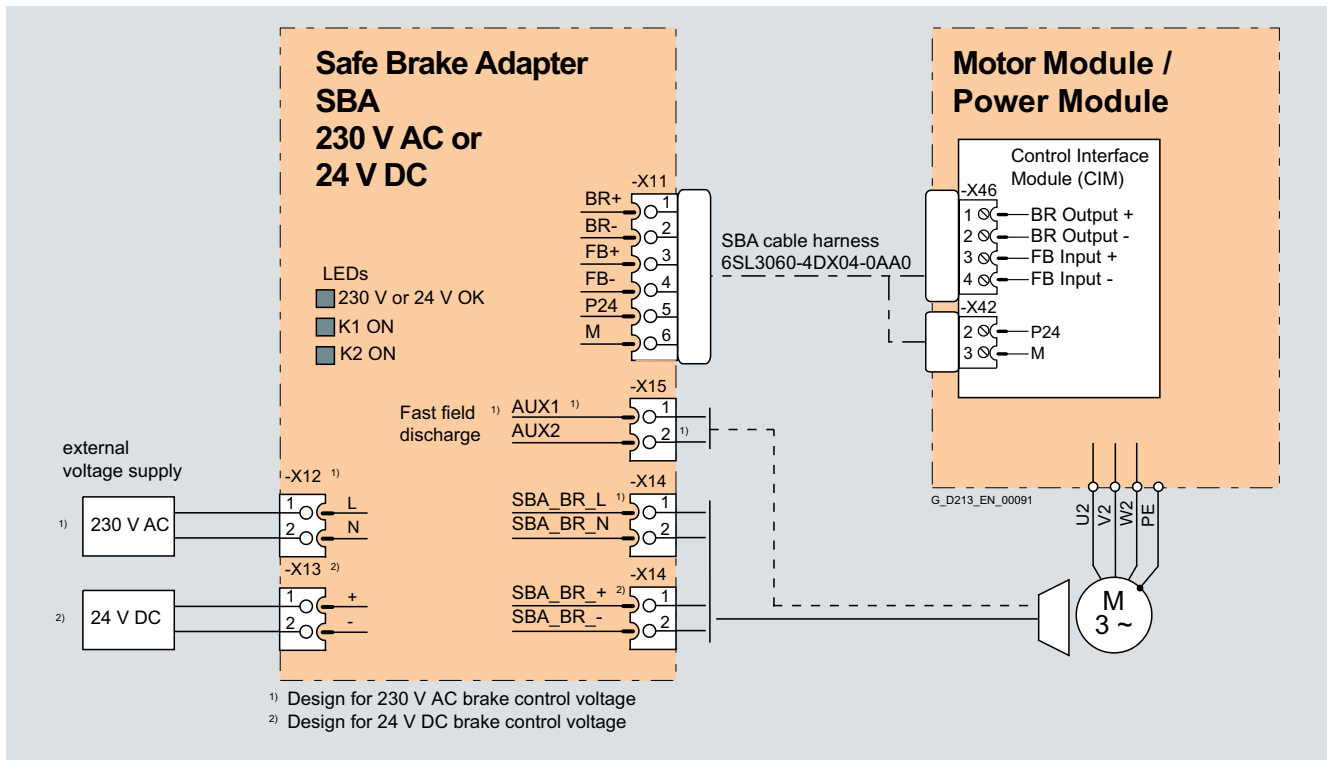
# SINAMICS S120 Chassis Format Units

## System components

### Supplementary system components Safe Brake Adapter SBA

#### Integration

2



Connection example of a Safe Brake Adapter SBA

## Overview



The SMC10 Sensor Module Cabinet-Mounted is required to evaluate the encoder signals of motors without a DRIVE-CLiQ interface. External encoders can also be connected via the SMC10.

The following encoder signals can be evaluated:

- 2-pole resolver
- Multipole resolver

## Design

The SMC10 Sensor Module Cabinet-Mounted features the following interfaces as standard:

- 1 DRIVE-CLiQ interface
- 1 encoder connection including motor temperature detection (KTY84-130 or PTC) via SUB-D connector
- 1 connection for the electronics power supply via the 24 V DC supply connector
- 1 PE/protective conductor connection

The status of the SMC10 Sensor Module Cabinet-Mounted is indicated via a multi-color LED.

The SMC10 Sensor Module Cabinet-Mounted can be snapped onto a TH 35 top-hat rail according to EN 60715 (IEC 60715).

The signal cable shield is connected via the encoder system connector and can also be connected to the SMC10 Sensor Module Cabinet-Mounted via a shield connection terminal, e.g. Phoenix Contact type SK8 or Weidmüller type KLBÜ CO 1.

## Selection and ordering data

Description	Order No.
<b>SMC10 Sensor Module Cabinet-Mounted</b> Without DRIVE-CLiQ cable	<b>6SL3055-0AA00-5AA3</b>

For the SINAMICS S150 and SINAMICS S120 Cabinet Modules, the SMC10 can be ordered as an option by specifying order code **K46**.

## Integration

SMC10 Sensor Modules Cabinet-Mounted communicate with a Control Unit via DRIVE-CLiQ.

## Technical data

<b>SMC10 Sensor Module Cabinet-Mounted</b> 6SL3055-0AA00-5AA3	
<b>Current demand, max.</b> At 24 V DC, without taking encoder into account	0.2 A
<ul style="list-style-type: none"> <li>• Conductor cross-section, max.</li> <li>• Fuse protection, max.</li> </ul>	2.5 mm <sup>2</sup> 20 A
<b>Power loss, max.</b>	10 W
<b>Encoders which can be evaluated</b>	<ul style="list-style-type: none"> <li>• 2-pole resolver</li> <li>• Multipole resolver</li> </ul>
<ul style="list-style-type: none"> <li>• Excitation voltage, rms</li> <li>• Excitation frequency</li> </ul>	4.1 V 5 ... 10 kHz depending on the current controller clock cycle of the Motor Module or Power Module
<ul style="list-style-type: none"> <li>• Transformation ratio</li> <li>• Encoder frequency, max.</li> </ul>	0.5 2 kHz (120000 rpm) depending on the pole pair number of the resolver and the current controller clock cycle of the Motor Module or Power Module
<ul style="list-style-type: none"> <li>• Signal subdivision (interpolation), max.</li> <li>• Cable length to encoder, max.</li> </ul>	16384 times (14 bit) 130 m
<b>PE connection</b>	M4 screw
<b>Dimensions</b>	
<ul style="list-style-type: none"> <li>• Width</li> <li>• Height</li> <li>• Depth</li> </ul>	30 mm 150 mm 111 mm
<b>Weight, approx.</b>	0.4 kg
<b>Conformity</b>	CE
<b>Approvals, according to</b>	cULus

# SINAMICS S120 Chassis Format Units

## System components

### Encoder system connection SMC20 Sensor Module Cabinet-Mounted

#### Overview



The SMC20 Sensor Module Cabinet-Mounted is required to evaluate the encoder signals of motors without a DRIVE-CLiQ interface. External encoders can also be connected via the SMC20.

The following encoder signals can be evaluated:

- Incremental encoder sin/cos 1 V<sub>pp</sub>
- EnDat absolute encoder
- SSI encoder with incremental signals sin/cos 1 V<sub>pp</sub> (firmware version 2.4 and later)

The motor temperature can also be detected with KTY84-130 or PTC thermistors.

#### Design

The SMC20 Sensor Module Cabinet-Mounted features the following interfaces as standard:

- 1 DRIVE-CLiQ interface
- 1 encoder connection including motor temperature detection (KTY84-130 or PTC) via SUB-D connector
- 1 connection for the electronics power supply via the 24 V DC supply connector
- 1 PE/protective conductor connection

The status of the SMC20 Sensor Module Cabinet-Mounted is indicated via a multi-color LED.

The SMC20 Sensor Module Cabinet-Mounted can be snapped onto a TH 35 top-hat rail acc. to EN 60715 (IEC 60715).

The signal cable shield is connected via the encoder system connector and can also be connected to the SMC20 Sensor Module Cabinet-Mounted via a shield connection terminal, e.g. Phoenix Contact type SK8 or Weidmüller type KLBÜ CO 1.

#### Selection and ordering data

Description	Order No.
<b>SMC20 Sensor Module Cabinet-Mounted</b> Without DRIVE-CLiQ cable	<b>6SL3055-0AA00-5BA2</b>

For the SINAMICS S150 and SINAMICS S120 Cabinet Modules, the SMC20 can be ordered as an option by specifying order code **K48**.

#### Integration

SMC20 Sensor Modules Cabinet-Mounted communicate with a Control Unit via DRIVE-CLiQ.

#### Technical data

<b>SMC20 Sensor Module Cabinet-Mounted</b> 6SL3055-0AA00-5BA2	
<b>Current demand, max.</b> At 24 V DC, without taking encoder into account	0.2 A
• Conductor cross-section, max.	2.5 mm <sup>2</sup>
• Fuse protection, max.	20 A
<b>Power loss, max.</b>	10 W
<b>Encoders which can be evaluated</b>	<ul style="list-style-type: none"> <li>• Incremental encoder sin/cos 1 V<sub>pp</sub></li> <li>• EnDat absolute encoder</li> <li>• SSI encoder with incremental signals sin/cos 1 V<sub>pp</sub> (firmware version 2.4 and later)</li> </ul>
• Encoder supply	5 V DC/0.35 A
• Encoder frequency incremental signals, max.	500 kHz
• Signal subdivision (interpolation), max.	16384 times (14 bit)
• SSI baud rate	100 kBaud
• Cable length to encoder, max.	100 m
<b>PE connection</b>	M4 screw
<b>Dimensions</b>	
• Width	30 mm
• Height	150 mm
• Depth	111 mm
<b>Weight, approx.</b>	0.45 kg
<b>Conformity</b>	CE
<b>Approvals, according to</b>	cULus

# SINAMICS S120 Chassis Format Units

## System components

### Encoder system connection SMC30 Sensor Module Cabinet-Mounted

#### Overview



The SMC30 Sensor Module Cabinet-Mounted is required to evaluate the encoder signals of motors without a DRIVE-CLiQ interface. External encoders can also be connected via the SMC30.

The following encoder signals can be evaluated:

- Incremental encoders TTL/HTL with/without open-circuit detection (open-circuit detection is only available with bipolar signals)
- SSI encoder with TTL/HTL incremental signals
- SSI encoder without incremental signals

The motor temperature can also be detected with KTY84-130 or PTC thermistors.

#### Design

The SMC30 Sensor Module Cabinet-Mounted features the following interfaces as standard:

- 1 DRIVE-CLiQ interface
- 1 encoder connection including motor temperature detection (KTY84-130 or PTC) via SUB-D connector or terminals
- 1 connection for the electronics power supply via the 24 V DC supply connector
- 1 PE/protective conductor connection

The status of the SMC30 Sensor Module Cabinet-Mounted is indicated via a multi-color LED.

The SMC30 Sensor Module Cabinet-Mounted can be snapped onto a TH 35 top-hat rail according to EN 60715 (IEC 60715).

The maximum encoder cable length between SMC30 modules and encoders is 100 m. For HTL encoders, this length can be increased to 300 m if the A\*, A and B\*, B signals are evaluated and the power supply cable has a minimum cross-section of 0.5 mm<sup>2</sup>.

The signal cable shield can be connected to the SMC30 Sensor Module Cabinet-Mounted via a shield connection terminal, e.g. Phoenix Contact type SK8 or Weidmüller type KLBÜ CO 1.

#### Selection and ordering data

Description	Order No.
<b>SMC30 Sensor Module Cabinet-Mounted</b> Without DRIVE-CLiQ cable	<b>6SL3055-0AA00-5CA2</b>

For the SINAMICS S150 and SINAMICS S120 Cabinet Modules, the SMC30 can be ordered as an option by specifying order code **K50**.

#### Integration

SMC30 Sensor Modules Cabinet-Mounted communicate with a Control Unit via DRIVE-CLiQ.

#### Technical data

<b>SMC30 Sensor Module Cabinet-Mounted</b> 6SL3055-0AA00-5CA2	
<b>Current demand, max.</b> At 24 V DC, without taking encoder into account	0.2 A
• Conductor cross-section, max.	2.5 mm <sup>2</sup>
• Fuse protection, max.	20 A
<b>Power loss, max.</b>	10 W
<b>Encoders which can be evaluated</b>	<ul style="list-style-type: none"> <li>• Incremental encoder TTL/HTL</li> <li>• SSI encoder with TTL/HTL incremental signals</li> <li>• SSI encoder without incremental signals</li> </ul>
• 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
• Limiting frequency	300 kHz
• Resolution absolute position SSI	30 bit
• Cable length, max.	
- TTL encoder	100 m (only bipolar signals permitted) <sup>1)</sup>
- HTL encoder	100 m for unipolar signals, 300 m for bipolar signals <sup>1)</sup>
- SSI encoder	100 m
<b>PE connection</b>	M4 screw
<b>Dimensions</b>	
• Width	30 mm
• Height	150 mm
• Depth	111 mm
<b>Weight, approx.</b>	0.45 kg
<b>Conformity</b>	CE
<b>Approvals, according to</b>	cULus

<sup>1)</sup> Signal cables twisted in pairs and shielded.

# SINAMICS S120 Chassis Format Units

## System components

### Connection system Signal cables

#### Overview



MOTION-CONNECT DRIVE-CLiQ cable

Signal cables are pre-assembled and are sold by the meter for the connection of a variety of components.

- DRIVE-CLiQ cables
- MOTION-CONNECT DRIVE-CLiQ cables
- MOTION-CONNECT pre-assembled cables

#### Applications

##### DRIVE-CLiQ cables

are used to connect components with DRIVE-CLiQ connections which have a separate or external 24 V DC power supply.

DRIVE-CLiQ cables for connecting Line/Motor Modules with a Control Unit are part of the scope of supply of the relevant modules.

##### MOTION-CONNECT DRIVE-CLiQ cables

are used whenever components with DRIVE-CLiQ connections must meet high requirements such as mechanical stress and oil resistance, e.g. when connections are made outside the cabinet between

- Motor Modules and Sensor Modules
- Motor Modules and motors with DRIVE-CLiQ interface

MOTION-CONNECT DRIVE-CLiQ cables have 24 V DC cores.

##### MOTION-CONNECT pre-assembled cables

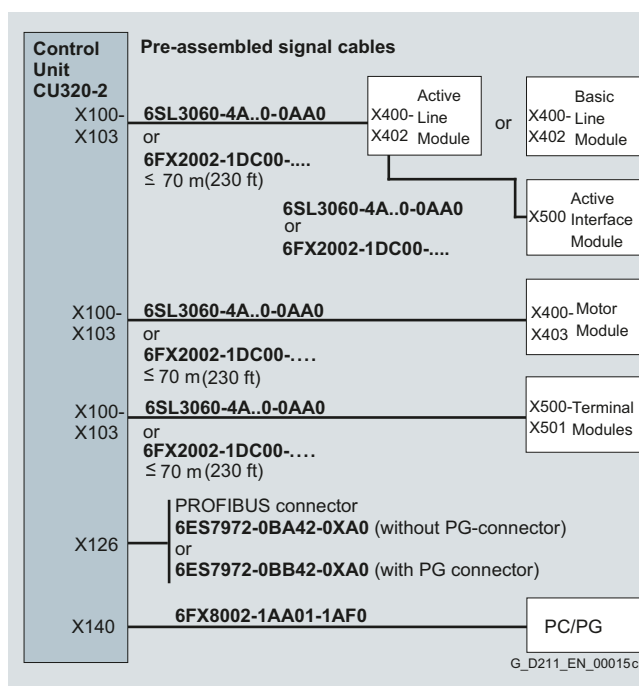
are used whenever motor encoders on motors without DRIVE-CLiQ interface are connected to Sensor Modules.

Note: All 6FX.002-2C... signal cables are also available with crimped contacts and connector housing supplied as a separate accessory.

- Signal cables with enclosed connector enclosure **for the motor end**. In this case, the 6th position of the Order No. must be changed from 0 to 4:  
6FX.042-2C...-....
- Signal cables with enclosed connector enclosure **for the module end**. In this case, the 6th position of the Order No. must be changed from 0 to 1:  
6FX.012-2C...-....

#### Integration

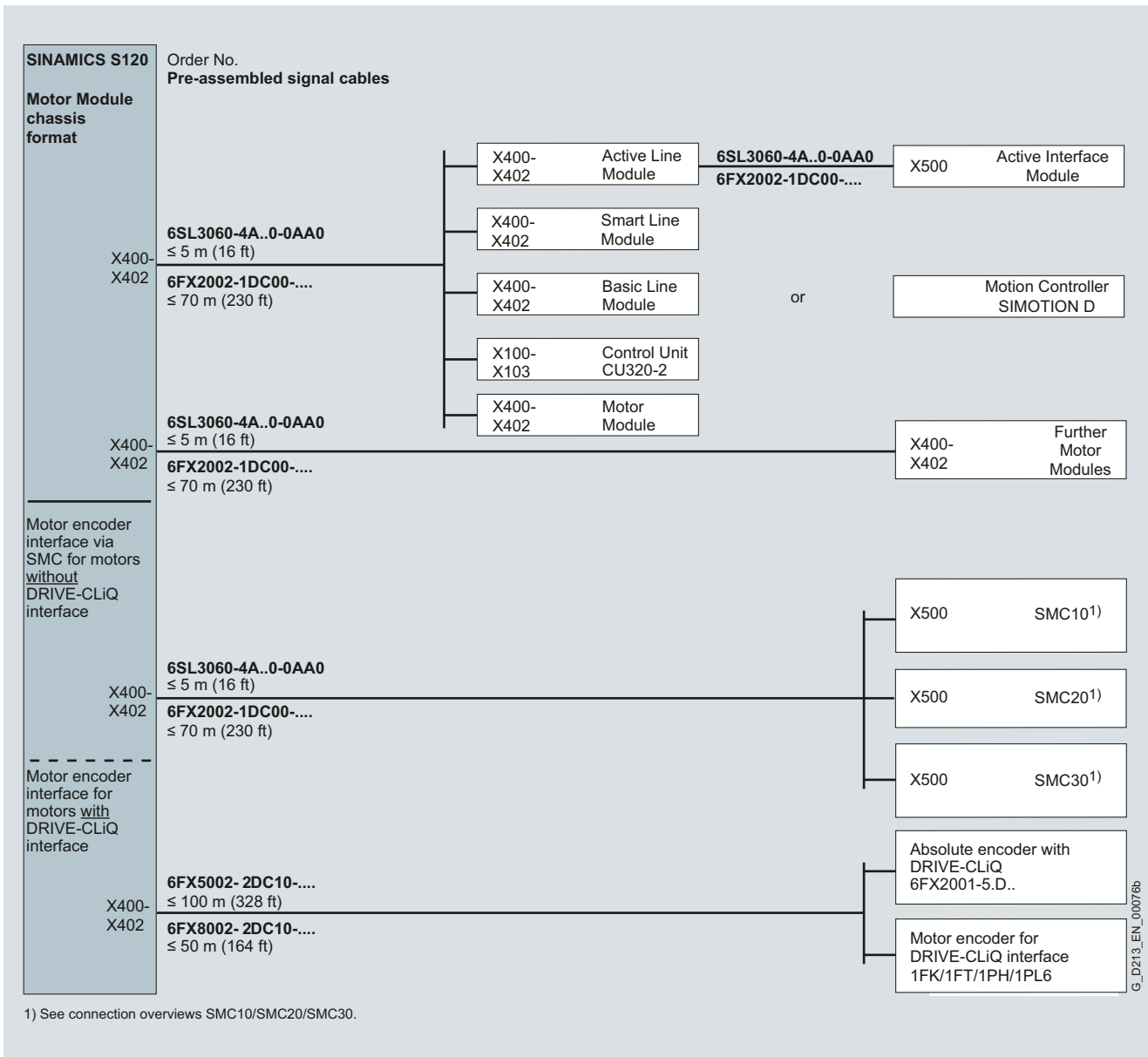
##### Connection overview for the CU320-2 Control Unit



### Integration

#### Connection overview for Line Modules and Motor Modules

The DRIVE-CLiQ type 6SL3060-4A..0-0AA0 cables for the standard configuration are part of the scope of supply of the Line Modules and Motor Modules. In this case, the modules must be mounted directly adjacent in a line.





# SINAMICS S120 Chassis Format Units

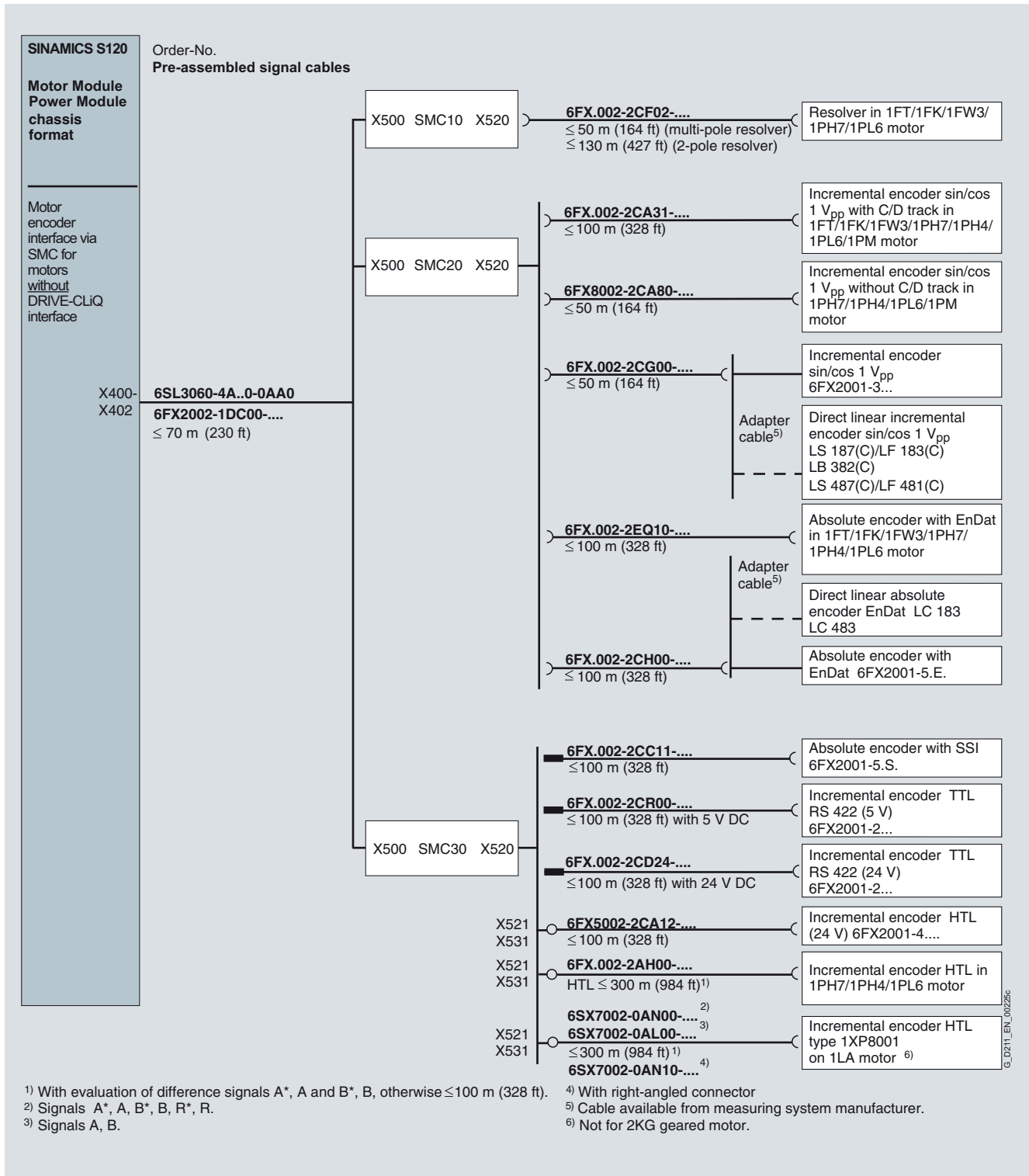
## System components

Connection system  
Signal cables

### Integration

Connection overview for Line Modules and Motor Modules

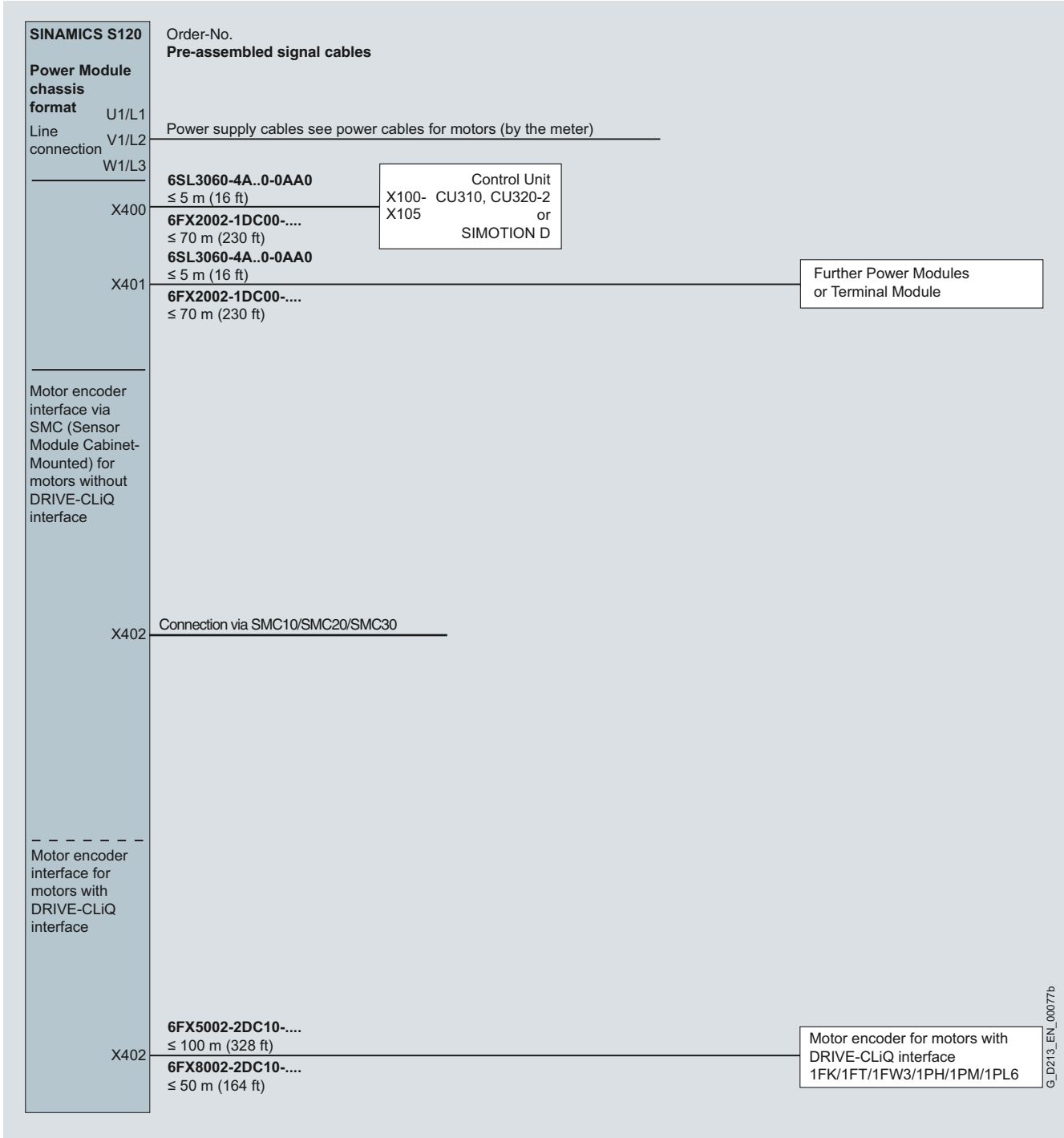
2



### Integration

#### Connection overview for Power Modules

A DRIVE-CLiQ cable of type 6SL3060-4A..0-0AA0 for connection to the chassis-mounted CU310 Control Unit is already included in the scope of supply.



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# SINAMICS S120 Chassis Format Units

## System components

Connection system  
Signal cables

### Integration

#### Connection overview for Power Modules

2

**SINAMICS S120**  
**Motor Module**  
**Power Module**  
**chassis**  
**format**

Motor encoder interface via SMC for motors without DRIVE-CLIQ interface

X400-  
X402

Order-No.  
**Pre-assembled signal cables**

**6SL3060-4A..0-0AA0**  
**6FX2002-1DC00-....**  
≤ 70 m (230 ft)

X500 SMC10 X520

**6FX.002-2CF02-....**  
≤ 50 m (164 ft) (multi-pole resolver)  
≤ 130 m (427 ft) (2-pole resolver)

Resolver in 1FT/1FK/1FW3/  
1PH7/1PL6 motor

X500 SMC20 X520

**6FX.002-2CA31-....**  
≤ 100 m (328 ft)

Incremental encoder sin/cos  
1 V<sub>pp</sub> with C/D track in  
1FT/1FK/1FW3/1PH7/1PH4/  
1PL6/1PM motor

**6FX8002-2CA80-....**  
≤ 50 m (164 ft)

Incremental encoder sin/cos  
1 V<sub>pp</sub> without C/D track in  
1PH7/1PH4/1PL6/1PM  
motor

**6FX.002-2CG00-....**  
≤ 50 m (164 ft)

Incremental encoder  
sin/cos 1 V<sub>pp</sub>  
6FX2001-3...

Adapter  
cable<sup>5)</sup>

Direct linear incremental  
encoder sin/cos 1 V<sub>pp</sub>  
LS 187(C)/LF 183(C)  
LB 382(C)  
LS 487(C)/LF 481(C)

**6FX.002-2EQ10-....**  
≤ 100 m (328 ft)

Absolute encoder with EnDat  
in 1FT/1FK/1FW3/1PH7/  
1PH4/1PL6 motor

Adapter  
cable<sup>5)</sup>

Direct linear absolute  
encoder EnDat LC 183  
LC 483

**6FX.002-2CH00-....**  
≤ 100 m (328 ft)

Absolute encoder with  
EnDat 6FX2001-5.E.

X500 SMC30 X520

**6FX.002-2CC11-....**  
≤ 100 m (328 ft)

Absolute encoder with SSI  
6FX2001-5.S.

**6FX.002-2CR00-....**  
≤ 100 m (328 ft) with 5 V DC

Incremental encoder TTL  
RS 422 (5 V)  
6FX2001-2...

**6FX.002-2CD24-....**  
≤ 100 m (328 ft) with 24 V DC

Incremental encoder TTL  
RS 422 (24 V)  
6FX2001-2...

X521  
X531

**6FX5002-2CA12-....**  
≤ 100 m (328 ft)

Incremental encoder HTL  
(24 V) 6FX2001-4....

X521  
X531

**6FX.002-2AH00-....**  
HTL ≤ 300 m (984 ft)<sup>1)</sup>

Incremental encoder HTL in  
1PH7/1PH4/1PL6 motor

X521  
X531

**6SX7002-0AN00-....**<sup>2)</sup>  
**6SX7002-0AL00-....**<sup>3)</sup>  
≤ 300 m (984 ft)<sup>1)</sup>

Incremental encoder HTL  
type 1XP8001  
on 1LA motor<sup>6)</sup>

**6SX7002-0AN10-....**<sup>4)</sup>

<sup>1)</sup> With evaluation of difference signals A\*, A and B\*, B, otherwise ≤ 100 m (328 ft).

<sup>2)</sup> Signals A\*, A, B\*, B, R\*, R.

<sup>3)</sup> Signals A, B.

<sup>4)</sup> With right-angled connector

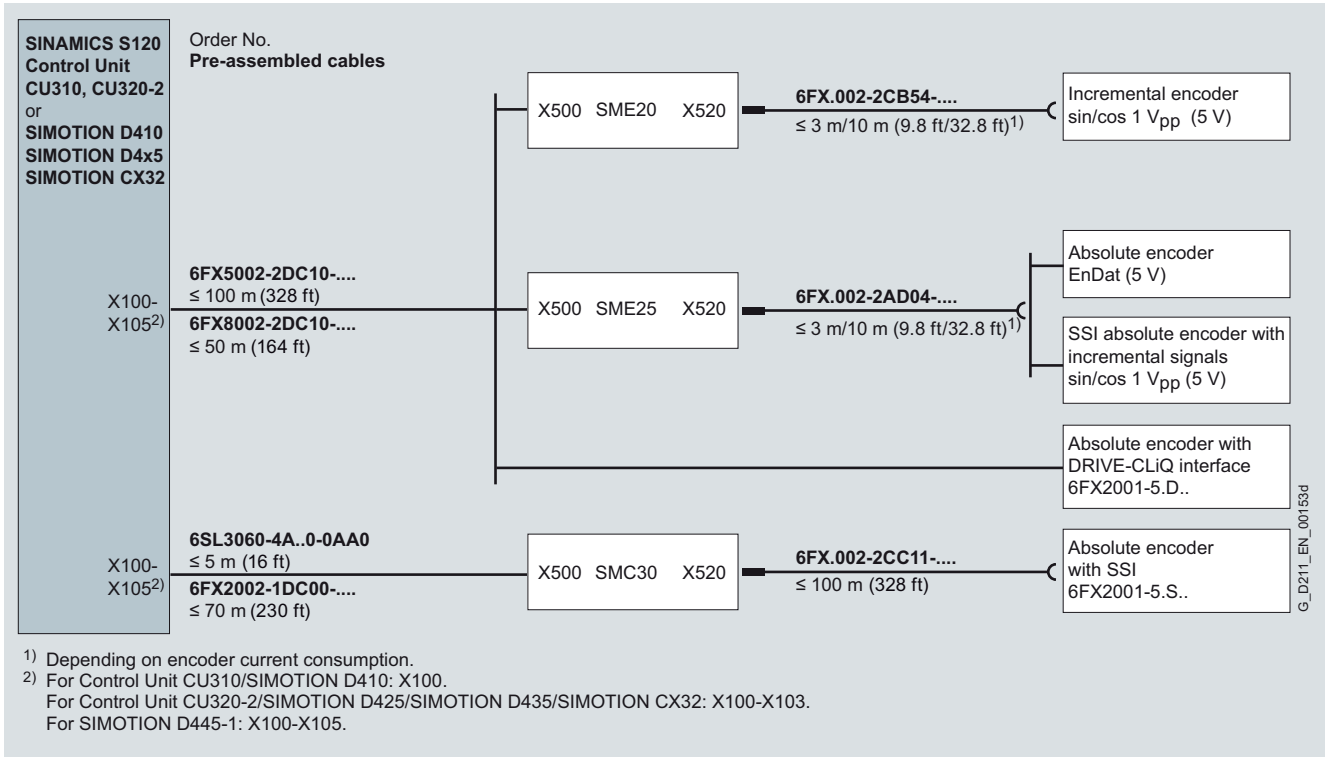
<sup>5)</sup> Cable available from measuring system manufacturer.

<sup>6)</sup> Not for 2KG geared motor.

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### Integration

#### Connection of a machine encoder (direct measuring system)



### Selection and ordering data

Signal cable	Length	Degree of protection (connector)	Basic cable Order No.
<b>DRIVE-CLiQ pre-assembled cables (without 24 V DC cores)</b>			
In specific lengths	0.11 m	IP20/IP20	6SL3060-4AB00-0AA0
	0.16 m		6SL3060-4AD00-0AA0
	0.21 m		6SL3060-4AF00-0AA0
	0.26 m		6SL3060-4AH00-0AA0
	0.31 m		6SL3060-4AK00-0AA0
	0.36 m		6SL3060-4AM00-0AA0
	0.41 m		6SL3060-4AP00-0AA0
	0.60 m		6SL3060-4AU00-0AA0
	0.95 m		6SL3060-4AA10-0AA0
	1.20 m		6SL3060-4AW00-0AA0
	1.45 m		6SL3060-4AF10-0AA0
2.80 m	6SL3060-4AJ20-0AA0		
5.00 m	6SL3060-4AA50-0AA0		
To the meter	Max. 70 m	IP20/IP20	6FX2002-1DC00-....
	Max. 70 m	IP67/IP67	6FX2002-1DC20-....
<b>DRIVE-CLiQ MOTION-CONNECT 500 cables (with 24 V DC cores)</b>			
To the meter	Max. 100 m	IP20/IP20	6FX5002-2DC00-....
	Max. 100 m	IP20/IP67	6FX5002-2DC10-....
	Max. 100 m	IP67/IP67	6FX5002-2DC20-....
<b>DRIVE-CLiQ MOTION-CONNECT 800 cables (with 24 V DC cores)</b>			
To the meter	Max. 50 m	IP20/IP20	6FX8002-2DC00-....
	Max. 50 m	IP20/IP67	6FX8002-2DC10-....
	Max. 50 m	IP67/IP67	6FX8002-2DC20-....
Length code (refer to the next page)			...

# SINAMICS S120 Chassis Format Units

## System components

### Connection system Signal cables

#### Selection and ordering data

##### Length codes

Description	Order No. supplement				
<b>Length codes for pre-assembled cables</b>					
	<b>6FX....-.....-</b>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	<b>6SX....-.....-</b>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
0 m	<b>1</b>				
100 m	<b>2</b>				
200 m	<b>3</b>				
300 m	<b>4</b>				
0 m		<b>A</b>			
10 m		<b>B</b>			
20 m		<b>C</b>			
30 m		<b>D</b>			
40 m		<b>E</b>			
50 m		<b>F</b>			
60 m		<b>G</b>			
70 m		<b>H</b>			
80 m		<b>J</b>			
90 m		<b>K</b>			
0 m			<b>A</b>		
1 m			<b>B</b>		
2 m			<b>C</b>		
3 m			<b>D</b>		
4 m			<b>E</b>		
5 m			<b>F</b>		
6 m			<b>G</b>		
7 m			<b>H</b>		
8 m			<b>J</b>		
9 m			<b>K</b>		
0 m				<b>0</b>	
0.1 m				<b>1</b>	
0.2 m				<b>2</b>	
0.3 m				<b>3</b>	
0.4 m				<b>4</b>	
0.5 m				<b>5</b>	
0.6 m				<b>6</b>	
0.7 m				<b>7</b>	
0.8 m				<b>8</b>	
Examples:	1.0 m:	1	A	B	0
	2.2 m:	1	A	C	2
	8.0 m:	1	A	J	0
	299.0 m:	3	K	K	0

# SINAMICS S120 Cabinet Modules



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# SINAMICS S120 Cabinet Modules

## System overview

### Overview



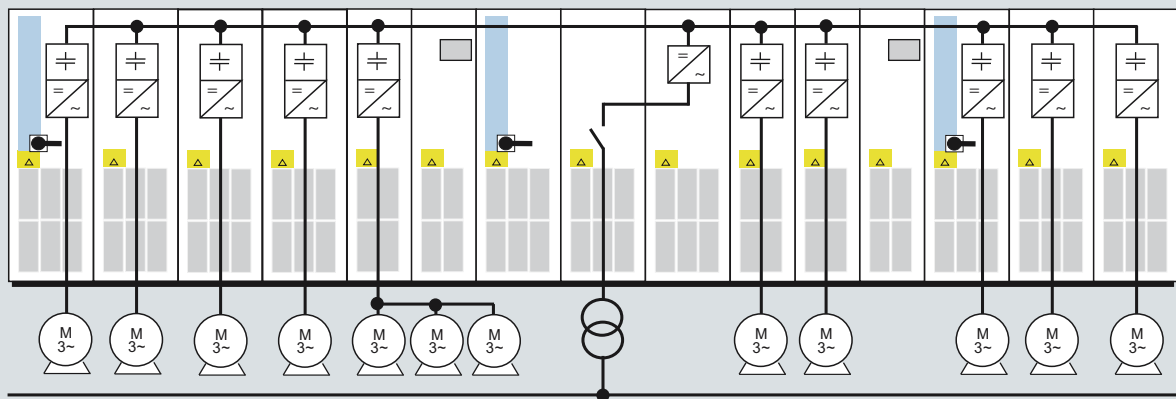
SINAMICS S120 Cabinet Modules are components forming part of a modular cabinet system for multi-motor drives with a central line infeed and a common DC busbar of the type typically used in, for example, paper-making machines, roller mills, test stands, or hoisting gear. As standard, they are installed side by side in a row. Other installation types (e.g. back to back) are possible on request. They include the chassis units from the SINAMICS S120 series in booksize format (Motor Modules) and chassis format, thus making the range an ideal supplement to the SINAMICS G150 and SINAMICS S150 cabinet unit series for single-motor drives.

All drive components, from the line infeed to the motor-side inverters, are configured in a clear, compact layout in the individual Cabinet Modules. They can be combined with great flexibility and can be optimally adapted to customer-specific requirements thanks to a comprehensive array of options.

The main components of the system are as follows:

- Line Connection Modules with line-side components such as contactors, fuses and circuit breakers, as well as line reactors for Basic Line Modules.
- Line Modules for the infeed in the following variations:
  - Basic Line Modules for two-quadrant operation
  - Smart Line Modules for four-quadrant operation
  - Active Line Modules for four-quadrant operation with negligible line harmonics
- Central Braking Modules for braking operation
- The following types of Motor Modules:
  - Booksize Kit
  - Chassis
- Control Units
- Auxiliary Power Supply Modules

Standardized interfaces for both the power and the control connections facilitate configuration and installation. Communication between the power modules and the central Control Unit takes place via DRIVE-CLiQ, the internal drive serial interface.



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

## Overview

The following table provides an overview of the voltage ranges and power ratings of the SINAMICS S120 Cabinet Modules that are available:

	Line voltage	Input current	DC link voltage	DC link current	Output current	Power range
<b>Line Connection Modules</b>	380 ... 480 V 3 AC	250 ... 3200 A	–	–	–	–
	500 ... 690 V 3 AC	280 ... 3200 A	–	–	–	–
<b>Basic Line Modules</b>	380 ... 480 V 3 AC	365 ... 1630 A	510 ... 650 V	420 ... 1880 A	–	200 ... 900 kW
	500 ... 690 V 3 AC	260 ... 1580 A	675 ... 930 V	300 ... 1880 A	–	250 ... 1500 kW
<b>Smart Line Modules</b>	380 ... 480 V 3 AC	463 ... 1430 A	510 ... 650 V	550 ... 1700 A	–	250 ... 800 kW
	500 ... 690 V 3 AC	463 ... 1430 A	675 ... 930 V	550 ... 1700 A	–	450 ... 1400 kW
<b>Active Line Modules</b>	380 ... 480 V 3 AC	210 ... 1405 A	540 ... 720 V	235 ... 1574 A	–	132 ... 900 kW
	500 ... 690 V 3 AC	575 ... 1270 A	710 ... 1035 V	644 ... 1422 A	–	560 ... 1400 kW
<b>Motor Modules booksize</b>	380 ... 480 V 3 AC	–	510 ... 720 V	3.6 ... 200 A	3 ... 200 A	1.6 ... 107 kW
<b>Motor Modules chassis</b>	380 ... 480 V 3 AC	–	510 ... 720 V	252 ... 1686 A	210 ... 1405 A	110 ... 800 kW
	500 ... 690 V 3 AC	–	675 ... 1035 V	102 ... 1524 A	85 ... 1270 A	75 ... 1200 kW
<b>Central Braking Modules</b>	380 ... 480 V 3 AC	–	510 ... 720 V	–	–	500 ... 1000 kW
	500 ... 600 V 3 AC	–	675 ... 900 V	–	–	550 ... 1100 kW
	660 ... 690 V 3 AC	–	890 ... 1035 V	–	–	630 ... 1200 kW
<b>Auxiliary Power Supply Modules</b>	380 ... 690 V 3 AC	125 ... 250 A	–	–	–	–

The power can be increased by connecting up to four identical modules in parallel.

## Benefits

The outstanding system features of the SINAMICS S120 Cabinet Modules provide the following advantages:

- Process optimization with minimal effort:
  - A standard PROFIBUS or PROFINET interface and various analog and digital interfaces enables easy integration into automation solutions.
  - Vector control ensures that they fulfill the most exacting requirements regarding the accuracy and dynamic response of drives.
- High level of reliability and availability:
  - Individual modules and power components can be replaced quickly and easily, which ensures a higher level of plant availability.
- Energy savings during operation:
  - The inverters on the motor side are coupled through a common DC link and allow energy to be exchanged between motors that are motoring and generating. In this way, energy is saved, the line infeed is relieved and line harmonics reduced.
  - Generally the line infeed is only dimensioned for the maximum energy required when motoring or the maximum current required when motoring – and not the sum of the energy requirements of the Motor Modules connected to the DC link. As a consequence, for example, for conveyor belts or motor test stands with Motor Modules that are simultaneously operated motoring and generating, a significantly smaller line infeed unit can be selected.
- Cost minimization during operation, maintenance, and service:
  - Simple commissioning thanks to the menu-driven STARTER commissioning tool.
  - Optional, menu-navigated AOP30 advanced operator panel with plain text display and bar-type display of process values.
  - All device modules are easily accessible, which makes them extremely service friendly.
- Space-saving design
- Environmentally-friendly operation:
  - The converters are exceptionally quiet and compact thanks to state-of-the-art IGBT power semiconductors and an innovative cooling concept.

## Applications

SINAMICS S120 Cabinet Modules have been specially developed to allow simple configuration of multi-motor systems. They are used for applications where several motors must be coordinated to realize a drive task as multi-motor drives in a drive line-up. Examples of such applications include:

- Paper machines
- Rolling mills
- Hoisting gear
- Test bays



# SINAMICS S120 Cabinet Modules

## System overview

### Design

They have been designed with a zone concept and therefore offer the highest possible level of operational reliability. EMC measures have been rigorously implemented. With the help of simulated conditions, partitions have been designed to act as air guides and heat dissipation units.

Special measures used in the construction of the cabinets ensure that they remain mechanically durable over their entire life cycle.

Attention has been paid to providing a wide range of cable routing options and special design concepts are applied consistently to broaden the scope of application and simplify servicing. The units have all the necessary connections and connecting elements. Thanks to their carefully considered configuration concept, cabinets are shipped in a ready-to-connect state or, in the case of multiple transport units, have been prepared for quick assembly. The selection you make is supported by an extensive range of options, harmonized and coordinated to various applications.

All components, from individual parts to the ready-to-connect cabinet, undergo rigorous testing throughout the entire production process. This guarantees a high level of functional reliability during installation and commissioning, as well as in operation.

The design of replaceable components is based on the principle that they must be quick and easy to change. In addition, the "SparesOnWeb" Internet tool makes it easy to view the spare parts that are available for the particular order <sup>1)</sup>.

### Line Modules

Power is fed to the drive line-up via Line Modules, which generate a DC voltage from the line voltage and, therefore, supply energy to the Motor Modules connected to the DC link. They are suitable for connection to grounded TN/TT and non-grounded IT systems.

The Line Modules are connected to the line supply system via Line Connection Modules and are equipped as standard according to Category C3. Category C3 is part of the "second environment" (in accordance with EN 61800-3). The second environment are locations outside residential areas or industrial sites which are supplied from the medium-voltage network via a separate transformer.

The range of Line Modules has power ratings from 132 kW to 900 kW (380 V to 480 V) and from 250 kW to 1500 kW (500 V to 690 V). Furthermore, up to four identical Line Modules can be connected in parallel in order to increase the power rating.

For a compact configuration, Line Connection Modules up to input currents of 3200 A are available. Two Line Modules can be operated in parallel on these Line Connection Modules.

The following types of Line Module are available:

- Basic Line Modules
- Smart Line Modules
- Active Line Modules

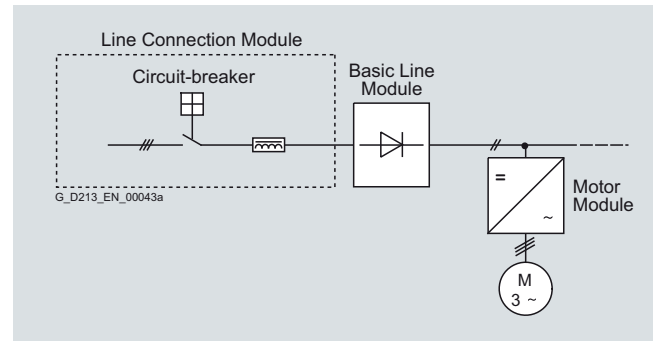
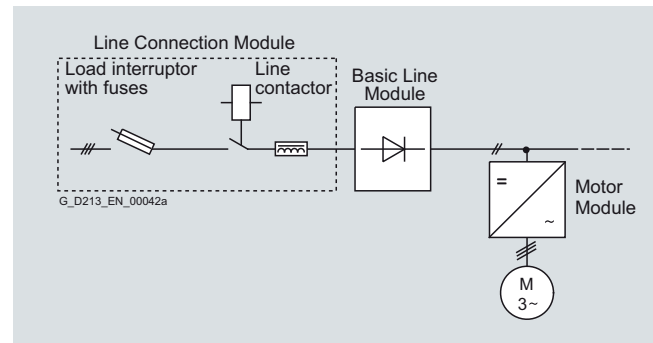
### Basic Line Modules

Basic Line Modules are designed only for infeed operation, i.e. they are not capable of recovering energy to the mains supply.

If regenerative energy is produced, e.g. when the drives brake, then it must be converted to heat by means of a Braking Module and a braking resistor.

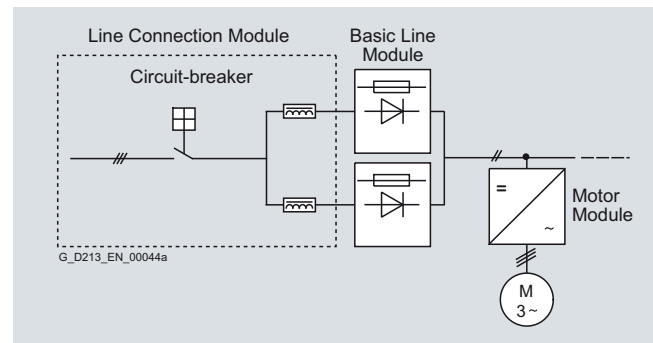
When a Basic Line Module is used as the infeed, a line reactor appropriate to the supply conditions must be installed. Line reactors are generally required if two or more Basic Line Modules are operated in parallel on a common supply system in order to increase power.

For this reason, line reactors are installed in the appropriate Line Connection Module as standard.



If, for example, a converter transformer is used to connect to the line supply (12-pulse operation), line reactors might not be required and they can be optionally omitted (order code **L22**).

In the case of parallel connection, versions with line-side fuses are available for selective protection of the individual Basic Line Modules.

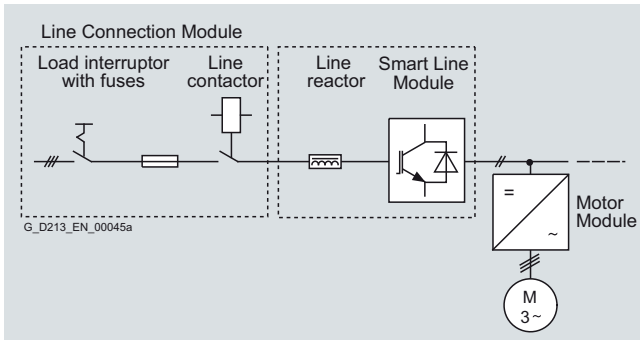


<sup>1)</sup> The properties of the SINAMICS S120 Cabinet Modules described in this catalog are not transferable to cabinet units constructed to meet the requirements of specific applications.

## Design

### Smart Line Modules

Smart Line Modules can supply energy to the DC link and return regenerative energy to the supply system. Braking Modules and braking resistors are required only if the drives need to be decelerated in a controlled manner after a power failure – i.e. when energy cannot be regenerated into the line supply. When a Smart Line Module is used as the infeed, the necessary line reactor is included in the device as standard.

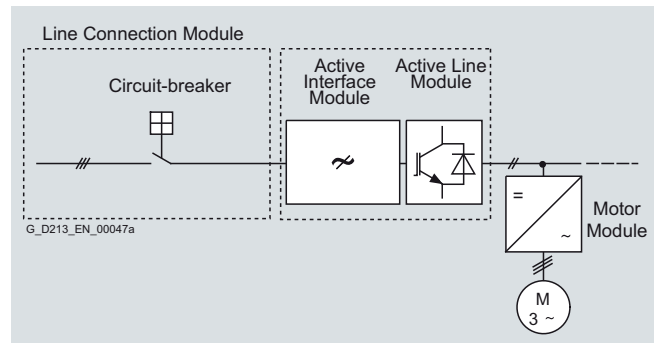
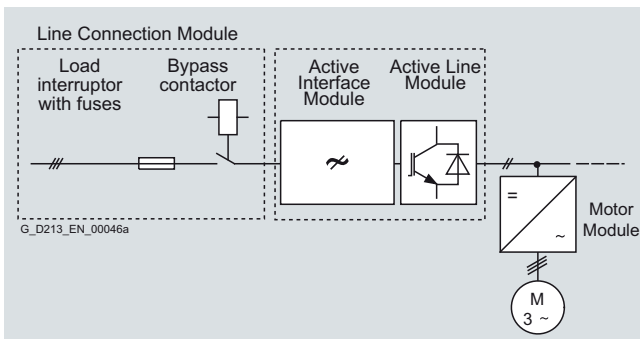


### Active Line Modules

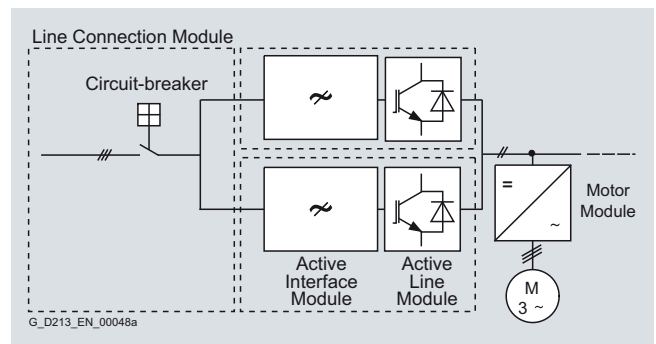
Active Line Modules can supply energy and return regenerative energy to the supply system. Braking Modules and braking resistors are required only if the drives need to be decelerated in a controlled manner after a power failure – i.e. when energy cannot be regenerated into the line supply.

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. However, 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 must always be used in conjunction with an Active Interface Module. Active Interface Modules include the required pre-charging circuit for the Active Line Module in addition to a Clean Power Filter. For SINAMICS S120 Cabinet Modules, these two components are always regarded as a single unit.



In the example, two units comprising an Active Interface Module and Active Line Module are connected in parallel to jointly supply the DC link.



### DC link components

Braking Modules enable braking resistors to absorb the regenerative energy produced during drive deceleration, which is then converted into heat.

### Braking Modules as a Line Module or Motor Module option

For lower braking powers, Braking Modules are available with continuous braking powers up to 50 kW. These Braking Modules are ordered as an option for the Line Modules and Motor Modules (order codes **L61/L64** (25 kW) or **L62/L65** (50 kW), refer to the description of the options).

### Central Braking Modules

For higher continuous braking powers, separate Central Braking Modules are available. These modules are used centrally in the drive line-up.

### Motor Modules

There are two different types of Motor Module available with the SINAMICS S120 Cabinet Modules drive system.

### Booksize Base Cabinets with Booksize Cabinet Kits

Motor Modules at the low end of the power range from 1.6 kW to 107 kW (380 V to 480 V) can be implemented as Booksize Cabinet Kits installed in Booksize Base Cabinets. In the 1.6 kW to 9.7 kW power range, Booksize Cabinet Kits are available as Double Motor Modules, which combine two inverters in a single module.

### Chassis Cabinets

Each Chassis Cabinet is fitted with one SINAMICS S120 Motor Module in chassis format and covers the power range from 75 kW to 1200 kW (380 V to 480 V or 500 V to 690 V). The power rating can be extended up to approx. 4500 kW by connecting up to four Motor Modules in the chassis format in parallel.

# SINAMICS S120 Cabinet Modules

## System overview

### Design

SINAMICS S120 Motor Modules, chassis format and Cabinet Modules can also be used as a braking module, if, instead of a motor, a 3-phase braking resistor is connected.

For more detailed information on this topic, please refer to the [SINAMICS Low Voltage Engineering Manual](#).

#### System structure

Line Modules are coupled with the various Motor Modules by means of prefabricated busbar sets with different current carrying capacities.

All standard busbars, as well as electronics components, are protected against environmental influences. This is achieved through the use of nickel-plated copper bars and painted modules throughout.

A special, standard auxiliary power supply system supplies the individual Cabinet Modules with the required auxiliary voltages for the power components, fans and 24 V loads.

These voltages are preferably generated using an auxiliary power supply module. Additional supply possibilities are available using the **K76** option (auxiliary power supply generation in the Line Connection Module) or using an external supply in the auxiliary power supply system.

The auxiliary power supply system comprises an auxiliary power supply module with two terminal blocks and a 24 V DC fuse as well as the required connecting cables. It is supplied completely assembled and ready to operate. Only the cable connections to the adjacent Cabinet Module must be established on-site.

Communication between the Control Unit, power units and other active SINAMICS components is realized via DRIVE-CLiQ connections.

DRIVE-CLiQ is an internal serial interface of the drive that enables fast and easy configuration of the complete drive line-up with prefabricated cables in varying lengths.

The Cabinet Modules can be optionally supplied in pre-configured transport units up to a total length of 2400 mm. This option is recommended in particular for Line Modules together with Line Connection Modules since, in this case, the Line Connection Module must be equipped with a pre-charging DC link or line reactors (depending on the type of Line Module), in addition to the electrical interface (busbar). Transport units enable the various devices to be quickly and easily assembled on-site.

#### Varnished PCBs

The following drive units are equipped as standard with varnished PCBs:

- Chassis format units
- Control Units
- Sensor Modules
- Terminal Modules
- Advanced Operator Panel (AOP30)

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

#### Nickel-plated busbars

All of the copper busbars used in the converter cabinets are nickel-plated in order to achieve the best possible immunity to environmental effects. Further, the bare copper connections do not have to be cleaned for customer connections.

**Note:** For technical reasons, some parts of the copper busbars are not nickel-plated for some of the options.

#### Degrees of protection

The EN 60529 standard covers the protection of electrical equipment by means of housings, covers or equivalent, and includes:

- Protection of persons against accidental contact with live or moving parts within the housing and protection of the equipment against the ingress of solid foreign matter (touch protection and protection against ingress of solid foreign bodies)
- Protection of the equipment against the ingress of water (water protection)
- Abbreviations for the internationally agreed degrees of protection

The degrees of protection are specified by abbreviations comprising the code letters IP and two digits.

Degree of protection	First code number (touch protection and protection against foreign bodies)	Second code number (protection of the equipment against the ingress of water)
<b>IP20</b> (Standard)	Protection against solid foreign bodies diameter $\geq 12.5$ mm	No water protection
<b>IP21</b> (Option <b>M21</b> )	Protection against solid foreign bodies diameter $\geq 12.5$ mm	Protected against drip water Vertically falling water drops shall not have a harmful effect.
<b>IP23</b> (Option <b>M23</b> )	Protection against solid foreign bodies diameter $\geq 12.5$ mm	Protected against spray water Water sprayed on both sides of the vertical at an angle of up to $60^\circ$ shall not have a harmful effect.
<b>IP43</b> (Option <b>M43</b> )	Protection against solid foreign bodies diameter $\geq 1$ mm	Protected against spray water Water sprayed on both sides of the vertical at an angle of up to $60^\circ$ shall not have a harmful effect.
<b>IP54</b> (Option <b>M54</b> )	Dust protected Ingress of dust is not totally prevented, but dust must not be allowed to enter in such quantities that the functioning or safety of the equipment is impaired.	Protected against splash water Water splashing onto the enclosure from any direction shall not have a harmful effect.

Cabinet Modules fulfill the criteria for degree of protection IP20 as standard. The other degrees of protection outlined here are available as an option.

**Function****Communication with higher-level control and customer terminal block**

As customer interface to the control system, as standard there is a PROFIBUS interface at the CU320-2 DP Control Unit or a PROFINET interface at the CU320-2 PN Control Unit.

The inputs and outputs available as standard at the customer terminal block -X55 are easy to access and easy to connect.

For additional information, please refer to the [SINAMICS Low Voltage Engineering Manual](#).

**Open-loop and closed-loop control functions**

SINAMICS S120 has a high-dynamic vector control with speed and current control – with and without speed actual value feedback.

**Software and protective functions**

The software functions available as standard are described below:

Software and protective functions	Description
<b>Setpoint input</b>	The setpoint can be input both internally and externally. It is applied internally as a fixed setpoint, motorized potentiometer setpoint or jog setpoint and externally via the communications interface or an analog input on the customer terminal block. The internal fixed setpoint and the motorized potentiometer setpoint can be switched over or adjusted using control commands from any interface.
<b>Motor identification</b>	The automatic motor identification function makes commissioning faster and easier and optimizes closed-loop control of the drive.
<b>Ramp-function generator</b>	A user-friendly ramp-function generator with separately adjustable ramp-up and ramp-down times, together with adjustable rounding times in the lower and upper speed ranges, allows the drive to be smoothly accelerated and braked. This results in a good speed control response and plays its role in reducing the stress on the mechanical system. The down ramp can be parameterized separately for a quick stop.
<b>V<sub>dc max</sub> controller</b>	The V <sub>dc max</sub> controller automatically prevents overvoltages in the DC link if the down ramp is too short, for example. This may also extend the set ramp-down time. <i>Comment:</i> This function only makes sense for single-axis applications.
<b>Kinetic buffering (KIP)</b>	For brief line supply failures, the kinetic energy of the rotating drive is used to buffer the DC link and therefore prevents fault trips. The drive converter remains operational as long as the drive can provide regenerative energy as a result of its motion and the DC link voltage does not drop below the shutdown threshold. When the line supply recovers within this time, the drive is again bumplessly accelerated up to its setpoint speed.
<b>Automatic restart</b>	The automatic restart switches the drive on again when the power is restored after a power failure, and ramps up to the current speed setpoint.
<b>Flying restart</b>	The flying restart function allows the converter to be switched to a motor that is still turning.
<b>Technology controller</b>	Using the technology controller (PID controller) function module, level or flow controls and complex tension controls can be implemented, for example. The existing D component can act both on the system deviation as well as on the actual value (factory setting). The P, I, and D components are separately set.
<b>Free function blocks</b>	Using the freely programmable function blocks, it is easy to implement logic and arithmetic functions for controlling the SINAMICS drive. The blocks can be programmed by means of an operator panel or the STARTER commissioning tool.
<b>Drive Control Chart (DCC)</b>	Drive Control Chart (DCC) is an additional tool for the easy configuration of technological functions for SINAMICS. The block library contains a large selection of control, arithmetic and logic blocks as well as extensive open-loop and closed-loop control functions. 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. DCC is an add-on to the STARTER commissioning tool (→ Tools and engineering).
<b>I<sup>2</sup>t detection for motor protection</b>	A motor model stored in the converter software calculates the motor temperature based on the current speed and load. More exact sensing of the temperature, which also takes into account the influence of the ambient temperature, is possible by means of direct temperature sensing using KTY84 sensors in the motor winding.
<b>Motor temperature evaluation</b>	Motor protection by evaluating a KTY84, PTC or Pt100 temperature sensor. When a KTY84 temperature sensor is connected, the limit values can be set for alarm or shutdown. When a PTC thermistor is connected, the system reaction to triggering of the thermistor (alarm or shutdown) can be defined.
<b>Motor blocking protection</b>	A blocked motor is detected and protected against thermal overloading by a fault trip.

**Power unit protection**

Power unit protection	Description
<b>Ground fault monitoring at the output</b>	A ground fault at the output end is detected by an aggregate current monitor and results in shutdown in grounded-neutral systems.
<b>Electronic short-circuit protection at the output</b>	A short-circuit at the output (e.g. at the converter output terminals, in the motor cable or in the motor terminal box) is detected and the converter shuts down with a "fault".
<b>Thermal overload protection</b>	An alarm is issued first when the overtemperature threshold responds. If the temperature continues to rise, the unit either shuts down or independently adjusts the pulse frequency or output current so that thermal load is reduced. Once the cause of the fault has been eliminated (e.g. cooling has been improved), the original operating values are automatically resumed.

## System overview

## Function

*Safety Integrated functions*

The integrated safety functions of SINAMICS provide highly-effective application-oriented protection for personnel and machinery. The Safety Integrated functions are implemented electronically and therefore offer short response times in comparison to solutions with externally implemented monitoring functions.

The trend toward greater complexity and increasing modularity of machines is increasingly seeing a shift in safety functions away from the classical central safety functions (for example, shutdown of the complete machine using a main switch) and into the machine control system and the drives. Frequently, this also significantly increases the productivity. This is because, for instance, equipping times can be reduced and during these equipping times, depending on the machine type, other parts can still continue to produce.

Integrated safety functions act much faster than those of a conventional design. The safety of a machine is increased further with Safety Integrated. Furthermore, thanks to the faster method of operation, safety measures controlled by integrated safety systems are perceived as less of a hindrance by the machine operator, therefore significantly reducing the motivation to consciously bypass safety functions.

The safety functions in the device and communication via PROFIsafe have already been certified. This simplifies configuring the safety functions and especially the acceptance of the plant or system by an authorized testing body when compared to safety solutions made up of individual safety components.

Legal framework

Machine and plant builders must ensure that their machines or plants neither present risks due to electric shock, heat or radiation nor due to functional faults. In Europe, for example, compliance with the machinery directive is legally stipulated by the EU industrial safety directive.

In order to ensure compliance with this directive, it is recommended that the corresponding harmonized European standards are applied. This initiates the assumption of conformity and gives manufacturers and operators the legal security when complying with both national regulations and EU directives. The machine manufacturer uses the CE marking to document the compliance with all relevant directives and regulations in the free movement of goods.

Safety-related standards

Functional safety is specified in various standards. EN ISO 12100 and EN ISO 14121-1, for example, are concerned with the design and risk assessment of machines. EN 62061 (only applicable for electrical and electronic control systems) and EN ISO 13849-1 (previously EN 954-1) define the functional and safety-related requirements of control systems with relevance to safety.

The above-mentioned standards define different safety requirements that the machine has to satisfy in accordance with the risk, frequency of a dangerous situation, probability of occurrence and the opportunities for recognizing impending danger.

- EN 954-1: Categories B, 1 ... 4 (from the end of 2011 will be replaced by EN ISO 13849-1)
- EN ISO 13849-1: Performance Level PL a ... e
- EN 62061: Safety Integrity Level SIL 1 ... 3

Safety functions integrated in the drive with SINAMICS

The safety functions integrated in SINAMICS satisfy the requirements of

- Category 3 according to EN 954-1 (from the end of 2011 will be replaced by EN ISO 13849-1)
- Safety Integrity Level (SIL) 2 according to EN 61508
- Performance Level (PL) d according to EN ISO 13849-1

In addition, the Safety Integrated functions of SINAMICS are generally certified by independent institutes. An up-to-date list of certified components is available on request from your local Siemens office.

## Function

### Safety Basic Functions and Safety Extended Functions

The Safety Integrated functions of the SINAMICS drive system are subdivided into what are known as Safety Basic Functions and Safety Extended Functions (terminology according to IEC 61800-5-2):

#### • **Basic Functions**

- Safe Torque Off (STO)
- Safe Stop 1 (SS1, time-controlled)
- Safe Brake Control (SBC)

The Safety Basic functions are included in the standard scope of delivery of the drive and can be used without requiring any additional license. The user can activate these functions at any time. An encoder is not required for their use.

The Safety Basic Functions are controlled as follows:

- Via terminals at the Control Unit and at the power unit
- Via PROFIBUS or PROFINET with PROFIsafe profile (from version 3 (last position of the Order No.  $\geq 3$ ) and Drives SW Version V2.6 SP2)

#### • **Extended Functions**

- Safe Torque Off (STO)
- Safe Stop 1 (SS1, time-controlled and acceleration controlled)
- Safe Stop 2 (SS2)
- Safe Operating Stop (SOS)
- Safely-Limited Speed (SLS)
- Safe Speed Monitor (SSM)
- Safe Direction (SDI)

Safety Extended Functions require a safety license depending on the axes. Depending on the control, additional DRIVE-CLiQ components are required.

**Note:** For chassis format units (chassis units and Cabinet Modules), Extended Functions require a sine-cosine encoder and therefore a SMC20 Sensor Module Cabinet-Mounted to evaluate the encoder signals (option **K48** for SINAMICS S120 Cabinet Modules).

The Safety Extended Functions are controlled as follows:

- Via the TM54F Terminal Module
- Via PROFIBUS or PROFINET with the PROFIsafe profile

Extended Functions are available for SINAMICS S120 Motor Modules, booksize and chassis formats from version 3 (last position of the Order No.  $\geq 3$ ).

The Safety Integrated functions currently available in SINAMICS S120 are subsequently described in more detail (terms as defined in IEC 61800-5-2):

### Safe Torque Off (STO)

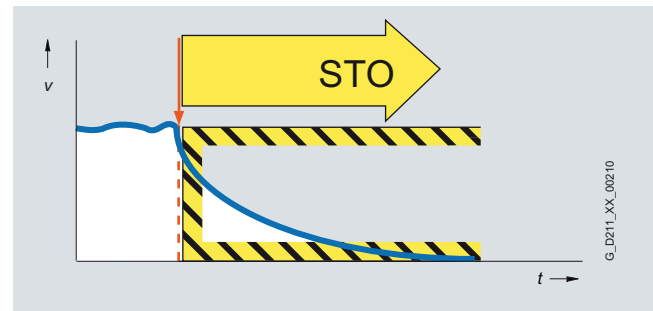
#### Function description

This function prevents unexpected starting according to EN 60204-1 Section 5.4. Safe Torque Off disables the control of the power unit, preventing a potentially hazardous torque (corresponds to Stop Category 0 according to EN 60204-1). The drive is reliably torque-free. This state is monitored internally in the drive.

Under Extended Functions, STO can also be controlled via the TM54F Terminal Module or PROFIsafe.

#### Application, customer benefits

STO has the immediate effect that the drive cannot supply any torque-generating energy. STO can be used wherever the drive will naturally reach a standstill due to load torque or friction in a sufficiently short time or when "coasting down" of the drive will not have any relevance for safety.





# SINAMICS S120 Cabinet Modules

## System overview

### Function

#### Safe Brake Control (SBC)

##### Function description

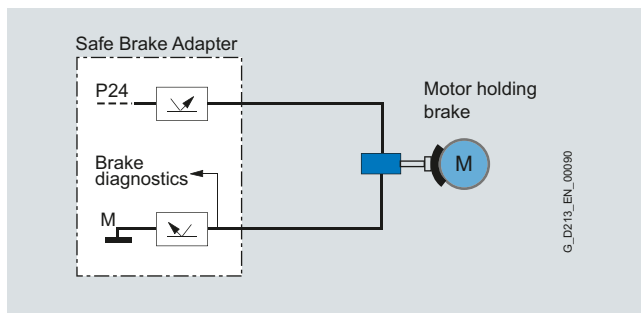
The Safe Brake Control SBC is used to control holding brakes, which are active in the no-current state, e.g. motor holding brakes (actuated using spring force). The brake is controlled through two channels in a safety-relevant fashion.

Safe Brake Control is executed when activating the operational brake control, Safe Torque Off function and when safety monitoring functions respond, which cause the power unit to be safely inhibited.

- **Note 1:** The Safe Brake Control does not detect mechanical faults in the brake, for example worn brake pads.
- **Note 2:** For Motor Modules, Booksize Cabinet Kits format, the terminals for the motor brake are integrated. For the chassis format, an additional Safe Brake Adapter (SBA) is required (option **K88** or **K89**, for a description see SINAMICS S120 Chassis Format Units, Supplementary system components).

##### Application, customer benefits

In conjunction with STO and SS1, SBC can also be activated. After switching off the torque-generating energy, SBC offers the possibility to safely control a holding brake at the motor; for example, to prevent hanging/suspended axes from sagging.



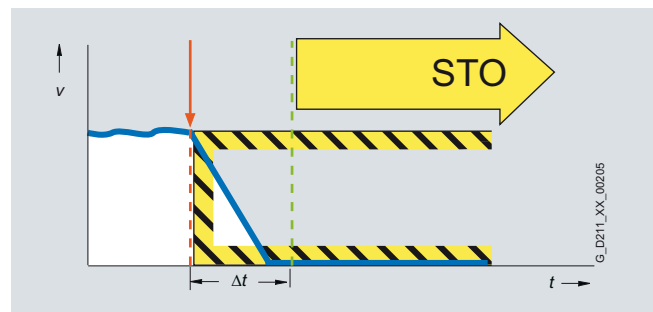
#### Safe Stop 1 (SS1, time-controlled, without encoder; Basic Safety Function)

##### Function description

The Safe Stop 1 function can safely stop the drive in accordance with EN 60204-1, Stop Category 1. When the SS1 function is selected, the drive independently brakes along a quick stop ramp (OFF3) and Safe Torque Off and Safe Brake Control (if enabled) are activated when the selected safety delay time has expired.

##### Application, customer benefits

When activating the stop function, if the drive does not come quickly enough to a standstill as a result of the load torque, then it can be actively braked by the converter. As a result of this integrated fast brake function, frequently it is possible to eliminate mechanical brakes which wear, or to reduce the load on them. This means that maintenance costs and stress on the machine can be reduced.



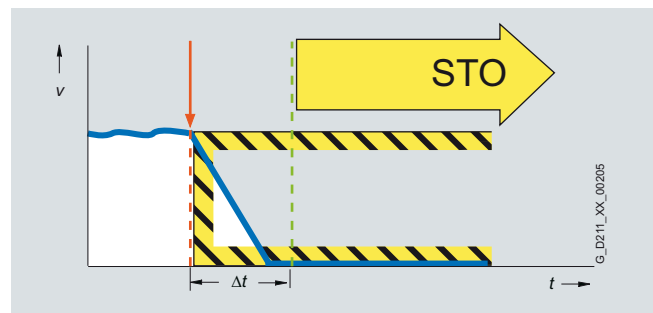
#### Safe Stop 1 (SS1, time and acceleration controlled, with sine-cosine encoder; Extended Safety Function)

##### Function description

The Safe Stop 1 function can safely stop the drive in accordance with EN 60204-1, Stop Category 1. When the SS1 function is selected, the drive independently brakes along a quick stop ramp, the deceleration is monitored (OFF3) and Safe Torque Off and Safe Brake Control (if enabled) are automatically activated when the selected safety delay time has expired.

##### Application, customer benefits

When activating the stop function, if the drive does not come quickly enough to a standstill as a result of the load torque, then it can be actively braked by the converter. As a result of this integrated fast brake function, frequently it is possible to eliminate mechanical brakes which wear, or to reduce the load on them. This means that maintenance costs and stress on the machine can be reduced.

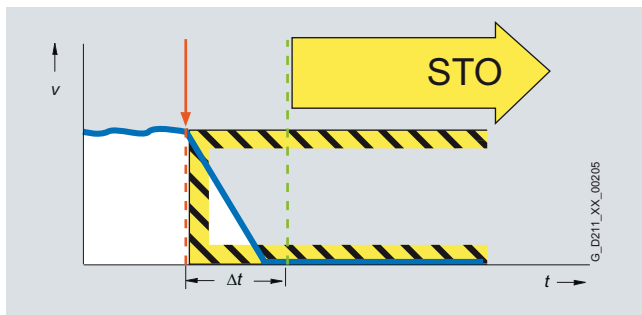


**Function****Safe Stop 2 (SS2, with sine-cosine encoder)**Function description

The Safe Stop 2 function can safely stop the drive in accordance with EN 60204-1, Stop Category 2. When the SS2 function is selected, the drive brakes autonomously along a quick stop ramp (OFF3). In contrast to SS1, the drive control remains operational afterwards, i.e. the motor can supply the full torque required to maintain the actual position. Standstill is safely monitored (Safe Operating Stop function, SOS).

Application, customer benefits

Just the same as for SS1, the drive is independently braked when the stop function is selected. Contrary to SS1, also at standstill, the drive can provide the full torque.

**Safe Stop 1 (SS1) and Safe Stop 2 (SS2) with Safe Acceleration Monitor (SAM, with sine-cosine encoder)**

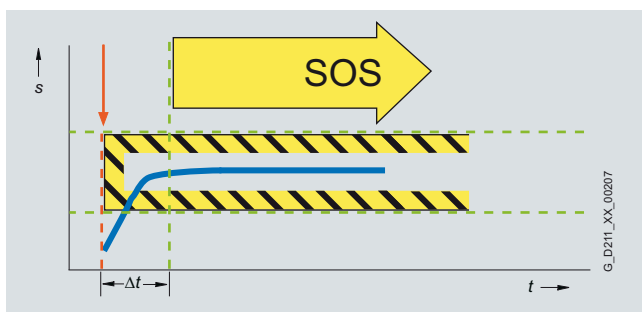
For the Extended Functions Safe Stop 1 (SS1) and Safe Stop 2 (SS2) with SAM, during braking, the acceleration is safely monitored (SAM) in order to identify faults already during the braking phase.

**Safe Operating Stop (SOS, with sine-cosine encoder)**Function description

The Safe Operating Stop function constitutes safe standstill monitoring. The drive control remains in operation. The motor can therefore deliver the full torque to hold the current position. The actual position is reliably monitored. In contrast to safety functions SS1 and SS2, the speed setpoint is not influenced autonomously. After SOS has been selected, the higher-level control must bring the drive to a standstill within a parameterized safe time  $\Delta t$  and then hold the position setpoint. After the time  $\Delta t$  has expired, SOS is activated and monitored to ensure that the actual standstill position is not left.

Application, customer benefits

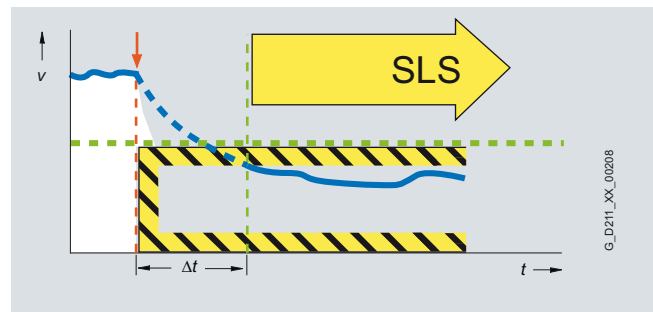
SOS is the ideal function for all those applications for which the machine or parts of the machine must be at a safe standstill for certain machining steps, but where the drive must also supply a holding torque.

**Safely-Limited Speed (SLS, with sine-cosine encoder)**Function description

Using the Safely-Limited Speed function, the drive is monitored against a parameterizable maximum velocity. Four different limit values can be activated. Just the same as for SOS, the speed setpoint is not independently influenced. After SLS has been selected, the higher-level control must bring the drive to below the selected velocity limit within a parameterizable time  $\Delta t$ .

Application, customer benefits

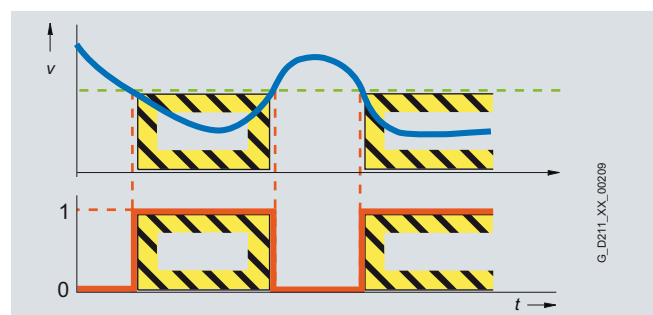
When setting-up many machines operating personnel must work on the machine as it rotates. This must either be done in steps, because the dangerous area must always be exited at each start, or alternatively, the operator works at the machine while it moves and is therefore exposed to an increased risk. When using the SLS function, a considerable amount of time can be saved – and it is still guaranteed that the operating personnel are safe. For this purpose, the drive velocity can be safely limited to a safe low level. The selectable wait time until SLS is activated allows the drive control to run-down the coordinated axes in a controlled fashion.

**Safe Speed Monitor (SSM, with sine-cosine encoder)**Function description

The Safe Speed Monitor function supplies a safety feedback signal (high active) if the drive falls below a selectable velocity limit value. Contrary to the functions described above, there is no drive-based fault response when the limit value is exceeded.

Application, customer benefits

The safety SSM feedback signal can be used in a higher-level control for safety-relevant responses. The higher-level safety control can flexibly respond to the signal, depending on the particular situation, as there is no drive-based response when the limit value is exceeded. For example, using the SSM signal, a protective door can be released after a non-hazardous velocity is reached.





# SINAMICS S120 Cabinet Modules

## System overview

### Function

#### Safe Direction (SDI, with sine-cosine encoder)

##### Function description

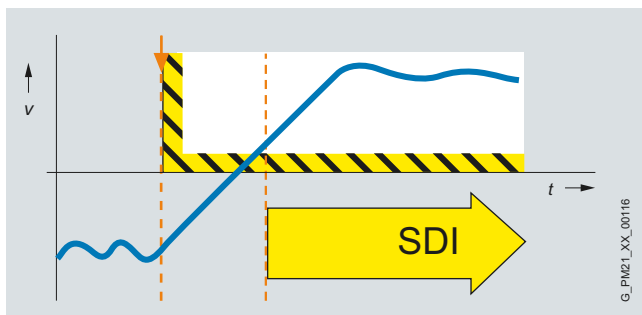
The SDI function ensures that the drive can only rotate in the selected direction.

Deviation from the direction of rotation currently being monitored is detected reliably and the configured drive-integrated fault reaction is initiated. It is possible to select which direction of rotation is to be monitored.

##### Application, customer benefits

The SDI function is used when the drive may only move in one direction. A typical application is to permit the operator access to a danger zone, as long as the machine is rotating in the safe direction, i.e. away from the operator. In this state, the operator can feed material into the work zone/remove material from the work zone without danger.

The function saves the use of external components e.g. speed monitors and the associated wiring. The release of a danger zone, while the machine is moving away from the operator, increases productivity. Without the SDI function, the machine must be safely stopped during material loading and removal.



#### PROFIsafe

PROFIsafe is an open communication standard, that facilitates standard and safety-relevant communication along one communication path (hard-wired or wireless). As a consequence, a second, separate bus system is not required. The telegrams that are sent are continually monitored to ensure safety-relevant communication. Possible errors such as telegrams that have been lost, repeated or received in the incorrect sequence etc. are avoided. This is done by consecutively numbering the telegrams in a safety-relevant fashion, monitoring their reception within a defined time and transferring an ID for transmitter and receiver of a telegram. Further, a cyclic redundancy check CRC (cyclic redundancy check) is performed.

SINAMICS 120 supports the PROFIsafe profile, based on PROFIBUS as well as on PROFINET.

#### Licensing

The Safety Integrated Basic Functions do not require a license.

A license is, however, required for each axis with safety functions in the case of Safety Integrated Extended Functions. It is irrelevant which safety functions are used and how many.

Licenses required for SINAMICS S120 Cabinet Modules can be ordered, depending on the axes, with safety options **K01** to **K05** for Motor Modules.

**Function**

An overview of the SINAMICS Safety Integrated functions plus their boundary conditions is provided in the following table:

Function	Control	Underlying function	Reaction to limit overshoot	Encoder required	License required
<b>Safety Basic Functions</b>					
<b>STO</b>	<ul style="list-style-type: none"> <li>• EP terminals on the power unit and digital input at the CU3xx/D4xx/CX32</li> <li>• PROFIsafe</li> <li>• Terminal module (24 V to 230 V), option <b>K82</b><sup>1)</sup></li> </ul>	SBC (if activated)	–	No	No
<b>SS1</b>	<ul style="list-style-type: none"> <li>• EP terminals on the power unit and digital input at the CU3xx/D4xx/CX32</li> <li>• PROFIsafe</li> <li>• Terminal module (24 V to 230 V), option <b>K82</b><sup>1)</sup></li> </ul>	STO, after a parameterized delay time has expired	STO	No	No
<b>SBC</b>	<ul style="list-style-type: none"> <li>• Via Safe Brake Adapter<sup>2)</sup></li> </ul>	–	–	No	No
<b>Safety Extended Functions</b>					
<b>STO</b>	<ul style="list-style-type: none"> <li>• Terminals on the TM54F<sup>3)</sup></li> <li>• PROFIsafe</li> </ul>	SBC (if activated)	–	Yes <sup>4)</sup>	Yes (each safety axis)
<b>SS1</b>	<ul style="list-style-type: none"> <li>• Terminals on the TM54F<sup>3)</sup></li> <li>• PROFIsafe</li> </ul>	STO is activated after the shutdown conditions have been fulfilled	STO	Yes <sup>4)</sup>	Yes (each safety axis)
<b>SBC</b>	<ul style="list-style-type: none"> <li>• Via Safe Brake Adapter</li> </ul>	–	–	Yes <sup>4)</sup>	Yes (each safety axis)
<b>SS2</b>	<ul style="list-style-type: none"> <li>• Terminals on the TM54F<sup>3)</sup></li> <li>• PROFIsafe</li> </ul>	STO is activated after the shutdown conditions have been fulfilled	STO	Yes <sup>4)</sup>	Yes (each safety axis)
<b>SLS</b>	<ul style="list-style-type: none"> <li>• Terminals on the TM54F<sup>3)</sup></li> <li>• PROFIsafe</li> </ul>	Up to four maximum speeds for operation can be parameterized	STO, SS1 or SOS (can be parameterized)	Yes <sup>4)</sup>	Yes (each safety axis)
<b>SOS</b>	<ul style="list-style-type: none"> <li>• Terminals on the TM54F<sup>3)</sup></li> <li>• PROFIsafe</li> </ul>	For closed-loop speed control: The position is monitored from standstill	STO or SS1 (can be parameterized)	Yes <sup>4)</sup>	Yes (each safety axis)
<b>SSM</b>	<ul style="list-style-type: none"> <li>• Terminals on the TM54F<sup>3)</sup></li> <li>• PROFIsafe</li> </ul>	Safe limit value monitoring in both directions of rotation, no independent drive response. A safety-relevant signal for further operation is generated.	–	Yes <sup>4)</sup>	Yes (each safety axis)
<b>SDI</b>	<ul style="list-style-type: none"> <li>• Terminals on the TM54F<sup>3)</sup></li> <li>• PROFIsafe</li> </ul>	–	STO, SS1 or SOS (can be parameterized)	Yes <sup>4)</sup>	Yes (each safety axis)

<sup>1)</sup> In addition for SINAMICS S120 Cabinet Modules and SINAMICS S150 Converter Cabinet Units.

<sup>2)</sup> Safe Brake Adapter has been released from firmware version 4.4.

<sup>3)</sup> For SINAMICS S120 Cabinet Modules and SINAMICS S150 Converter Cabinet Units as option **K87**.

<sup>4)</sup> The Safety Integrated Extended Functions require a sine-cosine encoder to sense the motor speed. Possible encoder evaluation units SMC20, SMI20, SME20/25/120/125.

# SINAMICS S120 Cabinet Modules

## System overview

### Function

#### *The principle of operation of Safety Integrated*

##### Two independent shutdown paths

There are two shutdown paths that are independent of one another.

All shutdown paths are low active. This therefore ensures that when a component fails or there is a wire break, then the system always goes into the safe state. When a fault is detected in the shutdown paths, the Safe Torque Off or Safe Stop 1 function (depending on the parameterization, also refer to the table on the Page 3/13) is activated and a restart is prevented.

##### Two-channel monitoring structure

All of the hardware and software functions important for Safety Integrated are implemented in two independent monitoring channels (e.g. shutdown paths, data management, data comparison). The safety-relevant data in the two monitoring channels is cyclically compared crosswise.

The monitoring functions in each monitoring channel are based on the principle that before a particular action, there must be a defined state, and after the action there must be a specific feedback. If this expectation is not fulfilled in a monitoring channel, then the drive is shutdown through two channels and the appropriate signal output.

##### Forced checking procedure using a test stop

In order to fulfill the requirements of EN ISO 13849-1 (previously EN 954-1) and IEC 61508 regarding early fault detection, the functions and the shutdown paths must be tested within a specific time period at least once to ensure that they are operating correctly. This must be realized either cyclically and manually or the test stop must be automatically initiated as part of the process. The test stop cycle is monitored, and after a specific time has been exceeded, an alarm is output.

A test stop does not require a power on. The acknowledgment is realized when deselecting the test stop request.

When the machine is operational, it can be assumed that there is no risk for personnel as a result of the appropriate safety equipment (e.g. protective doors). As a consequence, the user is only made aware of the forced checking procedure that is required using an alarm, and is requested to perform the forced checking procedure at the next possible opportunity.

Examples for performing the forced checking procedure:

- When the drives are stationary after switching-on the system
- Before opening the protective door
- In a specified rhythm (e.g. every 8 hours)
- In the automatic mode, time and event-triggered

**Technical data**

The most important directives and standards are listed below. These are used as basis for the SINAMICS S120 Cabinet Modules drive system and they must be carefully observed to achieve an EMC-compliant configuration that is safe both functionally and in operation.

**European directives**

<b>2006/95/EC</b>	Low-voltage directive: Legal guidelines of the EU member states concerning electrical equipment for use within specified voltage limits
<b>2004/108/EC</b>	EMC directive: Legal guidelines of the EU member states for electromagnetic compatibility

**European standards**

<b>EN 954-1 <sup>1)</sup></b>	Safety of machinery – safety-related parts of control systems; Part 1: General design principles
<b>EN ISO 13849-1</b>	Safety of machinery – safety-related parts of control systems; Part 1: General design guidelines (ISO 13849-1: 2006) (replaces EN 954-1)
<b>EN 60146-1-1</b>	Semiconductor converters – General requirements and line-commutated converters Part 1-1: Specification of basic requirements
<b>EN 60204-1</b>	Safety of machinery – Electrical equipment of machines; Part 1: General requirements
<b>EN 60529</b>	Degrees of protection provided by enclosures (IP code)
<b>EN 61508-1</b>	Functional safety of electrical/electronic/programmable electronic safety-related systems Part 1: General requirements
<b>EN 61800-2</b>	Variable-speed electric drives Part 2: General requirements – Rating specifications for low-voltage adjustable frequency AC power drive systems
<b>EN 61800-3</b>	Variable-speed electric drives Part 3: EMC requirements including specific test methods
<b>EN 61800-5-1</b>	Adjustable-speed electrical power drive systems Part 5: Safety requirements Main section 1: Electrical and thermal requirements
<b>EN 61800-5-2</b>	Adjustable speed electrical power drive systems Part 5-2: Safety requirements – Functional safety (IEC 61800-5-2:) 2007)

<sup>1)</sup> Will be replaced by EN ISO 13849-1 at the end of 2011.

# SINAMICS S120 Cabinet Modules

## System overview

### Technical data

#### General technical specifications

Electrical specifications	
<b>Line voltages</b>	380 ... 480 V 3 AC, ±10 % (-15 % < 1 min) 500 ... 690 V 3 AC, ±10 % (-15 % < 1 min)
<b>Line supply types</b>	Grounded TN/TT systems and non-grounded IT systems
<b>Line frequency</b>	47 ... 63 Hz
<b>Output frequency <sup>1)</sup></b>	
• Control type Servo	0 ... 650 Hz
• Control type Vector	0 ... 600 Hz
• Control type V/f	0 ... 600 Hz
<b>Line power factor Fundamental</b>	
• Basic Line Module	> 0.96
• Smart Line Module	> 0.96
• Active Line Module	Adjustable (factory-set to $\cos \varphi = 1$ )
<b>Efficiency</b>	
• Basic Line Module	> 99.0 %
• Smart Line Module	> 98.5 %
• Active Line Module	> 97.5 % (including Active Interface Module)
• Motor Module	> 98.5 %
<b>Overvoltage category</b>	III to EN 61800-5-1
<b>Control method</b>	Vector/servo control with and without encoder or V/f control
<b>Fixed speeds</b>	15 fixed speeds plus 1 minimum speed, parameterizable (in the default setting, 3 fixed setpoints plus 1 minimum speed are selectable using terminal block/PROFIBUS/PROFINET)
<b>Skipped speed ranges</b>	4, parameterizable
<b>Setpoint resolution</b>	0.001 rpm digital (14 bits + sign) 12 bit analog
<b>Braking operation</b>	With Active Line Modules and Smart Line Modules, four-quadrant operation as standard (energy recovery). With Basic Line Modules, single-quadrant operation as standard. Braking when the power fails using an optional braking module.
Mechanical specifications	
<b>Degree of protection</b>	IP20 (higher degrees of protection up to IP54 optional)
<b>Protection class</b>	I acc. to EN 61800-5-1
<b>Touch protection</b>	EN 50274/BGV A3 for the intended purpose
<b>Cabinet system</b>	Rittal TS 8, doors with double-barb lock, three-section base plates for cable entry
<b>Paint finish</b>	RAL 7035 (indoor requirements)
<b>Type of cooling</b>	Forced air cooling AF to EN 60146

<sup>1)</sup> Please note:

- The correlation between the maximum output frequency, pulse frequency and current derating. Higher output frequencies for specific configurations are available on request.
- The correlation between the minimum output frequency and permissible output current (current derating).

Information is provided in the [SINAMICS Low Voltage Engineering Manual](#).

## Technical data

Ambient conditions	Storage <sup>1)</sup>	Transport <sup>1)</sup>	Operation
<b>Ambient temperature</b>	-25 ... +55 °C	-25 ... +70 °C from <u>-40 °C</u> <sup>2)</sup> for 24 hours	0 ... +40 °C to +50 °C, see derating data
<b>Relative humidity</b> (condensation not permissible)	<u>5 ... 95 %</u> <sup>2)</sup> Class 1K4 acc. to EN 60721-3-1	5 ... 95 % at 40 °C Class 2K3 acc. to IEC 60721-3-2	5 ... 95 % <sup>2)</sup> Class 3K3 acc. to EN 60721-3-3
<b>Environmental class/harmful chemical substances</b>	Class 1C2 acc. to EN 60721-3-1	Class 2C2 acc. to EN 60721-3-2	Class 3C2 acc. to EN 60721-3-3
<b>Organic/biological influences</b>	Class 1B1 acc. to EN 60721-3-1	Class 2B1 acc. to EN 60721-3-2	Class 3B1 acc. to EN 60721-3-3
<b>Degree of pollution</b>	2 acc. to EN 61800-5-1	2 acc. to EN 61800-5-1	2 acc. to EN 61800-5-1
<b>Installation altitude</b>	Cabinet Modules, chassis format: up to 2000 m above sea level, without derating, > 2000 m, see characteristic curves/derating data For Motor Modules Booksize Cabinet Kit format as well as Central Braking Modules: up to 1000 m above sea level without derating, > 1000 m, see characteristic curves/derating data		
Mechanical stability	Storage <sup>1)</sup>	Transport <sup>1)</sup>	Operation
<b>Vibration load</b>	Class 1M2 acc. to EN 60721-3-1	Class 2M2 acc. to EN 60721-3-2	–
• Deflection	1.5 mm at <u>5</u> ... 9 Hz	3.1 mm at <u>5</u> ... 9 Hz	0.075 mm at 10 ... 58 Hz
• Acceleration	5 m/s <sup>2</sup> at > 9 ... 200 Hz	10 m/s <sup>2</sup> at > 9 ... 200 Hz	9.8 m/s <sup>2</sup> at > 58 ... 200 Hz
<b>Shock load</b>	Class 1M2 acc. to EN 60721-3-1	Class 2M2 acc. to EN 60721-3-2	Class 3M4 acc. to EN 60721-3-3
• Acceleration	40 m/s <sup>2</sup> at 22 ms	100 m/s <sup>2</sup> at 11 ms	100 m/s <sup>2</sup> at 11 ms
Compliance with standards			
<b>Conformances/approvals, according to</b>	CE (EMC Directive No. 2004/108/EC and Low-Voltage Directive No. 2006/95/EC)		
<b>Radio interference suppression</b>	SINAMICS drive converter systems are not designed for connection to the public network (first environment). Radio interference suppression is compliant with the EMC product standard for variable-speed drives EN 61800-3, "Second environment" (industrial line supplies). The equipment can cause electromagnetic interference when it is connected to the public network. However, if supplementary measures are taken (e.g. → line filter), it can also be operated in the "first environment".		

<sup>1)</sup> In transport packaging.

<sup>2)</sup> Deviations with respect to the specified class are underlined.

# SINAMICS S120 Cabinet Modules

## System overview

### Characteristic curves

#### Derating data for the chassis format

SINAMICS S120 Cabinet Modules and the associated system components are rated for an ambient temperature of 40 °C and installation altitudes up to 2000 m above sea level.

For ambient temperatures > 40 °C the output current must be reduced. Ambient temperatures above 50 °C are not permissible.

At installation altitudes > 2000 m above sea level, it must be taken into consideration that with increasing height, the air pressure decreases and therefore the air density. As a consequence, the cooling efficiency and the insulation capacity of the air also decrease.

Due to the reduced cooling efficiency, it is necessary, on one hand, to reduce the ambient temperature and on the other hand, to lower heat loss in the Cabinet Module by reducing the output current, whereby ambient temperatures lower than 40 °C may be offset to compensate.

The following table specifies the permissible output current as a function of the installation altitude and ambient temperature for the various degrees of protection (the permissible compensation between installation altitude and the ambient temperatures < 40 °C – air intake temperature at the entry to the Cabinet Module – has been taken into account in the specified values).

The values apply under the precondition that it is a guaranteed that the cooling air, as specified in the technical data, flows through the units as a result of the cabinet arrangement.

As additional measure for installation altitudes from 2000 m up to 5000 m, an isolating transformer is required in order to reduce transient overvoltages according to EN 60664-1. [For additional information, please refer to the SINAMICS Low Voltage Engineering Manual.](#)

Degree of protection	Installation altitude above sea level m	Current derating factor (as a % of the rated current) for an ambient/air intake temperature of						
		20 °C	25 °C	30 °C	35 °C	40 °C	45 °C	50 °C
IP20, IP21, IP23, IP43	0 ... 2000	100 %	100 %	100 %	100 %	100 %	93.3 %	86.7 %
	2001 ... 2500	100 %	100 %	100 %	100 %	96.3 %		
	2501 ... 3000	100 %	100 %	100 %	98.7 %			
	3001 ... 3500	100 %	100 %	100 %				
	3501 ... 4000	100 %	100 %	96.3 %				
	4001 ... 4500	100 %	97.5 %					
	4501 ... 5000	98.2 %						
IP54	0 ... 2000	100 %	100 %	100 %	100 %	93.3 %	86.7 %	80.0 %
	2001 ... 2500	100 %	100 %	100 %	96.3 %	89.8 %		
	2501 ... 3000	100 %	100 %	98.7 %	92.5 %			
	3001 ... 3500	100 %	100 %	94.7 %				
	3501 ... 4000	100 %	96.3 %	90.7 %				
	4001 ... 4500	97.5 %	92.1 %					
	4501 ... 5000	93.0 %						

Current-derating factors for Cabinet Modules as a function of the ambient/air intake temperature, the installation altitude and the degree of protection.

### Characteristic curves

Current derating for SINAMICS S120 Motors Modules, chassis format as a function of the pulse frequency

For additional information, please refer to the SINAMICS Low Voltage Engineering Manual.

To reduce motor noise or to increase output frequency, the pulse frequency can be increased relative to the factory setting. When the pulse frequency is increased, the derating factor of the output current must be taken into account. This derating factor must be applied to the currents specified in the technical data.

Motor Module, chassis format	Type rating at 400 V kW	Output current at 2 kHz A	Derating factor at the pulse frequency				
			2.5 kHz	4 kHz	5 kHz	7.5 kHz	8 kHz
<b>380 ... 480 V 3 AC</b>							
1TE32-1AA3	110	210	95 %	82 %	74 %	54 %	50 %
1TE32-6AA3	132	260	95 %	83 %	74 %	54 %	50 %
1TE33-1AA3	160	310	97 %	88 %	78 %	54 %	50 %
1TE33-8AA3	200	380	96 %	87 %	77 %	54 %	50 %
1TE35-0AA3	250	490	94 %	78 %	71 %	53 %	50 %

Derating factor of the output current as a function of the pulse frequency for units with a rated pulse frequency of 2 kHz

Motor Module, chassis format	Type rating at 400 V or 690 V kW	Output current at 1.25 kHz A	Derating factor at the pulse frequency				
			2.0 kHz	2.5 kHz	4 kHz	5 kHz	7.5 kHz
<b>380 ... 480 V 3 AC</b>							
1TE36-1AA3	315	605	83 %	72 %	64 %	60 %	40 %
1TE37-5AA3	400	745	83 %	72 %	64 %	60 %	40 %
1TE38-4AA3	450	840	87 %	79 %	64 %	55 %	40 %
1TE41-0AA3	560	985	92 %	87 %	70 %	60 %	50 %
1TE41-2AA3	710	1260	92 %	87 %	70 %	60 %	50 %
1TE41-4AA3	800	1405	97 %	95 %	74 %	64 %	50 %
<b>500 ... 690 V 3 AC</b>							
1TG28-5AA3	75	85	93 %	89 %	71 %	60 %	40 %
1TG31-0AA3	90	100	92 %	88 %	71 %	60 %	40 %
1TG31-2AA3	110	120	92 %	88 %	71 %	60 %	40 %
1TG31-5AA3	132	150	90 %	84 %	66 %	55 %	35 %
1TG31-8AA3	160	175	92 %	87 %	70 %	60 %	40 %
1TG32-2AA3	200	215	92 %	87 %	70 %	60 %	40 %
1TG32-6AA3	250	260	92 %	88 %	71 %	60 %	40 %
1TG33-3AA3	315	330	89 %	82 %	65 %	55 %	40 %
1TG34-1AA3	400	410	89 %	82 %	65 %	55 %	35 %
1TG34-7AA3	450	465	92 %	87 %	67 %	55 %	35 %
1TG35-8AA3	560	575	91 %	85 %	64 %	50 %	35 %
1TG37-4AA3	710	735	87 %	79 %	64 %	55 %	35 %
1TG38-1AA3	800	810	97 %	95 %	71 %	55 %	35 %
1TG38-8AA3	900	910	92 %	87 %	67 %	55 %	33 %
1TG41-0AA3	1000	1025	91 %	86 %	64 %	50 %	30 %
1TG41-3AA3	1200	1270	87 %	79 %	55 %	40 %	25 %

Derating factor of the output current as a function of the pulse frequency for units with a rated pulse frequency of 1.25 kHz

The following table lists the maximum achievable output frequency as a function of the pulse frequency:

Pulse frequency	Max. achievable output frequency
1.25 kHz	100 Hz
2.00 kHz	160 Hz
2.50 kHz	200 Hz
≥ 4.00 kHz	300 Hz



# SINAMICS S120 Cabinet Modules

## System overview

### Characteristic curves

#### Derating data for the booksize format

SINAMICS S120 Cabinet Modules with power units, booksize format and the associated system components are rated for an ambient temperature of 40 °C and installation altitudes up to 1000 m above sea level. If SINAMICS S120 Cabinet Modules with power units, booksize format are operated at ambient temperatures higher than 40 °C and/or installation altitudes higher than 1000 m above sea level, then the corresponding derating functions must be taken into account as a function of the ambient temperature and/or the installation altitude. [These derating factors are different from the derating factors for the chassis format power units and are listed in Catalog PM 21.](#)

#### Overload capability

SINAMICS S120 have an overload reserve e.g. to handle break-away torques. If larger surge loads occur, this must be taken into account when configuring. In drives with overload requirements, the appropriate base load current must, therefore, be used as a basis for the required load.

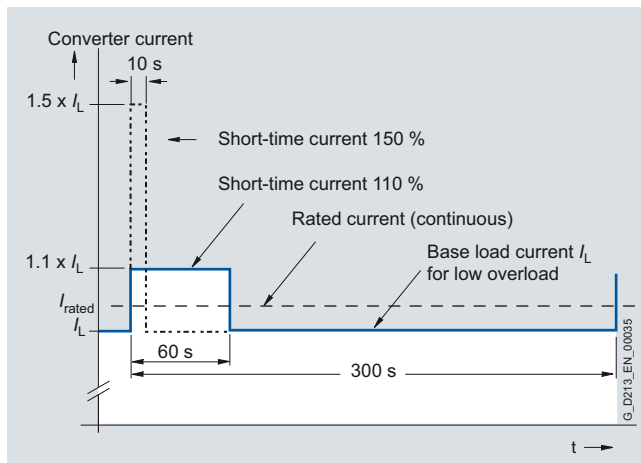
Permissible overload assumes that the drive converter is operated at its base load current before and after the overload occurs, based on a duty cycle duration of 300 s.

For short, repeating load cycles with significant load fluctuations within the load cycle, the appropriate sections in the SINAMICS Low Voltage Engineering Manual must be observed ([as PDF file on the CD-ROM provided with the catalog](#)).

#### Motor Modules chassis format

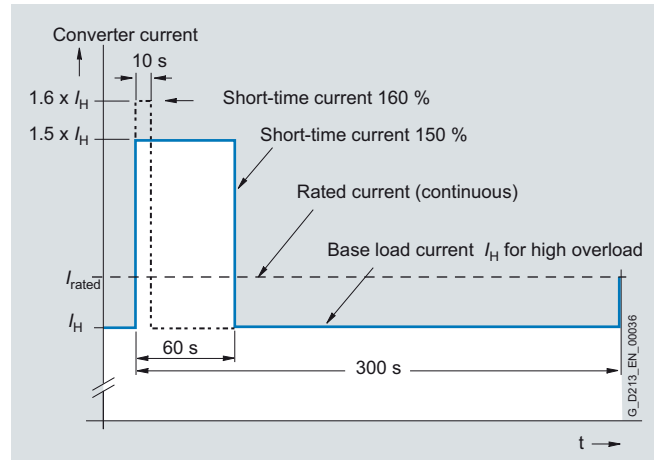
Motor Modules with power units in the chassis format can be configured on the basis of different base load currents.

The base load current for a low overload  $I_L$  is the basis for a duty cycle of 110 % for 60 s or 150 % for 10 s.



Low overload

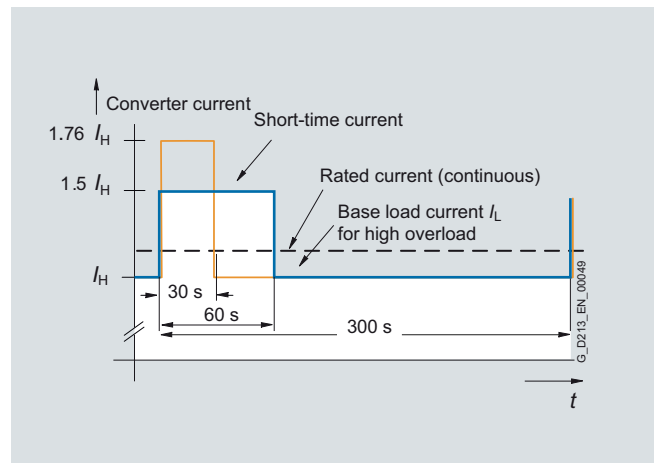
The base load current for a high overload  $I_H$  is the basis for a duty cycle of 150 % for 60 s or 160 % for 10 s.



High overload

#### Motor Modules booksize format

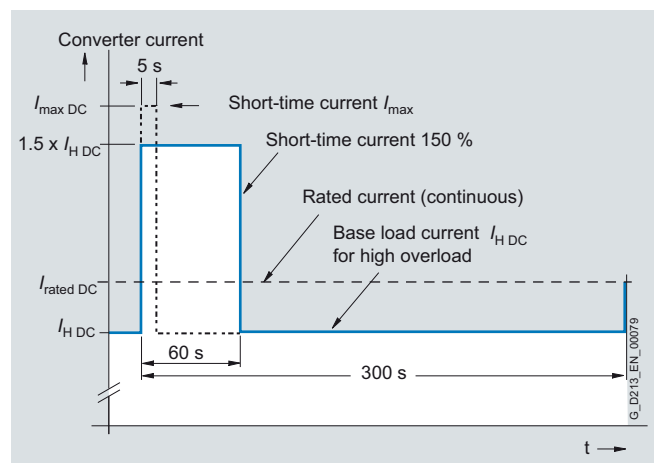
Motor Modules with power units in the booksize format have the following overload capabilities:



High overload

#### Line Modules chassis format

The base load current for a high overload  $I_{HDC}$  is the basis for a duty cycle of 150 % for 60 s or  $I_{max DC}$  for 5 s.



## Overview



Line Connection Modules (LCM) contain the line-side infeed with main circuit breaker and fuse switch disconnector or circuit breaker and provide the connection between the plant power system and the Line Modules.

Line Connection Modules are available for the following voltages and currents:

Line voltage	Rated infeed/regenerative feedback current
380 ... 480 V 3 AC	250 ... 3200 A
500 ... 690 V 3 AC	280 ... 3200 A

## Design

Different versions exist depending on the input current:

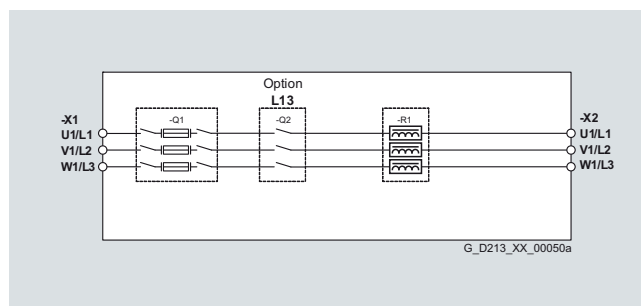
- Units  $\leq 800$  A include a main control switch with fuse switch disconnector
- Units  $> 800$  A include a fixed-mounted circuit breaker (a withdrawable circuit breaker is optionally possible)

When Line Connection Modules are ordered, the type of Line Module used must be specified:

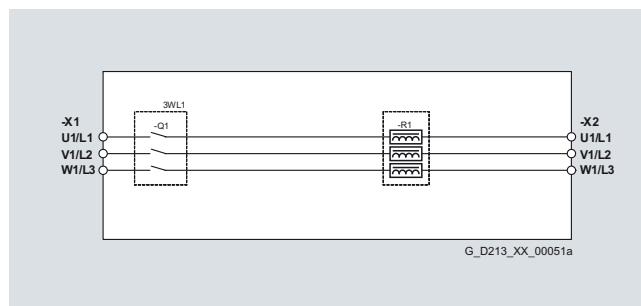
- for Basic Line Modules: Option **L43**
- for Smart Line Modules: Option **L44**
- for Active Line Modules: Option **L42**

When using a Basic Line Modules, a reactor is included in the scope of delivery, and when required, can be deselected (option **L22**).

For additional information, please refer to the SINAMICS Low Voltage Engineering Manual.



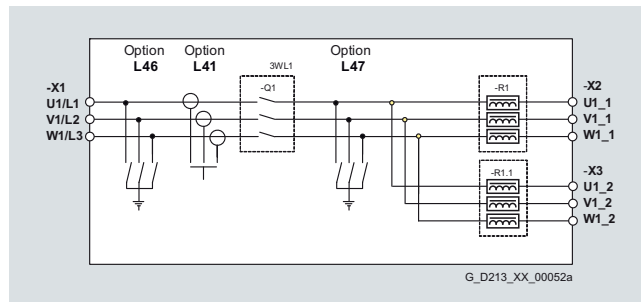
Connection example of a Line Connection Module for units  $\leq 800$  A to connect to Basic Line Modules, option **L43**, Option main contactor, order code **L13**



Example of connection of a Line Connection Module for units  $> 800$  A,  $< 2000$  A to connect to the Basic Line Modules, option **L43**

For input currents  $\geq 2000$  A, additional options are available:

- Grounding switch upstream of main circuit breaker: Option **L46**
- Current transformer upstream of main circuit breaker: Option **L41**
- Grounding switch downstream of main circuit breaker: Option **L47**



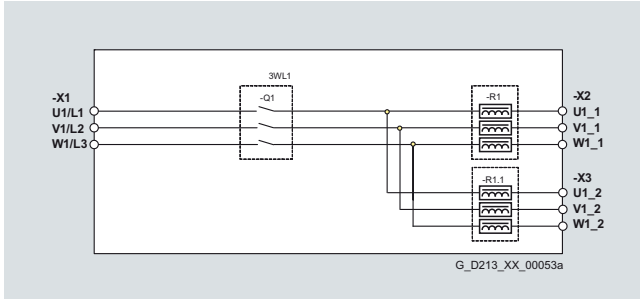
Example of connection of a Line Connection Module  $\geq 2000$  A

# SINAMICS S120 Cabinet Modules

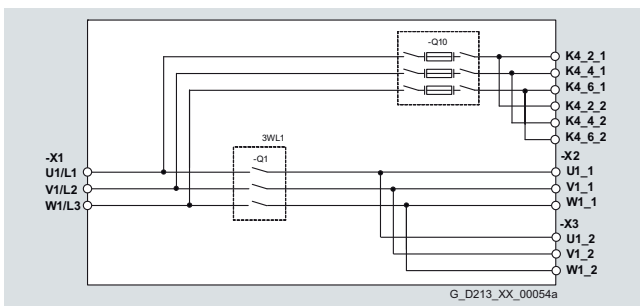
## Line Connection Modules

### Design

When Basic Line Modules that are fed via a common Line Connection Module are connected in parallel, line reactors are generally required. These are installed in the Line Connection Module.



Example of connection of a Line Connection Module  $\geq 2000$  A to connect to the Basic Line Modules, option **L43**



Example of connection of a Line Connection Module  $\geq 2000$  A to connect to the Active Line Modules in a parallel connection, option **L42**

### Selection and ordering data

Rated infeed/regenerative feedback current <sup>1)</sup> A	Line Connection Module Order No.
<b>Line voltage 380 ... 480 V 3 AC</b>	
250	<b>6SL3700-0LE32-5AA3</b>
380	<b>6SL3700-0LE34-0AA3</b>
600	<b>6SL3700-0LE36-3AA3</b>
770	<b>6SL3700-0LE38-0AA3</b>
1000	<b>6SL3700-0LE41-0AA3</b>
1250	<b>6SL3700-0LE41-3AA3</b>
1600	<b>6SL3700-0LE41-6AA3</b>
2000	<b>6SL3700-0LE42-0AA3</b>
2000	<b>6SL3700-0LE42-0BA3</b>
2500	<b>6SL3700-0LE42-5BA3</b>
3200	<b>6SL3700-0LE43-2BA3</b>
<b>Line voltage 500 ... 690 V 3 AC</b>	
280	<b>6SL3700-0LG32-8AA3</b>
380	<b>6SL3700-0LG34-0AA3</b>
600	<b>6SL3700-0LG36-3AA3</b>
770	<b>6SL3700-0LG38-0AA3</b>
1000	<b>6SL3700-0LG41-0AA3</b>
1250	<b>6SL3700-0LG41-3AA3</b>
1600	<b>6SL3700-0LG41-6AA3</b>
2000	<b>6SL3700-0LG42-0BA3</b>
2500	<b>6SL3700-0LG42-5BA3</b>
3200	<b>6SL3700-0LG43-2BA3</b>

#### Note:

When ordering Line Connection Modules, the option order code must be attached to the Order No. to indicate whether the Line Connection Module is to be connected to a Basic Line Module (option **L43**), to a Smart Line Module (option **L44**) or to an Active Line Module (option **L42**).

This information is required to ensure that the Line Connection Module is correctly equipped at the factory. This particularly applies to the busbar connection at the 3-phase end (3 AC), to any pre-charging circuits required and to the specified line reactors for Basic Line Modules.

When selecting and combining Cabinet Modules, the specified equipping and preparation of the Line Connection Modules is realized in the factory corresponding to the following assignment table. For all other combinations deviating from this, this is not the case. In such cases, the 3 AC busbar connections will have to be engineered and installed on site.

<sup>1)</sup> The current values listed are based on an ambient temperature (air intake temperature) of 40 °C.

## Integration

Line Connection Module		Basic Line Module		Smart Line Module		Active Line Module	
Rated infeed/ regenerative feed-back current <sup>1)</sup>		Rated input current		Rated infeed/ regenerative feed-back current		Rated infeed/ regenerative feed-back current	
A		A		A		A	
<b>Line voltage 380 ... 480 V 3 AC</b>							
250	6SL3700-0LE32-5AA3	–	–	–	–	210	6SL3730-7TE32-1BA3
380	6SL3700-0LE34-0AA3	–	–	–	–	260	6SL3730-7TE32-6BA3
600	6SL3700-0LE36-3AA3	365	6SL3730-1TE34-2AA3	463	6SL3730-6TE35-5AA3	380	6SL3730-7TE33-8BA3
		460	6SL3730-1TE35-3AA3			490	6SL3730-7TE35-0BA3
770	6SL3700-0LE38-0AA3	710	6SL3730-1TE38-2AA3	614	6SL3730-6TE37-3AA3	605	6SL3730-7TE36-1BA3
1000	6SL3700-0LE41-0AA3	–	–	883	6SL3730-6TE41-1AA3	840	6SL3730-7TE38-4BA3
1250	6SL3700-0LE41-3AA3	1010	6SL3730-1TE41-2AA3	1093	6SL3730-6TE41-3AA3	985	6SL3730-7TE41-0BA3
1600	6SL3700-0LE41-6AA3	1265	6SL3730-1TE41-5AA3	1430	6SL3730-6TE41-7AA3	1405	6SL3730-7TE41-4BA3
2000	6SL3700-0LE42-0AA3	1630	6SL3730-1TE41-8AA3	–	–	–	–
2000	6SL3700-0LE42-0BA3	2 × 935	6SL3730-1TE41-2BA3	2 × 817	6SL3730-6TE41-1BA3	2 × 936	6SL3730-7TE41-0BA3
			6SL3730-1TE41-2BC3		6SL3730-6TE41-1BC3		6SL3730-7TE41-0BC3
2500	6SL3700-0LE42-5BA3	2 × 1170	6SL3730-1TE41-5BA3	2 × 1011	6SL3730-6TE41-3BA3	–	–
			6SL3730-1TE41-5BC3		6SL3730-6TE41-3BC3		–
3200	6SL3700-0LE43-2BA3	2 × 1508	6SL3730-1TE41-8BA3	2 × 1323	6SL3730-6TE41-7BA3	2 × 1335	6SL3730-7TE41-4BA3
			6SL3730-1TE41-8BC3		6SL3730-6TE41-7BC3		6SL3730-7TE41-4BC3
<b>Line voltage 500 ... 690 V 3 AC</b>							
280	6SL3700-0LG32-8AA3	260	6SL3730-1TG33-0AA3	–	–	–	–
380	6SL3700-0LG34-0AA3	375	6SL3730-1TG34-3AA3	–	–	–	–
600	6SL3700-0LG36-3AA3	575	6SL3730-1TG36-8AA3	463	6SL3730-6TG35-5AA3	575	6SL3730-7TG35-8BA3
770	6SL3700-0LG38-0AA3	–	–	757	6SL3730-6TG38-8AA3	735	6SL3730-7TG37-4BA3
1000	6SL3700-0LG41-0AA3	925	6SL3730-1TG41-1AA3	–	–	–	–
1250	6SL3700-0LG41-3AA3	1180	6SL3730-1TG41-4AA3	1009	6SL3730-6TG41-2AA3	1025	6SL3730-7TG41-0BA3
1600	6SL3700-0LG41-6AA3	1580	6SL3730-1TG41-8AA3	1430	6SL3730-6TG41-7AA3	1270	6SL3730-7TG41-3BA3
2000	6SL3700-0LG42-0BA3	2 × 855	6SL3730-1TG41-1BA3	2 × 700	6SL3730-6TG38-8BA3	2 × 698	6SL3730-7TG37-4BA3
			6SL3730-1TG41-1BC3		6SL3730-6TG38-8BC3		6SL3730-7TG37-4BC3
			–		2 × 934		6SL3730-6TG41-2BA3
			–		6SL3730-6TG41-2BC3		6SL3730-7TG41-0BC3
2500	6SL3700-0LG42-5BA3	2 × 1092	6SL3730-1TG41-4BA3	–	–	2 × 1206	6SL3730-7TG41-3BA3
			6SL3730-1TG41-4BC3				6SL3730-7TG41-3BC3
3200	6SL3700-0LG43-2BA3	2 × 1462	6SL3730-1TG41-8BA3	2 × 1323	6SL3730-6TG41-7BA3	–	–
			6SL3730-1TG41-8BC3		6SL3730-6TG41-7BC3		–
<b>Entries</b>		Parallel circuit of two Line Modules connected to a Line Connection Module.					
<b>in italics:</b>		The required derating factors listed below are already included in the current values given above:					
		- 7.5 % for Basic Line Modules					
		- 7.5 % for Smart Line Modules					
		- 5.0 % for Active Line Modules					

<sup>1)</sup> The current values listed are based on an ambient temperature (air intake temperature) of 40 °C.

# SINAMICS S120 Cabinet Modules

## Line Connection Modules

### Technical data

Line voltage 380 ... 480 V 3 AC		Line Connection Modules						
		6SL3700-OLE32-5AA3	6SL3700-OLE34-0AA3	6SL3700-OLE36-3AA3	6SL3700-OLE38-0AA3	6SL3700-OLE41-0AA3	6SL3700-OLE41-3AA3	
<b>Infeed/regenerative feedback current</b>								
• Rated current $I_{NE}$	A	<b>250</b>	<b>380</b>	<b>600</b>	<b>770</b>	<b>1000</b>	<b>1250</b>	
<b>Current demand</b>								
• 24 V DC auxiliary power supply	A	–	–	–	–	–	–	
• 230 V 2 AC	A	–	–	–	–	1.07	1.07	
• 230 V 2 AC <sup>1)</sup>								
- Making current	A	3.6	3.6	3.6	10.8	0.5	0.5	
- Holding current	A	0.04	0.04	0.04	0.12	0.06	0.06	
<b>Power loss, max. <sup>2)</sup></b>								
• At 50 Hz 400 V								
- Option <b>L42/L44</b>	kW	0.115	0.19	0.31	0.39	0.18	0.29	
- Option <b>L43</b>	kW	–	–	0.675	0.74	–	0.787	
• At 60 Hz 460 V								
- Option <b>L42/L44</b>	kW	0.115	0.19	0.31	0.39	0.18	0.29	
- Option <b>L43</b>	kW	–	–	0.675	0.74	–	0.787	
<b>Cooling air requirement <sup>3)</sup></b>		m <sup>3</sup> /s	–	–	–	0.36	0.36	
<b>Sound pressure level <math>L_{pA}</math></b> (1 m) at 50/60 Hz		dB	–	–	–	68/70	68/70	
<b>Line supply connection</b> L1, L2, L3			2/M12	2/M12	2/M12	2/M12	5/M12 + 4/M16	5/M12 + 4/M16
• Conductor cross-section, max. (IEC)	mm <sup>2</sup>	2 × 150	2 × 150	4 × 240	8 × 240	8 × 240	8 × 240	
<b>PE/GND connection</b>			PE bar	PE bar	PE bar	PE bar	PE bar	
• Busbar cross-section	mm <sup>2</sup>	600	600	600	600	600	600	
• Conductor cross-section, max. (IEC)	mm <sup>2</sup>	240	240	240	240	240	240	
<b>Degree of protection</b>			IP20	IP20	IP20	IP20	IP20	
<b>Dimensions</b>								
• Width	mm	400	400	600	600	600	600	
• Height <sup>4)</sup>	mm	2200	2200	2200	2200	2200	2200	
• Depth	mm	600	600	600	600	600	600	
<b>Weight, approx.</b>								
• Option <b>L42/L44</b>	kg	210	230	310	340	450	470	
• Option <b>L43</b>	kg	–	–	360	420	–	570	
<b>Frame size</b>			FL	FL	GL	HL	JL	JL

<sup>1)</sup> Current demand of contactors/circuit breakers and fans with IP23, IP43, IP54 degree of protection (in combination with Basic Line Modules).

<sup>2)</sup> The specified power loss represents the maximum value at 100 % utilization. The value is lower under normal operating conditions.

<sup>3)</sup> For IP23, IP43 or IP54 degree of protection only (in combination with Basic Line Modules).

<sup>4)</sup> The cabinet height increases by 250 mm with IP21 degree of protection, and by 400 mm with IP23, IP43 and IP54 degrees of protection.

## Technical data

Line voltage 380 ... 480 V 3 AC		Line Connection Modules				
		6SL3700-OLE41-6AA3	6SL3700-OLE42-0AA3	6SL3700-OLE42-0BA3	6SL3700-OLE42-5BA3	6SL3700-OLE43-2BA3
		<i>Prepared for connection to Line Modules connected in parallel</i>				
<b>Infeed/regenerative feedback current</b>						
• Rated current $I_{NE}$	A	<b>1600</b>	<b>2000</b>	<b>2000</b>	<b>2500</b>	<b>3200</b>
<b>Current demand</b>						
• 24 V DC auxiliary power supply	A	–	–	–	–	–
• 230 V 2 AC	A	1.07	2.14	2.14	2.14	2.14
• 230 V 2 AC <sup>1)</sup>						
- Making current	A	0.5	0.5	0.5	0.5	0.5
- Holding current	A	0.06	0.06	0.06	0.06	0.04
<b>Power loss, max. <sup>2)</sup></b>						
• At 50 Hz 400 V						
- Option <b>L42/L44</b>	kW	0.41	0.6	0.6	0.95	0.95
- Option <b>L43</b>	kW	1.186	1.366	1.594	2.502	2.482
• At 60 Hz 460 V						
- Option <b>L42/L44</b>	kW	0.41	0.6	0.6	0.95	0.95
- Option <b>L43</b>	kW	1.186	1.366	1.594	2.502	2.482
<b>Cooling air requirement <sup>3)</sup></b>	m <sup>3</sup> /s	0.36	0.72	0.72	0.72	0.72
<b>Sound pressure level <math>L_{pA}</math></b> (1 m) at 50/60 Hz	dB	68/70	70/72	70/72	70/72	70/72
<b>Line supply connection</b> L1, L2, L3		5/M12 + 4/M16	5/M12 + 4/M16	5/M12 + 4/M16	5/M12 + 4/M16	5/M12 + 4/M16
• Conductor cross-section, max. (IEC)	mm <sup>2</sup>	8 × 240	10 × 240	10 × 240	10 × 240	10 × 300
<b>PE/GND connection</b>		PE bar	PE bar	PE bar	PE bar	PE bar
• Busbar cross-section	mm <sup>2</sup>	600	600	600	600	600
• Conductor cross-section, max. (IEC)	mm <sup>2</sup>	240	240	240	240	240
<b>Degree of protection</b>		IP20	IP20	IP20	IP20	IP20
<b>Dimensions</b>						
• Width	mm	600	1000	1000	1000	1000
• Height <sup>4)</sup>	mm	2200	2200	2200	2200	2200
• Depth	mm	600	600	600	600	600
<b>Weight, approx.</b>						
• Option <b>L42/L44</b>	kg	490	600	620	620	720
• Option <b>L43</b>	kg	650	760	820	900	1000
<b>Frame size</b>		JL	KL	KL	KL	LL

<sup>1)</sup> Current demand of contactors/circuit breakers and fans with IP23, IP43, IP54 degree of protection (in combination with Basic Line Modules).

<sup>2)</sup> The specified power loss represents the maximum value at 100 % utilization. The value is lower under normal operating conditions.

<sup>3)</sup> For IP23, IP43 or IP54 degree of protection only (in combination with Basic Line Modules).

<sup>4)</sup> The cabinet height increases by 250 mm with IP21 degree of protection, and by 400 mm with IP23, IP43 and IP54 degrees of protection.

# SINAMICS S120 Cabinet Modules

## Line Connection Modules

### Technical data

Line voltage 500 ... 690 V 3 AC		Line Connection Modules				
		6SL3700- OLG32-8AA3	6SL3700- OLG34-0AA3	6SL3700- OLG36-3AA3	6SL3700- OLG38-0AA3	6SL3700- OLG41-0AA3
<b>Infeed/regenerative feedback current</b>						
• Rated current $I_{NE}$	A	<b>280</b>	<b>380</b>	<b>600</b>	<b>770</b>	<b>1000</b>
<b>Current demand</b>						
• 24 V DC auxiliary power supply	A	–	–	–	–	–
• 230 V 2 AC	A	–	–	–	–	1.07
• 230 V 2 AC <sup>1)</sup>						
- Making current	A	3.6	3.6	3.6	10.8	0.5
- Holding current	A	0.04	0.04	0.04	0.2	0.06
<b>Power loss, max. <sup>2)</sup></b>						
• At 50 Hz 500/690 V						
- Option <b>L42/L44</b>	kW	0.125	0.19	0.31	0.39	0.18
- Option <b>L43</b>	kW	0.402	0.668	0.794	–	0.963
• At 60 Hz 575 V						
- Option <b>L42/L44</b>	kW	0.125	0.19	0.31	0.39	0.18
- Option <b>L43</b>	kW	0.402	0.668	0.794	–	0.963
<b>Cooling air requirement <sup>3)</sup></b>	m <sup>3</sup> /s	–	–	–	–	0.36
<b>Sound pressure level <math>L_{pA}</math></b> (1 m) at 50/60 Hz	dB	–	–	–	–	68/70
<b>Line supply connection</b> L1, L2, L3		2/M12	2/M12	2/M12	2/M12	5/M12 + 4/M16
• Conductor cross-section, max. (IEC)	mm <sup>2</sup>	2 × 150	2 × 150	4 × 240	8 × 240	8 × 240
<b>PE/GND connection</b>		PE bar	PE bar	PE bar	PE bar	PE bar
• Busbar cross-section	mm <sup>2</sup>	600	600	600	600	600
• Conductor cross-section, max. (IEC)	mm <sup>2</sup>	240	240	240	240	240
<b>Degree of protection</b>		IP20	IP20	IP20	IP20	IP20
<b>Dimensions</b>						
• Width	mm	400	600	600	600	600
• Height <sup>4)</sup>	mm	2200	2200	2200	2200	2200
• Depth	mm	600	600	600	600	600
<b>Weight, approx.</b>						
• Option <b>L42/L44</b>	kg	220	230	310	340	450
• Option <b>L43</b>	kg	260	310	400	–	650
<b>Frame size</b>		FL	FL	GL	HL	JL

<sup>1)</sup> Current demand of contactors/circuit breakers and fans with IP23, IP43, IP54 degree of protection (in combination with Basic Line Modules).

<sup>2)</sup> The specified power loss represents the maximum value at 100 % utilization. The value is lower under normal operating conditions.

<sup>3)</sup> For IP23, IP43 or IP54 degree of protection only (in combination with Basic Line Modules).

<sup>4)</sup> The cabinet height increases by 250 mm with IP21 degree of protection, and by 400 mm with IP23, IP43 and IP54 degrees of protection.

## Technical data

Line voltage 500 ... 690 V 3 AC		Line Connection Modules				
		6SL3700- OLG41-3AA3	6SL3700- OLG41-6AA3	6SL3700- OLG42-0BA3	6SL3700- OLG42-5BA3	6SL3700- OLG43-2BA3
		<i>Prepared for connection to Line Modules connected in parallel</i>				
<b>Infeed/regenerative feedback current</b>						
• Rated current $I_{NE}$	A	<b>1250</b>	<b>1600</b>	<b>2000</b>	<b>2500</b>	<b>3200</b>
<b>Current demand</b>						
• 24 V DC auxiliary power supply	A	–	–	–	–	–
• 230 V 2 AC	A	1.07	1.07	2.14	2.14	2.14
• 230 V 2 AC <sup>1)</sup>						
- Making current	A	0.5	0.5	0.5	0.5	0.5
- Holding current	A	0.06	0.06	0.06	0.06	0.06
<b>Power loss, max. <sup>2)</sup></b>						
• At 50 Hz 500/690 V						
- Option <b>L42/L44</b>	kW	0.29	0.41	0.6	0.6	0.95
- Option <b>L43</b>	kW	1.073	1.387	2.166	2.166	2.894
• At 60 Hz 575 V						
- Option <b>L42/L44</b>	kW	0.29	0.41	0.6	0.6	0.95
- Option <b>L43</b>	kW	1.073	1.387	2.166	2.166	2.894
<b>Cooling air requirement <sup>3)</sup></b>		m <sup>3</sup> /s	0.36	0.36	0.72	0.72
<b>Sound pressure level <math>L_{pA}</math></b> (1 m) at 50/60 Hz		dB	68/70	68/70	70/72	70/72
<b>Line supply connection</b> L1, L2, L3			5/M12 + 4/M16	5/M12 + 4/M16	5/M12 + 4/M16	5/M12 + 4/M16
• Conductor cross-section, max. (IEC)	mm <sup>2</sup>	8 × 240	8 × 240	10 × 240	10 × 240	10 × 300
<b>PE/GND connection</b>		PE bar	PE bar	PE bar	PE bar	PE bar
• Busbar cross-section	mm <sup>2</sup>	600	600	600	600	600
• Conductor cross-section, max. (IEC)	mm <sup>2</sup>	240	240	240	240	240
<b>Degree of protection</b>		IP20	IP20	IP20	IP20	IP20
<b>Dimensions</b>						
• Width	mm	600	600	1000	1000	1000
• Height <sup>4)</sup>	mm	2200	2200	2200	2200	2200
• Depth	mm	600	600	600	600	600
<b>Weight, approx.</b>						
• Option <b>L42/L44</b>	kg	470	490	600	620	720
• Option <b>L43</b>	kg	670	680	980	1000	1080
<b>Frame size</b>		JL	JL	KL	KL	LL

<sup>1)</sup> Current demand of contactors/circuit breakers and fans with IP23, IP43, IP54 degree of protection (in combination with Basic Line Modules).

<sup>2)</sup> The specified power loss represents the maximum value at 100 % utilization. The value is lower under normal operating conditions.

<sup>3)</sup> For IP23, IP43 or IP54 degree of protection only (in combination with Basic Line Modules).

<sup>4)</sup> The cabinet height increases by 250 mm with IP21 degree of protection, and by 400 mm with IP23, IP43 and IP54 degrees of protection.



# SINAMICS S120 Cabinet Modules

## Line Connection Modules

### Options

The table below lists the options available for Line Connection Modules  
(Details → [Description of the options](#)):

Available options	Order code	Rated current		
		≤ 800 A	800 ... 2000 A	≥ 2000 A
Auxiliary voltage generation in the LCM	<b>K76</b>	✓	✓	✓
Use in the first environment according to EN 61800-3, Category C2 (TN-TT line supplies with grounded neutral point)	<b>L00</b> <sup>1)</sup>	✓	✓	✓
Main contactor (for supply currents ≤ 800 A)	<b>L13</b>	✓	–	–
Scope of delivery without line reactor, only with option <b>L43</b> (for Basic Line Modules)	<b>L22</b>	✓	✓	–
Withdrawable circuit breaker in place of a fixed-mounted circuit breaker	<b>L25</b>	–	✓	✓
Current transformer upstream of main circuit breaker	<b>L41</b>	✓	✓	✓
Line Connection Module for Active Line Modules	<b>L42</b>	✓	✓	✓
Line Connection Module for Basic Line Modules	<b>L43</b>	✓	✓	✓
Line Connection Module for Smart Line Modules	<b>L44</b>	✓	✓	✓
EMERGENCY OFF pushbutton installed in the cabinet door	<b>L45</b>	✓	✓	✓
Grounding switch upstream of main circuit breaker	<b>L46</b>	–	–	✓
Grounding switch downstream of main circuit breaker	<b>L47</b>	–	–	✓
Cabinet anti-condensation heating	<b>L55</b>	✓	✓	✓
Insulation monitoring	<b>L87</b>	✓	✓	✓
Base 100 mm high, RAL 7022	<b>M06</b>	✓	✓	✓
Cable-marshalling space 200 mm high, RAL 7035	<b>M07</b>	✓	✓	✓
IP21 degree of protection	<b>M21</b>	✓	✓	✓
IP23 degree of protection (includes <b>M60</b> )	<b>M23</b>	✓	✓	✓
Side panel mounted at the left	<b>M27</b>	✓	✓	✓
IP43 degree of protection (includes <b>M60</b> )	<b>M43</b>	✓	✓	✓
IP54 degree of protection (includes <b>M60</b> )	<b>M54</b>	✓	✓	✓
Closed cabinet door, air intake from below through floor opening	<b>M59</b>	✓	✓	✓
Additional touch protection (included in <b>M23</b> , <b>M43</b> and <b>M54</b> )	<b>M60</b>	✓	✓	✓
EMC shield bus	<b>M70</b>	✓	✓	✓
DC busbar system ( $I_d = 1170$ A, 1 × 60 × 10 mm)	<b>M80</b>	✓	✓	✓
DC busbar system ( $I_d = 1500$ A, 1 × 80 × 10 mm)	<b>M81</b>	✓	✓	✓
DC busbar system ( $I_d = 1840$ A, 1 × 100 × 10 mm)	<b>M82</b>	✓	✓	✓
DC busbar system ( $I_d = 2150$ A, 2 × 60 × 10 mm)	<b>M83</b>	✓	✓	✓
DC busbar system ( $I_d = 2730$ A, 2 × 80 × 10 mm)	<b>M84</b>	✓	✓	✓
DC busbar system ( $I_d = 3320$ A, 2 × 100 × 10 mm)	<b>M85</b>	✓	✓	✓
DC busbar system ( $I_d = 3720$ A, 3 × 80 × 10 mm)	<b>M86</b>	✓	✓	✓
DC busbar system ( $I_d = 4480$ A, 3 × 100 × 10 mm)	<b>M87</b>	✓	✓	✓
Crane transport assembly (top-mounted)	<b>M90</b>	✓	✓	✓
Measuring instrument for line supply values; mounted in cabinet door (includes <b>L41</b> )	<b>P10</b>	✓	✓	✓
Measuring instrument for line supply values such as option <b>P10</b> , with PROFIBUS connection	<b>P11</b>	✓	✓	✓
Special paint finish for cabinet	<b>Y09</b>	✓	✓	✓
Factory assembly as transport units	<b>Y11</b>	✓	✓	✓
One-line label for system identification, 40 × 80 mm	<b>Y31</b>	✓	✓	✓
Two-line label for system identification, 40 × 180 mm	<b>Y32</b>	✓	✓	✓
Four-line label for system identification, 40 × 180 mm	<b>Y33</b>	✓	✓	✓

<sup>1)</sup> For Basic Line Modules for cable lengths < 100 m.  
Not for a parallel connection of Line Modules to a common Line Connection Module.

## Options

Available options (continued)	Order code	Rated current		
		≤ 800 A	800 ... 2000 A	≥ 2000 A
Customer documentation (circuit diagram, terminal diagram, layout diagram) in DXF format	<b>D02</b>	✓	✓	✓
Preliminary version of customer documentation in PDF format	<b>D14</b>	✓	✓	✓
Documentation in English/French	<b>D58</b>	✓	✓	✓
Documentation in English/Spanish	<b>D60</b>	✓	✓	✓
Documentation in English/Italian	<b>D80</b>	✓	✓	✓
Without Operating Instructions	<b>D99</b>	✓	✓	✓
Visual acceptance	<b>F03</b>	✓	✓	✓
Function test without connected motor	<b>F71</b>	✓	✓	✓
Insulation test	<b>F77</b>	✓	✓	✓
Customer-specific acceptance inspections (on request)	<b>F97</b>	✓	✓	✓
Rating plate data in English/French	<b>T58</b>	✓	✓	✓
Rating plate data in English/Spanish	<b>T60</b>	✓	✓	✓
Rating plate data in English/Italian	<b>T80</b>	✓	✓	✓

## Option selection matrix for Line Connection Modules

Certain options can mutually exclude one another (options that are not involved are not shown).

✓	Possible combination
–	Combination not possible

## Electrical options

	K76	L13 <sup>1)</sup>	L25 <sup>2)</sup>	L41	L46 <sup>3)</sup>	L47 <sup>3)</sup>	P10	P11
<b>K76</b>		✓	✓	✓	–	✓	✓	✓
<b>L13 <sup>1)</sup></b>	✓		–	✓	–	–	✓	✓
<b>L25 <sup>2)</sup></b>	✓	–		✓	✓	✓	✓	✓
<b>L41</b>	✓	✓	✓		✓	✓	–	–
<b>L46 <sup>3)</sup></b>	–	–	✓	✓		✓	✓	✓
<b>L47 <sup>3)</sup></b>	✓	–	✓	✓	✓		✓	✓
<b>P10</b>	✓	✓	✓	–	✓	✓		–
<b>P11</b>	✓	✓	✓	–	✓	✓	–	

## Mechanical/electrical options

	L22	L42	L43	L44	M06	M07	M21	M23	M43	M54	M60	M90	Y11	Y31	Y32	Y33
<b>L22</b>		–	✓	–	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
<b>L42</b>	–		–	–	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
<b>L43</b>	✓	–		–	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
<b>L44</b>	–	–	–		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
<b>M06</b>	✓	✓	✓	✓		–	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
<b>M07</b>	✓	✓	✓	✓	–		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
<b>M21</b>	✓	✓	✓	✓	✓	✓		–	–	–	✓	✓	✓	✓	✓	✓
<b>M23</b>	✓	✓	✓	✓	✓	✓	–		–	–	– <sup>4)</sup>	✓	✓	✓	✓	✓
<b>M43</b>	✓	✓	✓	✓	✓	✓	–	–		–	– <sup>4)</sup>	✓	✓	✓	✓	✓
<b>M54</b>	✓	✓	✓	✓	✓	✓	–	–	–		– <sup>4)</sup>	✓	✓	✓	✓	✓
<b>M60</b>	✓	✓	✓	✓	✓	✓	✓	– <sup>4)</sup>	– <sup>4)</sup>	– <sup>4)</sup>		✓	✓	✓	✓	✓
<b>M90</b>	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		–	✓	✓	✓
<b>Y11</b>	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	–		✓	✓	✓
<b>Y31</b>	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		–	–
<b>Y32</b>	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	–		–
<b>Y33</b>	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	–	–	

<sup>1)</sup> Option, only for rated current ≤ 800 A.

<sup>2)</sup> Option, only for rated current > 800 A.

<sup>3)</sup> Option, only for rated current ≥ 2000 A.

<sup>4)</sup> Option **M60** is already included in **M23**, **M43** and **M54**.

# SINAMICS S120 Cabinet Modules

## Line Connection Modules

### Options

DC busbar system mechanical options (busbars between individual Cabinet Modules)

	M80	M81	M82	M83	M84	M85	M86	M87
M80		-	-	✓	-	-	-	-
M81	-		-	-	✓	-	✓	-
M82	-	-		-	-	✓	-	✓
M83	✓	-	-		-	-	-	-
M84	-	✓	-	-		-	✓	-
M85	-	-	✓	-	-		-	✓
M86	-	✓	-	-	✓	-		-
M87	-	-	✓	-	-	✓	-	

### Documentation

	D02	D14	D58	D60	D80	D99
D02		✓	✓	✓	✓	-
D14	✓		✓	✓	✓	-
D58	✓	✓		-	-	-
D60	✓	✓	-		-	-
D80	✓	✓	-	-		-
D99	-	-	-	-	-	

### Rating plate data

	T58	T60	T80
T58		-	-
T60	-		-
T80	-	-	

## Overview



Basic Line Modules (BLM) are compact line infeeds for two-quadrant operation, i.e. without regenerative feedback.

They are used when energy does not to be fed back into the network.

If regenerative conditions occur in the drive line-up, Braking Modules must be used because they convert the excess energy into heat in braking resistors.

Basic Line Modules are available for the following voltages and power ratings:

Line voltage	Rated power
380 ... 480 V 3 AC	200 ... 900 kW
500 ... 690 V 3 AC	250 ... 1500 kW

The power ratings can be increased by connecting up to four identical Basic Line Modules in parallel.

For an infeed with the Basic Line modules, depending on the line short-circuit power, a line reactor must be provided at the connection point. [For additional information, please refer to the SINAMICS Low Voltage Engineering Manual](#). This reactor is available as standard in the Line Connection Module. However, it can be omitted if it is not required (option **L22**).

## Design

The Basic Line Modules are available in different frame sizes.

With frame sizes FB and GB, a fully controlled thyristor bridge is used to pre-charge the Basic Line Modules and connected Motor Modules. The thyristors normally operate with a trigger delay angle of 0°.

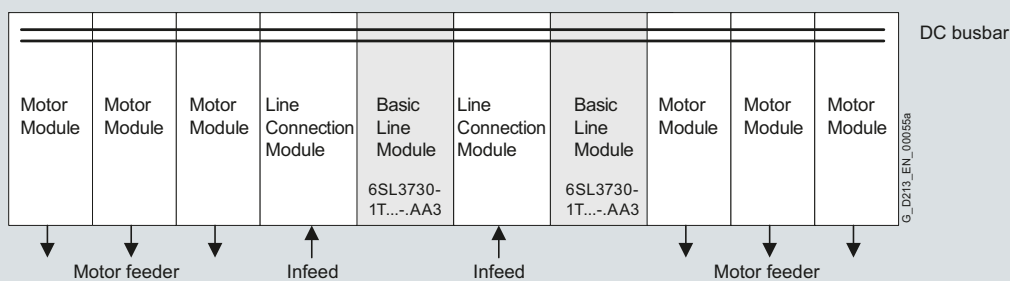
Basic Line Modules, frame size GD for 900 kW (400 V) or 1500 kW (690 V) include a diode bridge, and the DC link is pre-charged via a separate line-side pre-charging device that is located in the Line Connection Module (option **L43**, Line Connection Module for Basic Line Module).

### Parallel connection of Basic Line Modules to increase the power rating

Line Modules can be connected in parallel (relative to the line supply) in two ways for the purpose of creating drive line-ups with a higher power rating.

### Two Basic Line Modules supplied with power via two separate Line Connection Modules

With this arrangement, a Basic Line Module is supplied by a Line Connection Module and the Basic Line Modules are protected by fuses or circuit breakers (at  $I > 800$  A) in the Line Connection Module. A Basic Line Module is assigned to a Line Connection Module and is mechanically coupled. It is not necessary to mechanically directly couple both "groups" comprising Line Connection Module and Basic Line Module. Other modules can also be inserted in between.



# SINAMICS S120 Cabinet Modules

## Basic Line Modules

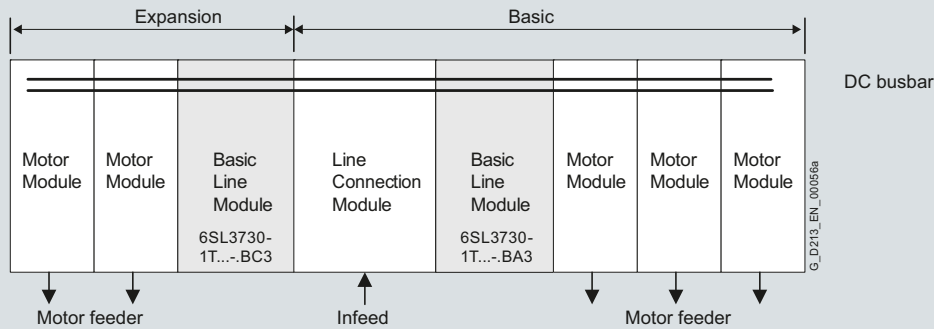
### Design

Two Basic Line Modules supplied with power via a single Line Connection Module

Basic Line Modules are available that can be operated on a single Line Connection Module. These can be connected to the left and right of the Line Connection Module. The power connections on the Basic Line Module on the left of the Line Connection Module are a mirror image (Order No. with "C" in the next to last position, example: 6SL3730-1T.41-.BC3), which results in a very compact design for the line infeed.

For additional information, please refer to the SINAMICS Low Voltage Engineering Manual.

These module versions feature integrated line-side fuses which are required because the circuit breaker in the Line Connection Module is not capable of providing selective protection for the Basic Line Modules. They are therefore 200 mm wider in each case than version 6SL3730-1T...-AA3.



#### Note:

If the Basic Line Modules are supplied with power via the same circuit breaker, line-side fuses are provided to ensure selective individual protection of the modules. This arrangement increases the cabinet width by 200 mm (dimension data in selection tables includes extra width).

Please note that only Basic Line Modules with exactly the same output rating may be connected in parallel. The potential for imbalances in current distribution means that a current derating

of 7.5 % applies; this must be taken into account when the modules are dimensioned.

A connection of the Basic Line Modules connected in parallel using DRIVE-CLiQ must be taken into consideration.

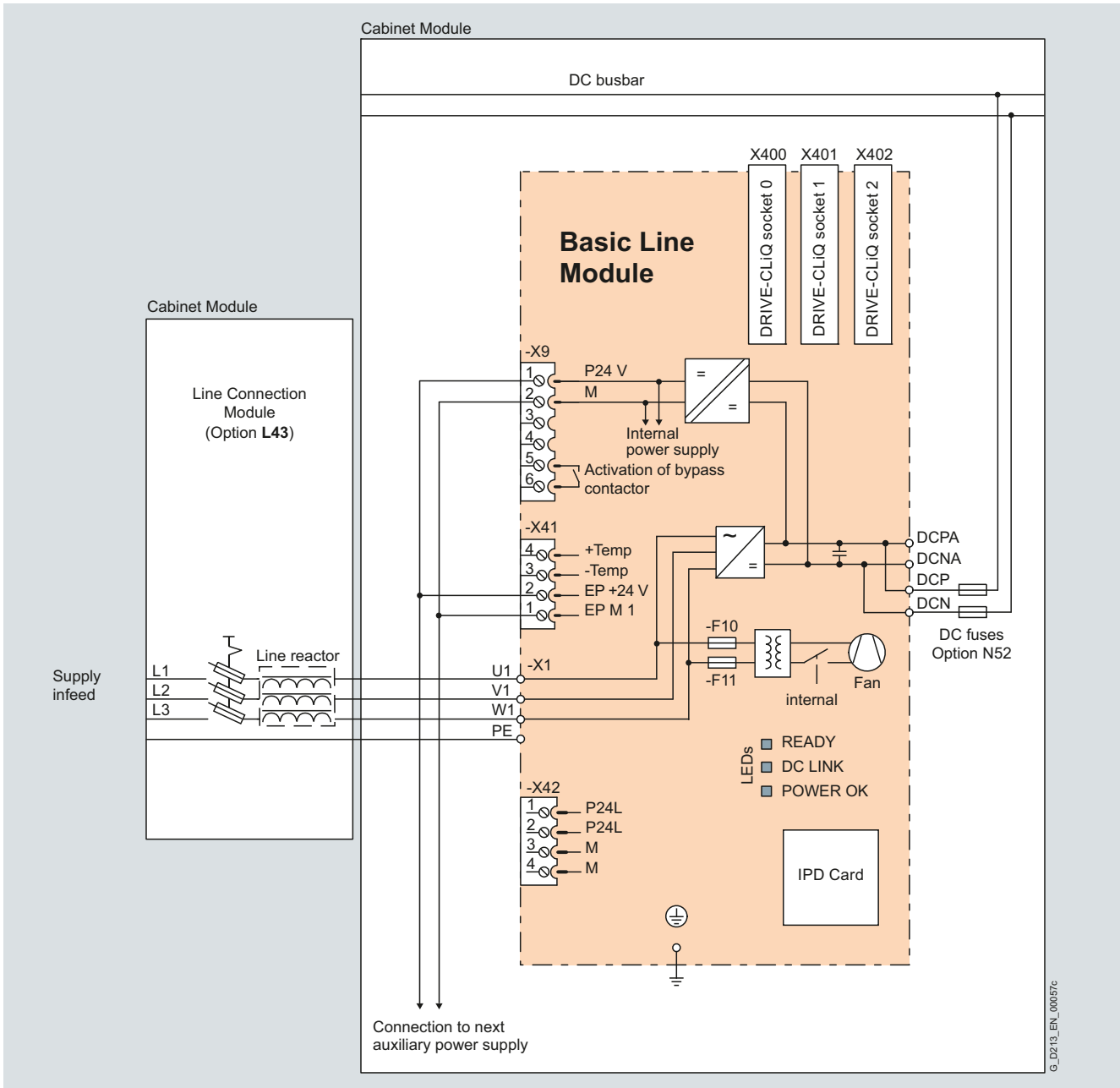
For additional information, please refer to the SINAMICS Low Voltage Engineering Manual.

### Selection and ordering data

Rated power at 400 V	Note for a parallel connection	Basic Line Module
kW	Mounting onto a Line Connection Module	Order No.
<b>Line voltage 380 ... 480 V 3 AC (DC link voltage 510 ... 650 V DC)</b>		
200	–	<b>6SL3730-1TE34-2AA3</b>
250	–	<b>6SL3730-1TE35-3AA3</b>
400	–	<b>6SL3730-1TE38-2AA3</b>
560	–	<b>6SL3730-1TE41-2AA3</b>
	Right	<b>6SL3730-1TE41-2BA3</b>
	Left	<b>6SL3730-1TE41-2BC3</b>
710	–	<b>6SL3730-1TE41-5AA3</b>
	Right	<b>6SL3730-1TE41-5BA3</b>
	Left	<b>6SL3730-1TE41-5BC3</b>
900	–	<b>6SL3730-1TE41-8AA3</b>
	Right	<b>6SL3730-1TE41-8BA3</b>
	Left	<b>6SL3730-1TE41-8BC3</b>

Rated power at 690 V	Note for a parallel connection	Basic Line Module
kW	Mounting onto a Line Connection Module	Order No.
<b>Line voltage 500 ... 690 V 3 AC (DC link voltage 675 ... 930 V DC)</b>		
250	–	<b>6SL3730-1TG33-0AA3</b>
355	–	<b>6SL3730-1TG34-3AA3</b>
500	–	<b>6SL3730-1TG36-8AA3</b>
900	–	<b>6SL3730-1TG41-1AA3</b>
	Right	<b>6SL3730-1TG41-1BA3</b>
	Left	<b>6SL3730-1TG41-1BC3</b>
1100	–	<b>6SL3730-1TG41-4AA3</b>
	Right	<b>6SL3730-1TG41-4BA3</b>
	Left	<b>6SL3730-1TG41-4BC3</b>
1500	–	<b>6SL3730-1TG41-8AA3</b>
	Right	<b>6SL3730-1TG41-8BA3</b>
	Left	<b>6SL3730-1TG41-8BC3</b>

### Integration



Connection example of a Basic Line Module

# SINAMICS S120 Cabinet Modules

## Basic Line Modules

### Technical data

Line voltage 380 ... 480 V 3 AC		Basic Line Modules					
		6SL3730-1TE34-2AA3	6SL3730-1TE35-3AA3	6SL3730-1TE38-2AA3	6SL3730-1TE41-2AA3	6SL3730-1TE41-5AA3	6SL3730-1TE41-8AA3
For a parallel circuit configuration, mounted to the <u>right</u> at the Line Connection Module					6SL3730-1TE41-2BA3	6SL3730-1TE41-5BA3	6SL3730-1TE41-8BA3
For a parallel circuit configuration, mounted to the <u>left</u> at the Line Connection Module					6SL3730-1TE41-2BC3	6SL3730-1TE41-5BC3	6SL3730-1TE41-8BC3
<b>Rated power</b>							
• For $I_{N\ DC}$ (50 Hz 400 V)	kW	<b>200</b>	<b>250</b>	<b>400</b>	<b>560</b>	<b>710</b>	<b>900</b>
• For $I_{H\ DC}$ (50 Hz 400 V)	kW	160	200	315	450	560	705
• For $I_{N\ DC}$ (60 Hz 460 V)	hp	305	385	615	860	1090	1390
• For $I_{H\ DC}$ (60 Hz 460 V)	hp	245	305	485	690	860	1090
<b>DC link current</b>							
• Rated current $I_{N\ DC}$	A	420	530	820	1200	1500	1880
• Base load current $I_{H\ DC}$ <sup>1)</sup>	A	328	413	640	936	1170	1467
• Maximum current $I_{max\ DC}$	A	630	795	1230	1800	2250	2820
<b>Input current</b>							
• Rated current $I_{N\ E}$	A	365	460	710	1010	1265	1630
• Maximum current $I_{max\ E}$	A	547	690	1065	1515	1897	2380
<b>Current demand</b>							
• 24 V DC auxiliary power supply	A	1.1	1.1	1.1	1.1	1.1	1.1
• 400 V AC <sup>2)</sup>	A	Internal	Internal	Internal	Internal	Internal	Internal
<b>DC link capacitance</b>							
• Basic Line Module	μF	7200	9600	14600	23200	29000	34800
• Drive line-up, max.	μF	57600	76800	116800	185600	232000	139200
<b>Power loss, max. <sup>3)</sup></b>							
• At 50 Hz 400 V	kW	1.9	2.1	3.2	4.6	5.5	6.9
• At 60 Hz 460 V	kW	1.9	2.1	3.2	4.6	5.5	6.9
<b>Cooling air requirement</b>		m <sup>3</sup> /s	0.17	0.17	0.17	0.36	0.36
<b>Sound pressure level <math>L_{pA}</math></b> (1 m) at 50/60 Hz		dB	66/68	66/68	66/68	71/73	71/73
<b>PE/GND connection</b>		PE bar	PE bar	PE bar	PE bar	PE bar	PE bar
• Busbar cross-section	mm <sup>2</sup>	600	600	600	600	600	600
• Conductor cross-section, max. (IEC)	mm <sup>2</sup>	240	240	240	240	240	240
<b>Cable length, max. <sup>4)</sup></b>							
• Shielded	m	2600	2600	2600	4000	4000	4800
• Unshielded	m	3900	3900	3900	6000	6000	7200
<b>Degree of protection</b>		IP20	IP20	IP20	IP20	IP20	IP20
<b>Dimensions</b>							
• Width	mm	400	400	400	400/600/600	400/600/600	400/600/600
• Height <sup>5)</sup>	mm	2200	2200	2200	2200	2200	2200
• Depth	mm	600	600	600	600	600	600
<b>Weight, approx.</b>		kg	166	166	166	320/440/480	320/440/480
<b>Frame size</b>			FB	FB	FB	GB	GD

<sup>1)</sup> The base load current  $I_{H\ DC}$  is the basis for a duty cycle of 150 % for 60 s or  $I_{max\ DC}$  for 5 s with a duty cycle duration of 300 s.

<sup>2)</sup> The current demand for the 400 V AC auxiliary power supply is drawn from the line input voltage.

<sup>3)</sup> The specified power loss represents the maximum value at 100 % utilization. The value is lower under normal operating conditions.

<sup>4)</sup> Sum of all motor cables and DC link. Longer cable lengths for specific configurations are available on request.

<sup>5)</sup> The cabinet height increases by 250 mm with IP21 degree of protection, and by 400 mm with IP23, IP43, IP54 degrees of protection.

## Technical data

Line voltage 500 ... 690 V 3 AC		Basic Line Modules					
		6SL3730-1TG33-0AA3	6SL3730-1TG34-3AA3	6SL3730-1TG36-8AA3	6SL3730-1TG41-1AA3	6SL3730-1TG41-4AA3	6SL3730-1TG41-8AA3
For a parallel circuit configuration, mounted to the <u>right</u> at the Line Connection Module		–	–	–	6SL3730-1TG41-1BA3	6SL3730-1TG41-4BA3	6SL3730-1TG41-8BA3
For a parallel circuit configuration, mounted to the <u>left</u> at the Line Connection Module		–	–	–	6SL3730-1TG41-1BC3	6SL3730-1TG41-4BC3	6SL3730-1TG41-8BC3
<b>Rated power</b>							
• For $I_{NDC}$ (50 Hz 690 V)	kW	<b>250</b>	<b>355</b>	<b>560</b>	<b>900</b>	<b>1100</b>	<b>1500</b>
• For $I_{HDC}$ (50 Hz 690 V)	kW	195	280	440	710	910	1220
• For $I_{NDC}$ (50 Hz 500 V)	kW	175	250	390	635	810	1085
• For $I_{HDC}$ (50 Hz 500 V)	kW	165	235	365	595	755	1015
• For $I_{NDC}$ (60 Hz 575 V)	hp	250	350	600	900	1250	1500
• For $I_{HDC}$ (60 Hz 575 V)	hp	200	300	450	800	1000	1250
<b>DC link current</b>							
• Rated current $I_{NDC}$	A	300	430	680	1100	1400	1880
• Base load current $I_{HDC}$ <sup>1)</sup>	A	234	335	530	858	1092	1467
• Maximum current $I_{maxDC}$	A	450	645	1020	1650	2100	2820
<b>Input current</b>							
• Rated current $I_{NE}$	A	260	375	575	925	1180	1580
• Maximum current $I_{maxE}$	A	390	563	863	1388	1770	2370
<b>Current demand</b>							
• 24 V DC auxiliary power supply	A	1.1	1.1	1.1	1.1	1.1	1.1
• 500 V/690 V AC <sup>2)</sup>	A	Internal	Internal	Internal	Internal	Internal	Internal
<b>DC link capacitance</b>							
• Basic Line Module	μF	3200	4800	7300	11600	15470	19500
• Drive line-up, max.	μF	25600	38400	58400	92800	123760	78000
<b>Power loss, max. <sup>3)</sup></b>							
• At 50 Hz 690 V	kW	1.5	2.1	3.0	5.4	5.8	7.3
• At 60 Hz 575 V	kW	1.5	2.1	3.0	5.4	5.8	7.3
<b>Cooling air requirement</b>		m <sup>3</sup> /s	0.17	0.17	0.17	0.36	0.36
<b>Sound pressure level <math>L_{pA}</math></b> (1 m) at 50/60 Hz		dB	66/68	66/68	66/68	71/73	71/73
<b>PE/GND connection</b>		PE bar	PE bar	PE bar	PE bar	PE bar	PE bar
• Busbar cross-section	mm <sup>2</sup>	600	600	600	600	600	600
• Conductor cross-section, max. (IEC)	mm <sup>2</sup>	240	240	240	240	240	240
<b>Cable length, max. <sup>4)</sup></b>							
• Shielded	m	1500	1500	1500	2250	2250	2750
• Unshielded	m	2250	2250	2250	3375	3375	4125
<b>Degree of protection</b>		IP20	IP20	IP20	IP20	IP20	IP20
<b>Dimensions</b>							
• Width	mm	400	400	400	400/600 600	400/600 600	400/600 600
• Height <sup>5)</sup>	mm	2200	2200	2200	2200	2200	2200
• Depth	mm	600	600	600	600	600	600
<b>Weight, approx.</b>		kg	166	166	166	320/440 480	320/440 480
<b>Frame size</b>			FB	FB	FB	GB	GB
						GD	

<sup>1)</sup> The base load current  $I_{HDC}$  is the basis for a duty cycle of 150 % for 60 s or  $I_{maxDC}$  for 5 s with a duty cycle duration of 300 s.

<sup>2)</sup> The current demand for the 500 V/690 V AC auxiliary power supply is drawn from the line input voltage.

<sup>3)</sup> The specified power loss represents the maximum value at 100 % utilization. The value is lower under normal operating conditions.

<sup>4)</sup> Sum of all motor cables and DC link. Longer cable lengths for specific configurations are available on request.

<sup>5)</sup> The cabinet height increases by 250 mm with IP21 degree of protection, and by 400 mm with IP23, IP43, IP54 degrees of protection.



# SINAMICS S120 Cabinet Modules

## Basic Line Modules

### Options

The table below lists the options available for Basic Line Modules ([Details](#) → [Description of the options](#)):

Available options	Order code
CBC10 Communication Board	<b>G20</b> <sup>1)</sup>
CBE20 Communication Board	<b>G33</b> <sup>1)</sup>
AOP30 Advanced Operator Panel installed in the cabinet door	<b>K08</b> <sup>1)</sup>
CU320-2 DP Control Unit	<b>K90</b>
Performance expansion for CU320-2	<b>K94</b> <sup>1)</sup>
CU320-2 PN Control Unit	<b>K95</b>
Cabinet anti-condensation heating	<b>L55</b>
25/125 kW braking unit (can be used for frame size FB) for line voltages of 380 ... 480 V and 660 ... 690 V	<b>L61</b>
50/250 kW braking unit (can be used for frame size GB/GD) for line voltages of 380 ... 480 V and 660 ... 690 V	<b>L62</b>
25/125 kW braking unit (can be used for frame size FB) for line voltages of 500 ... 600 V	<b>L64</b>
50/250 kW braking unit (can be used for frame size GB/GD) for line voltages of 500 ... 600 V	<b>L65</b>
Base 100 mm high, RAL 7022	<b>M06</b>
Cable-marshalling space 200 mm high, RAL 7035	<b>M07</b>
IP21 degree of protection	<b>M21</b>
IP23 degree of protection (includes <b>M60</b> )	<b>M23</b>
Side panel mounted at the right	<b>M26</b>
Side panel mounted at the left	<b>M27</b>
IP43 degree of protection (includes <b>M60</b> )	<b>M43</b>
IP54 degree of protection (includes <b>M60</b> )	<b>M54</b>
Closed cabinet door, air intake from below through floor opening	<b>M59</b>
Additional touch protection (included in <b>M23</b> , <b>M43</b> and <b>M54</b> )	<b>M60</b>
DC busbar system ( $I_d = 1170$ A, $1 \times 60 \times 10$ mm)	<b>M80</b>
DC busbar system ( $I_d = 1500$ A, $1 \times 80 \times 10$ mm)	<b>M81</b>
DC busbar system ( $I_d = 1840$ A, $1 \times 100 \times 10$ mm)	<b>M82</b>
DC busbar system ( $I_d = 2150$ A, $2 \times 60 \times 10$ mm)	<b>M83</b>
DC busbar system ( $I_d = 2730$ A, $2 \times 80 \times 10$ mm)	<b>M84</b>
DC busbar system ( $I_d = 3320$ A, $2 \times 100 \times 10$ mm)	<b>M85</b>
DC busbar system ( $I_d = 3720$ A, $3 \times 80 \times 10$ mm)	<b>M86</b>
DC busbar system ( $I_d = 4480$ A, $3 \times 100 \times 10$ mm)	<b>M87</b>
Crane transport assembly (top-mounted)	<b>M90</b>

Available options	Order code
DC link fuses for BLM	<b>N52</b>
Special paint finish for cabinet	<b>Y09</b>
Factory assembly as transport units	<b>Y11</b>
One-line label for system identification, $40 \times 80$ mm	<b>Y31</b>
Two-line label for system identification, $40 \times 180$ mm	<b>Y32</b>
Four-line label for system identification, $40 \times 180$ mm	<b>Y33</b>
Customer documentation (circuit diagram, terminal diagram, layout diagram) in DXF format	<b>D02</b>
Preliminary version of customer documentation in PDF format	<b>D14</b>
Documentation in English/French	<b>D58</b>
Documentation in English/Spanish	<b>D60</b>
Documentation in English/Italian	<b>D80</b>
Without Operating Instructions	<b>D99</b>
Rating plate data in English/French	<b>T58</b>
Rating plate data in English/Spanish	<b>T60</b>
Rating plate data in English/Italian	<b>T80</b>
Visual acceptance	<b>F03</b>
Function test without connected motor	<b>F71</b>
Insulation test	<b>F77</b>
Customer-specific acceptance inspections (on request)	<b>F97</b>

<sup>1)</sup> Only together with option **K90** or **K95**.

## Options

## Option selection matrix for Basic Line Modules

Certain options can mutually exclude one another (options that are not involved are not shown).

✓	Possible combination
–	Combination not possible

## Electrical options

	G20	G33	K90	K95	L61/64	L62/65
G20		–	✓	✓	✓	✓
G33	–		✓	✓	✓	✓
K90	✓	✓		–	✓	✓
K95	✓	✓	–		✓	✓
L61/64	✓	✓	✓	✓		–
L62/65	✓	✓	✓	✓	–	

## Mechanical/electrical options

	M06	M07	M21	M23	M26	M27	M43	M54	M60	M90	Y11	Y31	Y32	Y33
M06		–	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
M07	–		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
M21	✓	✓		–	✓	✓	–	–	✓	✓	✓	✓	✓	✓
M23	✓	✓	–		✓	✓	–	–	– <sup>1)</sup>	✓	✓	✓	✓	✓
M26	✓	✓	✓	✓		–	✓	✓	✓	✓	✓	✓	✓	✓
M27	✓	✓	✓	✓	–		✓	✓	✓	✓	✓	✓	✓	✓
M43	✓	✓	–	–	✓	✓		–	– <sup>1)</sup>	✓	✓	✓	✓	✓
M54	✓	✓	–	–	✓	✓	–		– <sup>1)</sup>	✓	✓	✓	✓	✓
M60	✓	✓	✓	– <sup>1)</sup>	✓	✓	– <sup>1)</sup>	– <sup>1)</sup>		✓	✓	✓	✓	✓
M90	✓	✓	✓	✓	✓	✓	✓	✓	✓		–	✓	✓	✓
Y11	✓	✓	✓	✓	✓	✓	✓	✓	✓	–		✓	✓	✓
Y31	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	–		–	–
Y32	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	–		–	–
Y33	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	–	–		

<sup>1)</sup> The option **M60** is included in **M23**, **M43** and **M54**.

# SINAMICS S120 Cabinet Modules

## Basic Line Modules

### Options

DC busbar system mechanical options (busbars between individual Cabinet Modules)

	M80	M81	M82	M83	M84	M85	M86	M87
M80		-	-	✓	-	-	-	-
M81	-		-	-	✓	-	✓	-
M82	-	-		-	-	✓	-	✓
M83	✓	-	-		-	-	-	-
M84	-	✓	-	-		-	✓	-
M85	-	-	✓	-	-		-	✓
M86	-	✓	-	-	✓	-		-
M87	-	-	✓	-	-	✓	-	

Documentation

	D02	D14	D58	D60	D80	D99
D02		✓	✓	✓	✓	-
D14	✓		✓	✓	✓	-
D58	✓	✓		-	-	-
D60	✓	✓	-		-	-
D80	✓	✓	-	-		-
D99	-	-	-	-	-	

Rating plate data

	T58	T60	T80
T58		-	-
T60	-		-
T80	-	-	

## Overview



Smart Line Modules are uncontrolled rectifier/regenerative units. The infeed circuit comprises a diode bridge, while the line-commutated regenerative feedback circuit with immunity to inverter commutation faults comprises IGBTs with 100 % continuous regenerative power. An autotransformer is not required for regenerative feedback.

The regenerative capability can be deactivated with a digital input.

Smart Line Modules are suitable for connection to grounded TN/TT and non-grounded IT systems. The following voltages and power ratings are available:

Line voltage	Rated power
380 ... 480 V 3 AC	250 ... 800 kW
500 ... 690 V 3 AC	450 ... 1400 kW

The power ratings can be increased by connecting up to four identical Smart Line Modules in parallel. [For additional information, please refer to the SINAMICS Low Voltage Engineering Manual.](#)

## Design

IGBTs (fundamental frequency-switched) serve as Smart Line Module power semiconductors. Because this reduces switching losses, a high percentage of the power unit current can be utilized.

The current flows in rectifier direction via the freewheeling diodes of the IGBTs. This means that the Smart Line Module behaves in a similar way to the Basic Line Module. If the DC link voltage increases due to regenerative operation of the drives, the IGBTs conduct the current, thus feeding the energy back into the supply system.

In contrast to Active Line Modules, Smart Line Modules do not require a line-side filter; all they require is a line reactor (4 %  $u_k$ ). The unit has a built-in pre-charging circuit for the DC link capacitors. For this reason, a line contactor or a motor-driven circuit breaker is absolutely essential. By specifying the option with order code **L44** for the Line Connection Modules, these components are appropriately accommodated in the Line Connection Module.

## Parallel connection of Smart Line Modules to increase power rating

Up to four Smart Line Modules with the same power rating can be connected in parallel in order to increase power. Current derating of 7.5 % with respect to the rated current of each Smart Line Module must be taken into account when the system is dimensioned.

A connection of the Smart Line Modules connected in parallel using DRIVE-CLiQ must be taken into consideration.

[For additional information, please refer to the SINAMICS Low Voltage Engineering Manual.](#)

A 4 % reactor is always required upstream of each Smart Line Module for the purpose of current symmetrization. This is integrated as standard. Just as with the Basic Line Modules, "mirror-image" power connections are available for Smart Line Modules, which enable parallel circuits to be realized in a compact design. Units that are arranged to the left of the Line Connection Module have the letter "C" at the next to last position of the order number. Example: 6SL3730-6TE41-1BC3 (see also the corresponding diagram for the Basic Line Modules).

## Selection and ordering data

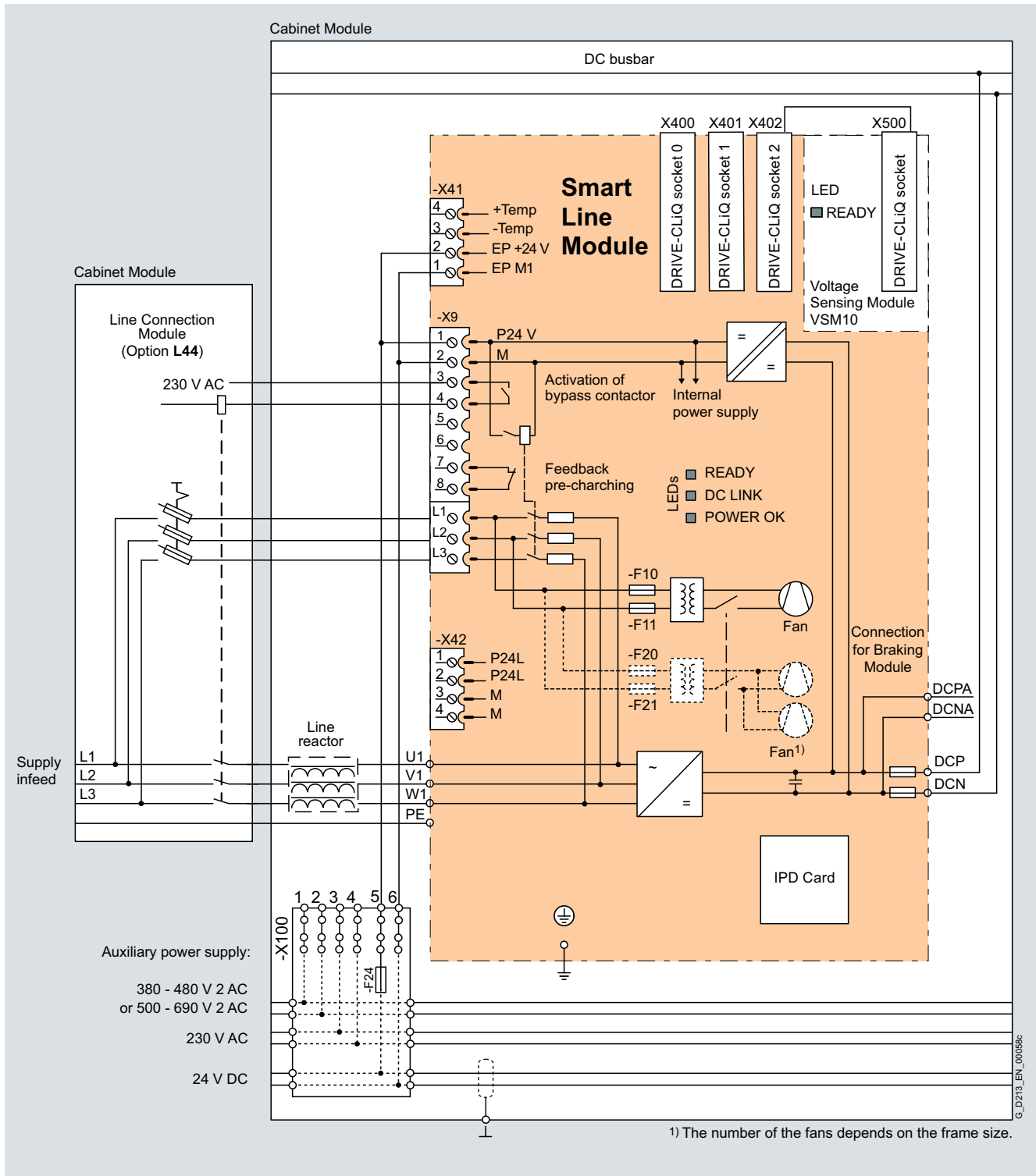
Rated power at 400 V or 690 V kW	Note for a parallel connection Mounting onto a Line Connection Module	Smart Line Module Order No.
<b>Line voltage 380 ... 480 V 3 AC (DC link voltage 510 ... 650 V DC)</b>		
250	–	<b>6SL3730-6TE35-5AA3</b>
355	–	<b>6SL3730-6TE37-3AA3</b>
500	–	<b>6SL3730-6TE41-1AA3</b>
	Right	<b>6SL3730-6TE41-1BA3</b>
	Left	<b>6SL3730-6TE41-1BC3</b>
630	–	<b>6SL3730-6TE41-3AA3</b>
	Right	<b>6SL3730-6TE41-3BA3</b>
	Left	<b>6SL3730-6TE41-3BC3</b>
800	–	<b>6SL3730-6TE41-7AA3</b>
	Right	<b>6SL3730-6TE41-7BA3</b>
	Left	<b>6SL3730-6TE41-7BC3</b>
<b>Line voltage 500 ... 690 V 3 AC (DC link voltage 675 ... 930 V DC)</b>		
450	–	<b>6SL3730-6TG35-5AA3</b>
710	–	<b>6SL3730-6TG38-8AA3</b>
	Right	<b>6SL3730-6TG38-8BA3</b>
	Left	<b>6SL3730-6TG38-8BC3</b>
1000	–	<b>6SL3730-6TG41-2AA3</b>
	Right	<b>6SL3730-6TG41-2BA3</b>
	Left	<b>6SL3730-6TG41-2BC3</b>
1400	–	<b>6SL3730-6TG41-7AA3</b>
	Right	<b>6SL3730-6TG41-7BA3</b>
	Left	<b>6SL3730-6TG41-7BC3</b>

# SINAMICS S120 Cabinet Modules

## Smart Line Modules

### Integration

3



Connection example of a Smart Line Module

## Technical data

Line voltage 380 ... 480 V 3 AC		Smart Line Modules					
		6SL3730-6TE35-5AA3	6SL3730-6TE37-3AA3	6SL3730-6TE41-1AA3	6SL3730-6TE41-3AA3	6SL3730-6TE41-7AA3	
For a parallel circuit configuration, mounted to the <u>right</u> at the Line Connection Module				6SL3730-6TE41-1BA3	6SL3730-6TE41-3BA3	6SL3730-6TE41-7BA3	
For a parallel circuit configuration, mounted to the <u>left</u> at the Line Connection Module				6SL3730-6TE41-1BC3	6SL3730-6TE41-3BC3	6SL3730-6TE41-7BC3	
<b>Rated power</b>							
• For $I_{NDC}$ (50 Hz 400 V)	kW	<b>250</b>	<b>355</b>	<b>500</b>	<b>630</b>	<b>800</b>	
• For $I_{HDC}$ (50 Hz 400 V)	kW	235	315	450	555	730	
• For $I_{NDC}$ (60 Hz 460 V)	hp	395	545	770	970	1230	
• For $I_{HDC}$ (60 Hz 460 V)	hp	360	485	695	855	1125	
<b>DC link current</b>							
• Rated current $I_{NDC}$	A	550	730	1050	1300	1700	
• Base load current $I_{HDC}^{1)}$	A	490	650	934	1157	1513	
• Maximum current $I_{maxDC}$	A	825	1095	1575	1950	2550	
<b>Infeed/regenerative feedback current</b>							
• Rated current $I_{NE}$	A	463	614	883	1093	1430	
• Maximum current $I_{maxE}$	A	694	921	1324	1639	2145	
<b>Current demand</b>							
• 24 V DC auxiliary power supply	A	1.35	1.35	1.4	1.5	1.7	
• 400 V AC <sup>2)</sup>	A	1.8	1.8	3.6	5.4	5.4	
<b>DC link capacitance</b>							
• Smart Line Module	μF	8400	12000	16800	18900	28800	
• Drive line-up, max.	μF	42000	60000	67200	75600	115200	
<b>Power loss, max. <sup>3)</sup></b>							
• At 50 Hz 400 V	kW	3.7	4.7	7.1	11.0	11.5	
• At 60 Hz 460 V	kW	3.7	4.7	7.1	11.0	11.5	
<b>Cooling air requirement</b>		m <sup>3</sup> /s	0.36	0.36	0.78	1.08	
<b>Sound pressure level <math>L_{pA}</math></b> (1 m) at 50/60 Hz		dB	69/73	69/73	70/73	70/73	
<b>PE/GND connection</b>		PE bar	PE bar	PE bar	PE bar	PE bar	
• Busbar cross-section	mm <sup>2</sup>	600	600	600	600	600	
• Conductor cross-section, max. (IEC)	mm <sup>2</sup>	240	240	240	240	240	
<b>Cable length, max. <sup>4)</sup></b>							
• Shielded	m	4000	4000	4800	4800	4800	
• Unshielded	m	6000	6000	7200	7200	7200	
<b>Degree of protection</b>		IP20	IP20	IP20	IP20	IP20	
<b>Dimensions</b>							
• Width	mm	400	400	600	800	800	
• Height <sup>5)</sup>	mm	2200	2200	2200	2200	2200	
• Depth	mm	600	600	600	600	600	
<b>Weight, approx.</b>		kg	270	270	490	775	
<b>Frame size</b>		GX	GX	HX	JX	JX	

<sup>1)</sup> The base load current  $I_{HDC}$  is the basis for a duty cycle of 150 % for 60 s or  $I_{maxDC}$  for 5 s with a duty cycle duration of 300 s.

<sup>2)</sup> The current demand for the 400 V AC auxiliary power supply is drawn from the line input voltage.

<sup>3)</sup> The specified power loss represents the maximum value at 100 % utilization. The value is lower under normal operating conditions.

<sup>4)</sup> Sum of all motor cables and DC link. Longer cable lengths for specific configurations are available on request.

<sup>5)</sup> The cabinet height increases by 250 mm with IP21 degree of protection, and by 400 mm with IP23, IP43, IP54 degrees of protection.

# SINAMICS S120 Cabinet Modules

## Smart Line Modules

### Technical data

Line voltage 500 ... 690 V 3 AC		Smart Line Modules				
		6SL3730-6TG35-5AA3	6SL3730-6TG38-8AA3	6SL3730-6TG41-2AA3	6SL3730-6TG41-7AA3	
For a parallel circuit configuration, mounted to the <u>right</u> at the Line Connection Module			6SL3730-6TG38-8BA3	6SL3730-6TG41-2BA3	6SL3730-6TG41-7BA3	
For a parallel circuit configuration, mounted to the <u>left</u> at the Line Connection Module			6SL3730-6TG38-8BC3	6SL3730-6TG41-2BC3	6SL3730-6TG41-7BC3	
<b>Rated power</b>						
• For $I_{NDC}$ (50 Hz 690 V)	kW	<b>450</b>	<b>710</b>	<b>1000</b>	<b>1400</b>	
• For $I_{HDC}$ (50 Hz 690 V)	kW	405	665	885	1255	
• For $I_{NDC}$ (50 Hz 500 V)	kW	320	525	705	995	
• For $I_{HDC}$ (50 Hz 500 V)	kW	295	480	640	910	
• For $I_{NDC}$ (60 Hz 575 V)	hp	500	790	1115	1465	
• For $I_{HDC}$ (60 Hz 575 V)	hp	450	740	990	1400	
<b>DC link current</b>						
• Rated current $I_{NDC}$	A	550	900	1200	1700	
• Base load current $I_{HDC}$ <sup>1)</sup>	A	490	800	1068	1513	
• Maximum current $I_{maxDC}$	A	825	1350	1800	2550	
<b>Infeed/regenerative feedback current</b>						
• Rated current $I_{NE}$	A	463	757	1009	1430	
• Maximum current $I_{maxE}$	A	694	1135	1513	2145	
<b>Current demand</b>						
• 24 V DC auxiliary power supply	A	1.35	1.4	1.5	1.7	
• 500 V AC <sup>2)</sup>	A	1.3	2.9	4.3	4.3	
• 690 V AC	A	1.0	2.1	3.1	3.1	
<b>DC link capacitance</b>						
• Smart Line Module	μF	5600	7400	11100	14400	
• Drive line-up, max.	μF	28000	29600	44400	57600	
<b>Power loss, max. <sup>3)</sup></b>						
• At 50 Hz 690 V	kW	4.3	6.5	12	13.8	
• At 60 Hz 575 V	kW	4.3	6.5	12	13.8	
<b>Cooling air requirement</b>		m <sup>3</sup> /s	0.36	0.78	1.08	1.08
<b>Sound pressure level <math>L_{pA}</math></b> (1 m) at 50/60 Hz		dB	69/73	70/73	70/73	70/73
<b>PE/GND connection</b>		PE bar	PE bar	PE bar	PE bar	
• Busbar cross-section	mm <sup>2</sup>	600	600	600	600	
• Conductor cross-section, max. (IEC)	mm <sup>2</sup>	240	240	240	240	
<b>Cable length, max. <sup>4)</sup></b>						
• Shielded	m	2250	2750	2750	2750	
• Unshielded	m	3375	4125	4125	4125	
<b>Degree of protection</b>		IP20	IP20	IP20	IP20	
<b>Dimensions</b>						
• Width	mm	400	600	800	800	
• Height <sup>5)</sup>	mm	2200	2200	2200	2200	
• Depth	mm	600	600	600	600	
<b>Weight, approx.</b>	kg	270	550	795	795	
<b>Frame size</b>		GX	HX	JX	JX	

<sup>1)</sup> The base load current  $I_{HDC}$  is the basis for a duty cycle of 150 % for 60 s or  $I_{maxDC}$  for 5 s with a duty cycle duration of 300 s.

<sup>2)</sup> The current demand for the 500 V/690 V AC auxiliary power supply is drawn from the line input voltage.

<sup>3)</sup> The specified power loss represents the maximum value at 100 % utilization. The value is lower under normal operating conditions.

<sup>4)</sup> Sum of all motor cables and DC link. Longer cable lengths for specific configurations are available on request.

<sup>5)</sup> The cabinet height increases by 250 mm with IP21 degree of protection, and by 400 mm with IP23, IP43, IP54 degrees of protection.

## Options

The table below lists the options available for Smart Line Modules ([Details → Description of the options](#)):

Available options	Order code
CBC10 Communication Board	<b>G20</b> <sup>1)</sup>
CBE20 Communication Board	<b>G33</b> <sup>1)</sup>
AOP30 Advanced Operator Panel installed in the cabinet door	<b>K08</b> <sup>1)</sup>
CU320-2 DP Control Unit	<b>K90</b>
Performance expansion for CU320-2 Control Unit	<b>K94</b> <sup>1)</sup>
CU320-2 PN Control Unit	<b>K95</b>
Scope of delivery without line reactor	<b>L22</b>
Cabinet anti-condensation heating	<b>L55</b>
50/250 kW braking unit for line voltages of 380 ... 480 V and 660 ... 690 V	<b>L62</b>
50/250 kW braking unit for line voltages of 500 ... 600 V	<b>L65</b>
Base 100 mm high, RAL 7022	<b>M06</b>
Cable-marshalling space 200 mm high, RAL 7035	<b>M07</b>
IP21 degree of protection	<b>M21</b>
IP23 degree of protection (includes <b>M60</b> )	<b>M23</b>
Side panel mounted at the right	<b>M26</b>
Side panel mounted at the left	<b>M27</b>
IP43 degree of protection (includes <b>M60</b> )	<b>M43</b>
IP54 degree of protection (includes <b>M60</b> )	<b>M54</b>
Closed cabinet door, air intake from below through floor opening	<b>M59</b>
Additional touch protection (included in <b>M23</b> , <b>M43</b> and <b>M54</b> )	<b>M60</b>
DC busbar system ( $I_d = 1170$ A, 1 × 60 × 10 mm)	<b>M80</b>
DC busbar system ( $I_d = 1500$ A, 1 × 80 × 10 mm)	<b>M81</b>
DC busbar system ( $I_d = 1840$ A, 1 × 100 × 10 mm)	<b>M82</b>
DC busbar system ( $I_d = 2150$ A, 2 × 60 × 10 mm)	<b>M83</b>
DC busbar system ( $I_d = 2730$ A, 2 × 80 × 10 mm)	<b>M84</b>
DC busbar system ( $I_d = 3320$ A, 2 × 100 × 10 mm)	<b>M85</b>
DC busbar system ( $I_d = 3720$ A, 3 × 80 × 10 mm)	<b>M86</b>
DC busbar system ( $I_d = 4480$ A, 3 × 100 × 10 mm)	<b>M87</b>
Crane transport assembly (top-mounted)	<b>M90</b>

Available options	Order code
Special paint finish for cabinet	<b>Y09</b>
Factory assembly as transport units	<b>Y11</b>
One-line label for system identification, 40 × 80 mm	<b>Y31</b>
Two-line label for system identification, 40 × 180 mm	<b>Y32</b>
Four-line label for system identification, 40 × 180 mm	<b>Y33</b>
Customer documentation (circuit diagram, terminal diagram, layout diagram) in DXF format	<b>D02</b>
Preliminary version of customer documentation in PDF format	<b>D14</b>
Documentation in English/French	<b>D58</b>
Documentation in English/Spanish	<b>D60</b>
Documentation in English/Italian	<b>D80</b>
Without Operating Instructions	<b>D99</b>
Rating plate data in English/French	<b>T58</b>
Rating plate data in English/Spanish	<b>T60</b>
Rating plate data in English/Italian	<b>T80</b>
Visual acceptance	<b>F03</b>
Function test without connected motor	<b>F71</b>
Insulation test	<b>F77</b>
Customer-specific acceptance inspections (on request)	<b>F97</b>

<sup>1)</sup> Only together with option **K90** or **K95**.



# SINAMICS S120 Cabinet Modules

## Smart Line Modules

### Options

#### Option selection matrix for Smart Line Modules

Certain options can mutually exclude one another (options that are not involved are not shown).

✓	Possible combination
–	Combination not possible

#### Electrical options

	G20	G33	K90	K95
G20		–	✓	✓
G33	–		✓	✓
K90	✓	✓		–
K95	✓	✓	–	

#### Mechanical/electrical options

	M06	M07	M21	M23	M26	M27	M43	M54	M60	M90	Y11	Y31	Y32	Y33
M06		–	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
M07	–		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
M21	✓	✓		–	✓	✓	–	–	✓	✓	✓	✓	✓	✓
M23	✓	✓	–		✓	✓	–	–	– <sup>1)</sup>	✓	✓	✓	✓	✓
M26	✓	✓	✓	✓		–	✓	✓	✓	✓	✓	✓	✓	✓
M27	✓	✓	✓	✓	–		✓	✓	✓	✓	✓	✓	✓	✓
M43	✓	✓	–	–	✓	✓		–	– <sup>1)</sup>	✓	✓	✓	✓	✓
M54	✓	✓	–	–	✓	✓	–		– <sup>1)</sup>	✓	✓	✓	✓	✓
M60	✓	✓	✓	– <sup>1)</sup>	✓	✓	– <sup>1)</sup>	– <sup>1)</sup>		✓	✓	✓	✓	✓
M90	✓	✓	✓	✓	✓	✓	✓	✓	✓		–	✓	✓	✓
Y11	✓	✓	✓	✓	✓	✓	✓	✓	✓	–		✓	✓	✓
Y31	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	–		–	–
Y32	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	–		–
Y33	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	–	–	

<sup>1)</sup> The option **M60** is included in **M23**, **M43** and **M54**.

**Options**

DC busbar system mechanical options (busbars between individual Cabinet Modules)

	M80	M81	M82	M83	M84	M85	M86	M87
M80		-	-	✓	-	-	-	-
M81	-		-	-	✓	-	✓	-
M82	-	-		-	-	✓	-	✓
M83	✓	-	-		-	-	-	-
M84	-	✓	-	-		-	✓	-
M85	-	-	✓	-	-		-	✓
M86	-	✓	-	-	✓	-		-
M87	-	-	✓	-	-	✓	-	

Documentation

	D02	D14	D58	D60	D80	D99
D02		✓	✓	✓	✓	-
D14	✓		✓	✓	✓	-
D58	✓	✓		-	-	-
D60	✓	✓	-		-	-
D80	✓	✓	-	-		-
D99	-	-	-	-	-	

Rating plate data

	T58	T60	T80
T58		-	-
T60	-		-
T80	-	-	

# SINAMICS S120 Cabinet Modules

## Active Line Modules including Active Interface Modules

### Overview



Active Line Modules can supply energy and return regenerative energy to the supply system.

In contrast to Basic Line Modules and Smart Line Modules, Active Line Modules generate a controlled DC voltage that is kept constant despite fluctuations in the line voltage (the line voltage must remain within the permissible tolerance range). Active Line Modules draw a virtually sinusoidal current from the supply system and therefore do not cause any harmful current harmonics.

Braking Modules and braking resistors are required only if the drives need to be decelerated in a controlled manner after a power failure – i.e. when energy cannot be regenerated into the line supply.

Active Line Modules are available for the following voltages and power ratings:

Line voltage	Rated power
380 ... 480 V 3 AC	132 ... 900 kW
500 ... 690 V 3 AC	560 ... 1400 kW

### Design

Active Line Modules are always operated together with an Active Interface Module, which contains the associated Clean Power Filter and pre-charging circuit. The integrated line filter ensures compliance with the EMC requirements for the "second environment".

The Active Line Module and Active Interface Module are supplied as a complete, fully wired unit, i.e., the customer does not need to supply any further cables or carry out any other wiring tasks.

#### Parallel connection of Active Line Modules to increase power rating

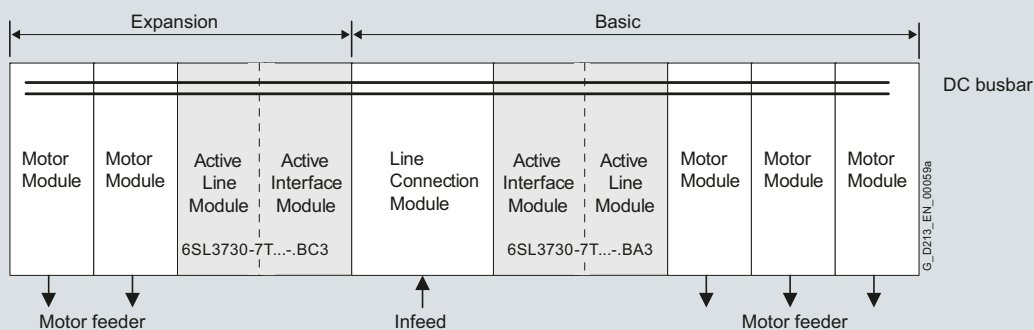
Active Line Modules are available for creating drive line-ups with more power. These modules can be operated in parallel on a common Line Connection Module and are arranged to the right and left of the Line Connection Module.

The power connections on the Active Line Module on the left of the Line Connection Module are a mirror image (Order No. with "C" in the next to last position, example: 6SL3730-7T.41.-BC3), which results in a very compact design for the line infeed.

Please note that only Active Line Modules with exactly the same power rating may be connected in parallel. The potential for imbalances in current distribution means that a current derating of 5 % applies; this must be taken into account when the modules are dimensioned.

A connection of the Active Line Modules connected in parallel using DRIVE-CLiQ must be taken into consideration.

For additional information, please refer to the [SINAMICS Low Voltage Engineering Manual](#).



**Active Line Modules  
including Active Interface Modules**
**Selection and ordering data**

Rated power at 400 V kW	<i>Note for a parallel connection</i> <i>Mounting onto a Line Connection Module</i>	<b>Active Line Module (incl. Active Interface Module)</b> Order No.
<b>Line voltage 380 ... 480 V 3 AC</b> (DC link voltage 540 ... 720 V DC)		
132	–	<b>6SL3730-7TE32-1BA3</b>
160	–	<b>6SL3730-7TE32-6BA3</b>
235	–	<b>6SL3730-7TE33-8BA3</b>
300	–	<b>6SL3730-7TE35-0BA3</b>
380	–	<b>6SL3730-7TE36-1BA3</b>
500	–	<b>6SL3730-7TE38-4BA3</b>
630	–	<b>6SL3730-7TE41-0BA3</b>
	<i>Left</i>	<b>6SL3730-7TE41-0BC3</b>
900	–	<b>6SL3730-7TE41-4BA3</b>
	<i>Left</i>	<b>6SL3730-7TE41-4BC3</b>

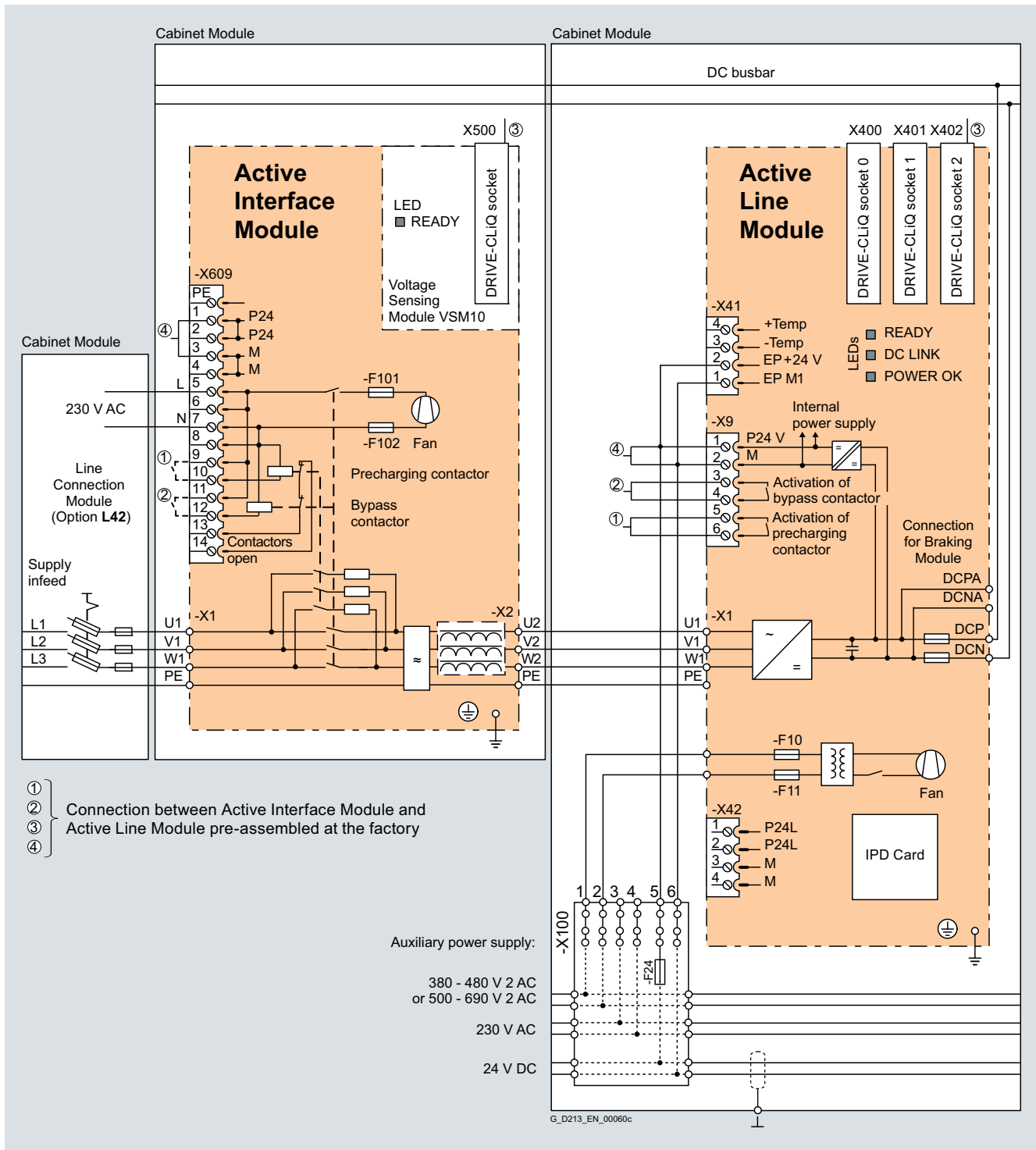
Rated power at 690 V kW	<i>Note for a parallel connection</i> <i>Mounting onto a Line Connection Module</i>	<b>Active Line Module (incl. Active Interface Module)</b> Order No.
<b>Line voltage 500 ... 690 V 3 AC</b> (DC link voltage 710 ... 1035 V DC)		
560	–	<b>6SL3730-7TG35-8BA3</b>
800	–	<b>6SL3730-7TG37-4BA3</b>
	<i>Left</i>	<b>6SL3730-7TG37-4BC3</b>
1100	–	<b>6SL3730-7TG41-0BA3</b>
	<i>Left</i>	<b>6SL3730-7TG41-0BC3</b>
1400	–	<b>6SL3730-7TG41-3BA3</b>
	<i>Left</i>	<b>6SL3730-7TG41-3BC3</b>

# SINAMICS S120 Cabinet Modules

## Active Line Modules including Active Interface Modules

**Integration**  
 The Active Line Module is controlled by the CU320-2 Control Unit. Communication between the Control Unit and module is established via DRIVE-CLiQ connections. The Active Interface Module is included in the scope of delivery for the Active Line Module.

3

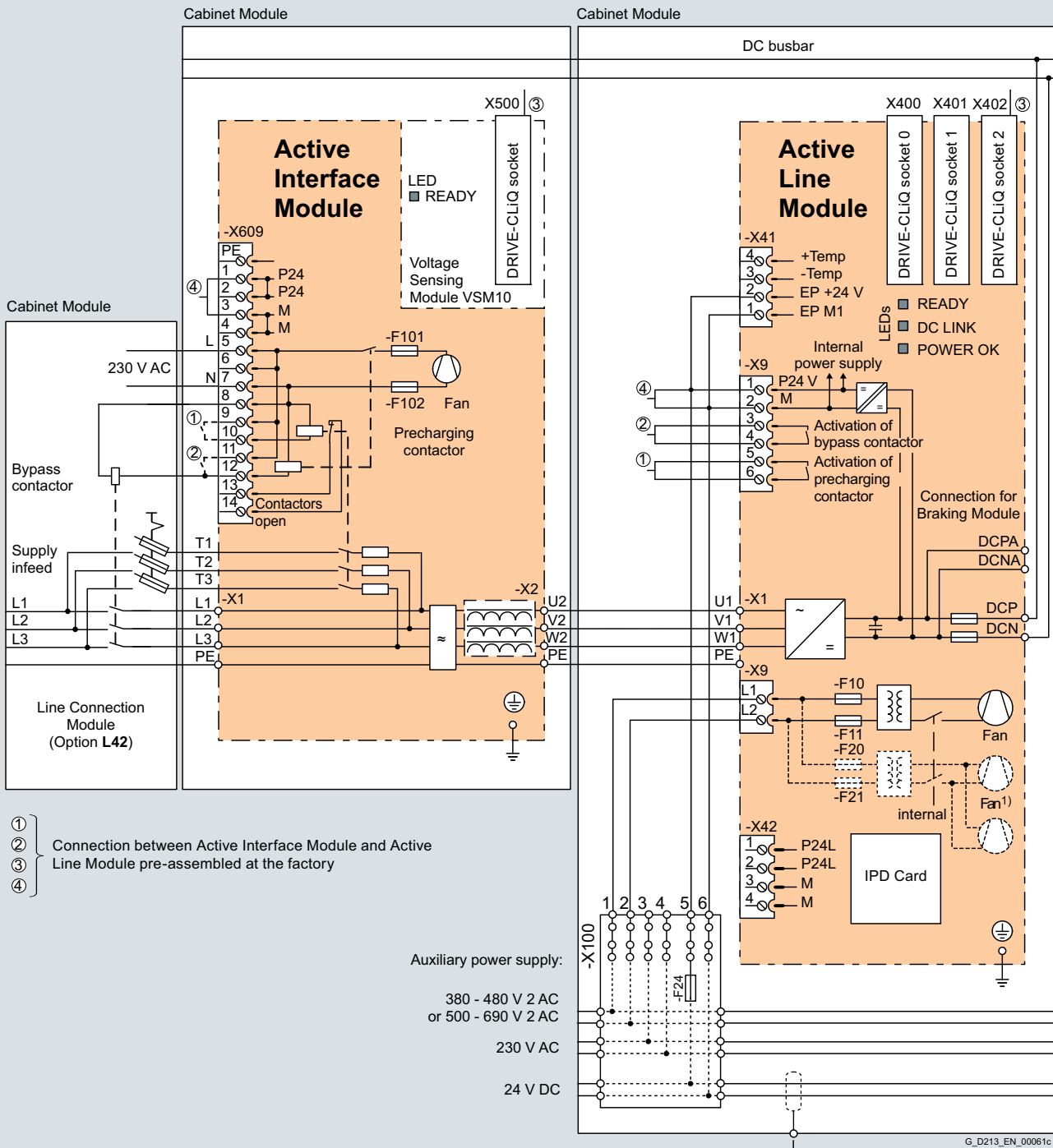


Example of connection of an Active Line Module (frame size FI/FX and GI/GX)

## Active Line Modules including Active Interface Modules

### Integration

3



1) The number of the fans depends on the frame size.

Example of connection of an Active Line Module (frame size HI/HX and JI/JX)

# SINAMICS S120 Cabinet Modules

## Active Line Modules including Active Interface Modules

### Technical data

Line voltage 380 ... 480 V 3 AC		Active Line Modules							
		6SL3730-7TE32-1BA3	6SL3730-7TE32-6BA3	6SL3730-7TE33-8BA3	6SL3730-7TE35-0BA3	6SL3730-7TE36-1BA3	6SL3730-7TE38-4BA3	6SL3730-7TE41-0BA3	6SL3730-7TE41-4BA3
<i>For a parallel circuit configuration, mounted to the left at the Line Connection Module</i>								6SL3730-7TE41-0BC3	6SL3730-7TE41-4BC3
<b>Rated power</b>									
• For $I_{N\ DC}$ (50 Hz 400 V)	kW	<b>132</b>	<b>160</b>	<b>235</b>	<b>300</b>	<b>380</b>	<b>500</b>	<b>630</b>	<b>900</b>
• For $I_{H\ DC}$ (50 Hz 400 V)	kW	115	145	210	270	335	465	545	780
• For $I_{N\ DC}$ (60 Hz 460 V)	hp	200	250	400	500	600	700	900	1250
• For $I_{H\ DC}$ (60 Hz 460 V)	hp	150	200	300	400	500	700	800	1000
<b>DC link current</b>									
• Rated current $I_{N\ DC}$	A	235	291	425	549	678	940	1103	1574
• Base load current $I_{H\ DC}^{1)}$	A	209	259	378	489	603	837	982	1404
• Maximum current $I_{max\ DC}$	A	352	436	637	823	1017	1410	1654	2361
<b>Infeed/regenerative feedback current</b>									
• Rated current $I_{N\ E}$	A	210	260	380	490	605	840	985	1405
• Maximum current $I_{max\ E}$	A	315	390	570	735	907	1260	1477	2107
<b>Current demand</b>									
• 24 V DC auxiliary power supply	A	1.27	1.27	1.52	1.52	1.57	1.57	1.67	1.67
• 230 V AC auxiliary power supply	A	0.6	0.6	1.2	1.2	4.6	4.6	4.9	4.9
• 400 V AC <sup>2)</sup>	A	0.63	1.13	1.8	1.8	3.6	3.6	5.4	5.4
<b>DC link capacitance</b>									
• Active Line Module	μF	4200	5200	7800	9600	12600	16800	18900	28800
• Drive line-up, max.	μF	41600	41600	76800	76800	134400	134400	230400	230400
<b>Power loss, max. <sup>3)</sup></b>									
• At 50 Hz 400 V	kW	4.3	4.9	6.9	8.7	11.7	13.8	17.6	21.8
• At 60 Hz 460 V	kW	4.4	5.1	7.2	9.0	12.1	14.3	18.3	22.7
<b>Cooling air requirement</b>		m <sup>3</sup> /s	0.65	0.65	1.3	1.3	1.58	1.58	1.88
<b>Sound pressure level <math>L_{pA}^{4)}</math></b> (1 m) at 50/60 Hz		dB	71/73	71/73	72/74	72/74	77/79	77/79	78/80
<b>PE/GND connection</b>		PE bar	PE bar	PE bar	PE bar	PE bar	PE bar	PE bar	PE bar
• Busbar cross-section	mm <sup>2</sup>	600	600	600	600	600	600	600	600
• Conductor cross-section, max. (IEC)	mm <sup>2</sup>	240	240	240	240	240	240	240	240
<b>Cable length, max. <sup>5)</sup></b>									
• Shielded	m	2700	2700	2700	2700	3900	3900	3900	3900
• Unshielded	m	4050	4050	4050	4050	5850	5850	5850	5850
<b>Degree of protection</b>		IP20	IP20	IP20	IP20	IP20	IP20	IP20	IP20
<b>Dimensions</b>									
• Width	mm	800	800	800	800	1000	1000	1400	1400
• Height <sup>6)</sup>	mm	2200	2200	2200	2200	2200	2200	2200	2200
• Depth	mm	600	600	600	600	600	600	600	600
<b>Weight, approx.</b>		kg	380	380	530	530	930	930	1360
<b>Frame size</b>		FX + FI	FX + FI	GX + GI	GX + GI	HX + HI	HX + HI	JX + JI	JX + JI

<sup>1)</sup> The base load current  $I_{H\ DC}$  is the basis for a duty cycle of 150 % for 60 s or  $I_{max\ DC}$  for 5 s with a duty cycle duration of 300 s.

<sup>2)</sup> The current demand for the 400 V AC auxiliary power supply is drawn from the line input voltage.

<sup>3)</sup> The specified power loss represents the maximum value at 100 % utilization. The value is lower under normal operating conditions.

<sup>4)</sup> Total sound pressure level of Active Interface Module and Active Line Module.

<sup>5)</sup> Sum of all motor cables and DC link. Longer cable lengths for specific configurations are available on request.

<sup>6)</sup> The cabinet height increases by 250 mm with IP21 degree of protection, and by 400 mm with IP23, IP43, IP54 degrees of protection.

## Technical data

Line voltage 500 ... 690 V 3 AC		Active Line Modules			
		6SL3730-7TG35-8BA3	6SL3730-7TG37-4BA3 6SL3730-7TG37-4BC3	6SL3730-7TG41-0BA3 6SL3730-7TG41-0BC3	6SL3730-7TG41-3BA3 6SL3730-7TG41-3BC3
<i>For a parallel circuit configuration, mounted to the left at the Line Connection Module</i>					
<b>Rated power</b>					
• For $I_{N\ DC}$ (50 Hz 690 V)	kW	<b>560</b>	<b>800</b>	<b>1100</b>	<b>1400</b>
• For $I_{H\ DC}$ (50 Hz 690 V)	kW	550	705	980	1215
• For $I_{N\ DC}$ (50 Hz 500 V)	kW	435	560	780	965
• For $I_{H\ DC}$ (50 Hz 500 V)	kW	400	510	710	880
• For $I_{N\ DC}$ (60 Hz 575 V)	hp	600	900	1250	1500
• For $I_{H\ DC}$ (60 Hz 575 V)	hp	450	600	1000	1250
<b>DC link current</b>					
• Rated current $I_{N\ DC}$	A	644	823	1148	1422
• Base load current $I_{H\ DC}$ <sup>1)</sup>	A	573	732	1022	1266
• Maximum current $I_{max\ DC}$	A	966	1234	1722	2133
<b>Infeed/regenerative feedback current</b>					
• Rated current $I_{N\ E}$	A	575	735	1025	1270
• Maximum current $I_{max\ E}$	A	862	1102	1537	1905
<b>Current demand <sup>2)</sup></b>					
• 24 V DC auxiliary power supply	A	1.57	1.67	1.87	1.87
• 230 V AC auxiliary power supply	A	4.6	4.9	4.9	4.9
• 500 V AC	A	3.0	4.4	4.4	4.4
• 690 V AC	A	2.1	3.1	3.1	3.1
<b>DC link capacitance</b>					
• Active Line Module	μF	7400	11100	14400	19200
• Drive line-up, max.	μF	59200	153600	153600	153600
<b>Power loss, max. <sup>3)</sup></b>					
• At 50 Hz 500/690 V	kW	13.6	19.2	22.8	26.1
• At 60 Hz 575 V	kW	13.0	18.6	22.1	24.9
<b>Cooling air requirement</b>					
	m <sup>3</sup> /s	1.58	1.88	1.88	1.88
<b>Sound pressure level <math>L_{pA}</math> <sup>4)</sup></b> (1 m) at 50/60 Hz					
	dB	77/79	77/79	77/79	77/79
<b>PE/GND connection</b>					
• Busbar cross-section	mm <sup>2</sup>	600	600	600	600
• Conductor cross-section, max. (IEC)	mm <sup>2</sup>	240	240	240	240
<b>Cable length, max. <sup>5)</sup></b>					
• Shielded	m	2250	2250	2250	2250
• Unshielded	m	3375	3375	3375	3375
<b>Degree of protection</b>					
		IP20	IP20	IP20	IP20
<b>Dimensions</b>					
• Width	mm	1000	1400	1400	1400
• Height <sup>6)</sup>	mm	2200	2200	2200	2200
• Depth	mm	600	600	600	600
<b>Weight, approx.</b>					
	kg	930	1360	1360	1360
<b>Frame size</b>					
		HX + HI	JX + JI	JX + JI	JX + JI

<sup>1)</sup> The base load current  $I_{H\ DC}$  is the basis for a duty cycle of 150 % for 60 s or  $I_{max\ DC}$  for 5 s with a duty cycle duration of 300 s.

<sup>2)</sup> The current demand for the 500 V/690 V AC auxiliary power supply is drawn from the line input voltage.

<sup>3)</sup> The specified power loss represents the maximum value at 100 % utilization. The value is lower under normal operating conditions.

<sup>4)</sup> Total sound pressure level of Active Interface Module and Active Line Module.

<sup>5)</sup> Sum of all motor cables and DC link. Longer cable lengths for specific configurations are available on request.

<sup>6)</sup> The cabinet height increases by 250 mm with IP21 degree of protection, and by 400 mm with IP23, IP43, IP54 degrees of protection.



# SINAMICS S120 Cabinet Modules

## Active Line Modules including Active Interface Modules

### Options

The table below lists the options available for Active Line Modules ([Details → Description of the options](#)):

Available options	Order code
CBC10 Communication Board	<b>G20</b> <sup>1)</sup>
CBE20 Communication Board	<b>G33</b> <sup>1)</sup>
AOP30 Advanced Operator Panel installed in the cabinet door	<b>K08</b> <sup>1)</sup>
CU320-2 DP Control Unit	<b>K90</b>
Performance expansion for CU320-2 Control Unit	<b>K94</b> <sup>1)</sup>
CU320-2 PN Control Unit	<b>K95</b>
Cabinet anti-condensation heating	<b>L55</b>
25/125 kW braking unit (can be used for frame size FX) for line voltages of 380 ... 480 V and 660 ... 690 V	<b>L61</b>
50/250 kW braking unit (can be used for frame size GX/HX/JX) for line voltages of 380 ... 480 V and 660 ... 690 V	<b>L62</b>
25/125 kW braking unit (can be used for frame size FX) for line voltages of 500 ... 600 V	<b>L64</b>
50/250 kW braking unit (can be used for frame size GX/HX/JX) for line voltages of 500 ... 600 V	<b>L65</b>
Base 100 mm high, RAL 7022	<b>M06</b>
Cable-marshalling space 200 mm high, RAL 7035	<b>M07</b>
IP21 degree of protection	<b>M21</b>
IP23 degree of protection (includes <b>M60</b> )	<b>M23</b>
Side panel mounted at the right	<b>M26</b>
Side panel mounted at the left	<b>M27</b>
IP43 degree of protection (includes <b>M60</b> )	<b>M43</b>
IP54 degree of protection (includes <b>M60</b> )	<b>M54</b>
Closed cabinet door, air intake from below through floor opening	<b>M59</b>
Additional touch protection (included in <b>M23</b> , <b>M43</b> and <b>M54</b> )	<b>M60</b>
DC busbar system ( $I_d = 1170$ A, $1 \times 60 \times 10$ mm)	<b>M80</b>
DC busbar system ( $I_d = 1500$ A, $1 \times 80 \times 10$ mm)	<b>M81</b>
DC busbar system ( $I_d = 1840$ A, $1 \times 100 \times 10$ mm)	<b>M82</b>
DC busbar system ( $I_d = 2150$ A, $2 \times 60 \times 10$ mm)	<b>M83</b>
DC busbar system ( $I_d = 2730$ A, $2 \times 80 \times 10$ mm)	<b>M84</b>
DC busbar system ( $I_d = 3320$ A, $2 \times 100 \times 10$ mm)	<b>M85</b>
DC busbar system ( $I_d = 3720$ A, $3 \times 80 \times 10$ mm)	<b>M86</b>
DC busbar system ( $I_d = 4480$ A, $3 \times 100 \times 10$ mm)	<b>M87</b>
Crane transport assembly (top-mounted)	<b>M90</b>

Available options	Order code
Special paint finish for cabinet	<b>Y09</b>
Factory assembly as transport units	<b>Y11</b>
One-line label for system identification, $40 \times 80$ mm	<b>Y31</b>
Two-line label for system identification, $40 \times 180$ mm	<b>Y32</b>
Four-line label for system identification, $40 \times 180$ mm	<b>Y33</b>
Customer documentation (circuit diagram, terminal diagram, layout diagram) in DXF format	<b>D02</b>
Preliminary version of customer documentation in PDF format	<b>D14</b>
Documentation in English/French	<b>D58</b>
Documentation in English/Spanish	<b>D60</b>
Documentation in English/Italian	<b>D80</b>
Without Operating Instructions	<b>D99</b>
Rating plate data in English/French	<b>T58</b>
Rating plate data in English/Spanish	<b>T60</b>
Rating plate data in English/Italian	<b>T80</b>
Visual acceptance	<b>F03</b>
Function test without connected motor	<b>F71</b>
Insulation test	<b>F77</b>
Customer-specific acceptance inspections (on request)	<b>F97</b>

<sup>1)</sup> Only together with option **K90** or **K95** (installed in the Active Line Module).

## Options

## Option selection matrix for Active Line Modules

Certain options can mutually exclude one another (options that are not involved are not shown).

✓	Possible combination
–	Combination not possible

## Electrical options

	G20	G33	K90	K95	L61/64	L62/65
G20		–	✓	✓	✓	✓
G33	–		✓	✓	✓	✓
K90	✓	✓		–	✓	✓
K95	✓	✓	–		✓	✓
L61/64	✓	✓	✓	✓		–
L62/65	✓	✓	✓	✓	–	

## Mechanical/electrical options

	M06	M07	M21	M23	M26	M27	M43	M54	M60	M90	Y11	Y31	Y32	Y33
M06		–	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
M07	–		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
M21	✓	✓		–	✓	✓	–	–	✓	✓	✓	✓	✓	✓
M23	✓	✓	–		✓	✓	–	–	– <sup>1)</sup>	✓	✓	✓	✓	✓
M26	✓	✓	✓	✓		–	✓	✓	✓	✓	✓	✓	✓	✓
M27	✓	✓	✓	✓	–		✓	✓	✓	✓	✓	✓	✓	✓
M43	✓	✓	–	–	✓	✓		–	– <sup>1)</sup>	✓	✓	✓	✓	✓
M54	✓	✓	–	–	✓	✓	–		– <sup>1)</sup>	✓	✓	✓	✓	✓
M60	✓	✓	✓	– <sup>1)</sup>	✓	✓	– <sup>1)</sup>	– <sup>1)</sup>		✓	✓	✓	✓	✓
M90	✓	✓	✓	✓	✓	✓	✓	✓	✓		–	✓	✓	✓
Y11	✓	✓	✓	✓	✓	✓	✓	✓	✓	–		✓	✓	✓
Y31	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		–	–
Y32	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	–		–
Y33	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	–	–	

<sup>1)</sup> The option **M60** is included in **M23**, **M43** and **M54**.

# SINAMICS S120 Cabinet Modules

## Active Line Modules including Active Interface Modules

### Options

DC busbar system mechanical options (busbars between individual Cabinet Modules)

	M80	M81	M82	M83	M84	M85	M86	M87
M80		-	-	✓	-	-	-	-
M81	-		-	-	✓	-	✓	-
M82	-	-		-	-	✓	-	✓
M83	✓	-	-		-	-	-	-
M84	-	✓	-	-		-	✓	-
M85	-	-	✓	-	-		-	✓
M86	-	✓	-	-	✓	-		-
M87	-	-	✓	-	-	✓	-	

Documentation

	D02	D14	D58	D60	D80	D99
D02		✓	✓	✓	✓	-
D14	✓		✓	✓	✓	-
D58	✓	✓		-	-	-
D60	✓	✓	-		-	-
D80	✓	✓	-	-		-
D99	-	-	-	-	-	

Rating plate data

	T58	T60	T80
T58		-	-
T60	-		-
T80	-	-	

## Overview



Motor Modules are also available as Booksize Cabinet Kits in voltage class 380 V to 480 V (DC link voltage 510 V to 720 V).

The following Motor Modules are available:

- Single Motor Modules for power ratings of 1.6 kW to 107 kW to connect a motor
- Double Motor Modules for power ratings of 1.6 kW to 9.7 kW to connect two motors

## Design

Motor Modules booksize format are installed in the factory as Booksize Cabinet Kits in Booksize Base Cabinets. This complete unit contains all of the components necessary for operation.

Several Booksize Cabinet Kits can be installed in one Booksize Base Cabinet, depending on the installation width requirements, which in turn depend on the power rating. The number of Booksize Cabinet Kits that can be installed in a Booksize Base Cabinet is determined solely on the basis of the available cabinet width. By changing the way in which the cabinet width is used (i.e. the equipment that is installed), it can be adapted to suit system requirements.

Each Motor Module is connected separately to the DC busbar of the SINAMICS S120 Cabinet Module via a separate fuse switch disconnecter with integrated fuses. The DC connecting busbar integrated in the units is not used.

The basic version of the Booksize Cabinet Kit comprises the following components:

- Motor Module, booksize format
- Fuse switch disconnecter for each Motor Module installed
- Customer interface -X55.1 located in the connection area of the Booksize Base Cabinet
- Shield connection plate
- Complete electrical connection to the Booksize Base Cabinet interfaces

## Motor Modules Booksize Cabinet Kits format

Whereas Single Motor Modules have one inverter connection, Double Motor Modules combine two inverters in a single module. For each Double Motor Module that is installed in a Booksize Cabinet Kit, the customer interface, the motor connection and in some cases also options for separate control, are provided twice and shown in the option selection table.

The Booksize Base Cabinets can be operated up to and including IP54 degree of protection without additional temperature derating. However, some values need to be taken into account that differ from those of the chassis format. [Derating data](#), see the [System overview](#) → [Characteristic curves](#).

## Selection and ordering data

Type rating at 400 V kW	Rated output current $I_N$ A	Installation width mm	Single Motor Module Booksize Cabinet Kit Order No.
<b>Line voltage 380 ... 480 V 3 AC (DC link voltage 510 ... 720 V DC)</b>			
1.6	3	100	<b>6SL3720-1TE13-0AB3</b>
2.7	5	100	<b>6SL3720-1TE15-0AB3</b>
4.8	9	100	<b>6SL3720-1TE21-0AB3</b>
9.7	18	100	<b>6SL3720-1TE21-8AB3</b>
16	30	100	<b>6SL3720-1TE23-0AB3</b>
24	45	200	<b>6SL3720-1TE24-5AB3</b>
32	60	200	<b>6SL3720-1TE26-0AB3</b>
46	85	200	<b>6SL3720-1TE28-5AB3</b>
71	132	300	<b>6SL3720-1TE31-3AB3</b>
107	200	300	<b>6SL3720-1TE32-0AB3</b>

Type rating at 400 V kW	Rated output current $I_N$ A	Installation width mm	Double Motor Module Booksize Cabinet Kit Order No.
<b>Line voltage 380 ... 480 V 3 AC (DC link voltage 510 ... 720 V DC)</b>			
2 × 1.6	2 × 3	200	<b>6SL3720-2TE13-0AB3</b>
2 × 2.7	2 × 5	200	<b>6SL3720-2TE15-0AB3</b>
2 × 4.8	2 × 9	200	<b>6SL3720-2TE21-0AB3</b>
2 × 9.7	2 × 18	200	<b>6SL3720-2TE21-8AB3</b>

Booksize Cabinet Kits must always be ordered in combination with at least one Booksize Base Cabinet (cannot be supplied as a single unit).

The required number of Booksize Cabinet Kits installed in a Booksize Base Cabinet must be stated in plain text in the order. The number of possible kits is limited only by the usable installation width of the Booksize Base Cabinet.

Booksize Base Cabinets ready to be installed in the Booksize Cabinet Kits:

Usable installation width mm	Weight, approx. kg	Dimension for IP20 degree of protection <sup>1)</sup> (W × D × H) mm	Booksize Base Cabinet Order No.
600	170	800 × 600 × 2200	<b>6SL3720-1TX38-0AA3</b>
1000	240	1200 × 600 × 2200	<b>6SL3720-1TX41-2AA3</b>

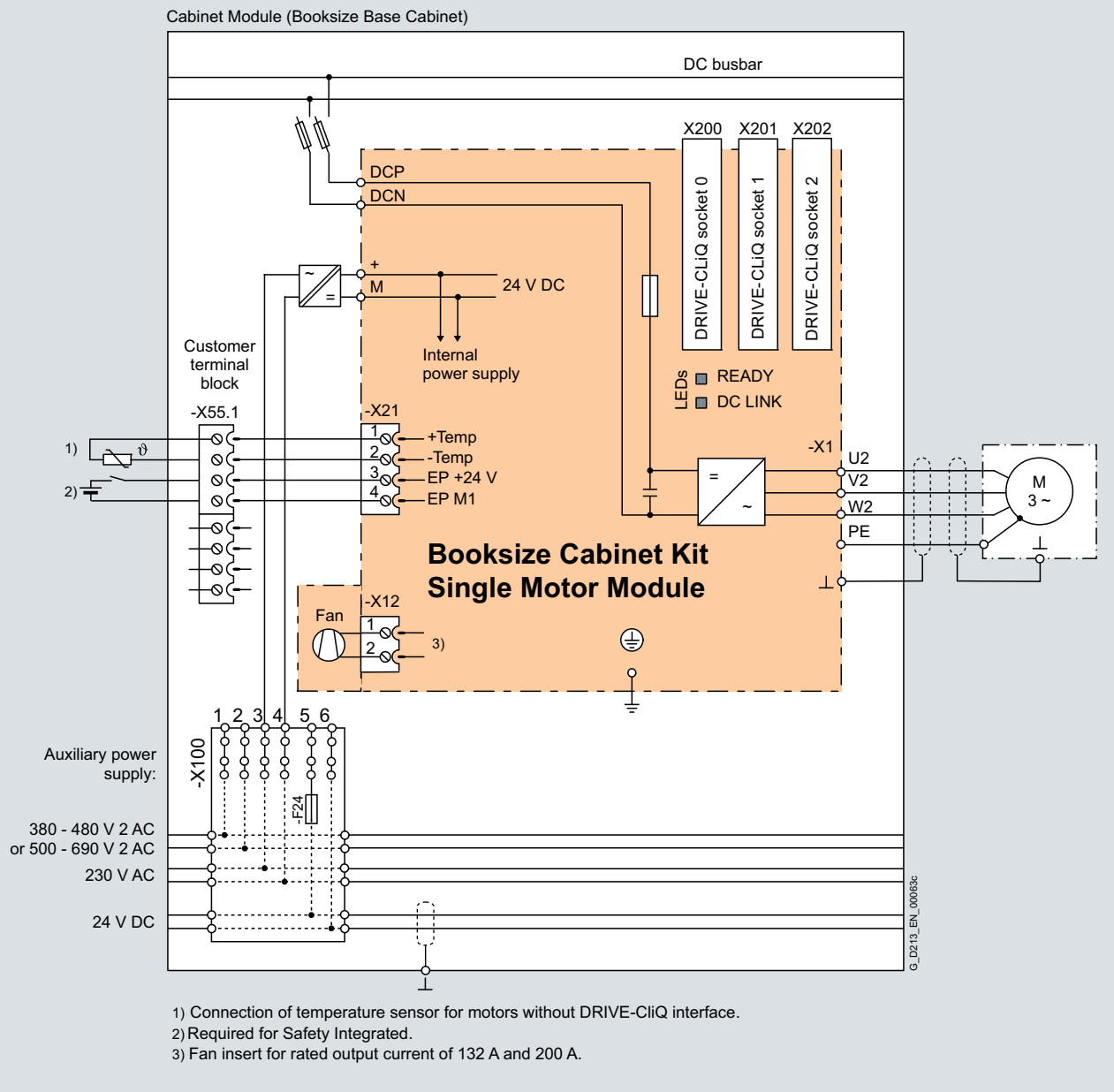
<sup>1)</sup> The cabinet height increases by 250 mm with IP21 degree of protection, and by 400 mm with IP23, IP43 and IP54 degrees of protection.

# SINAMICS S120 Cabinet Modules

## Motor Modules Booksize Cabinet Kits format

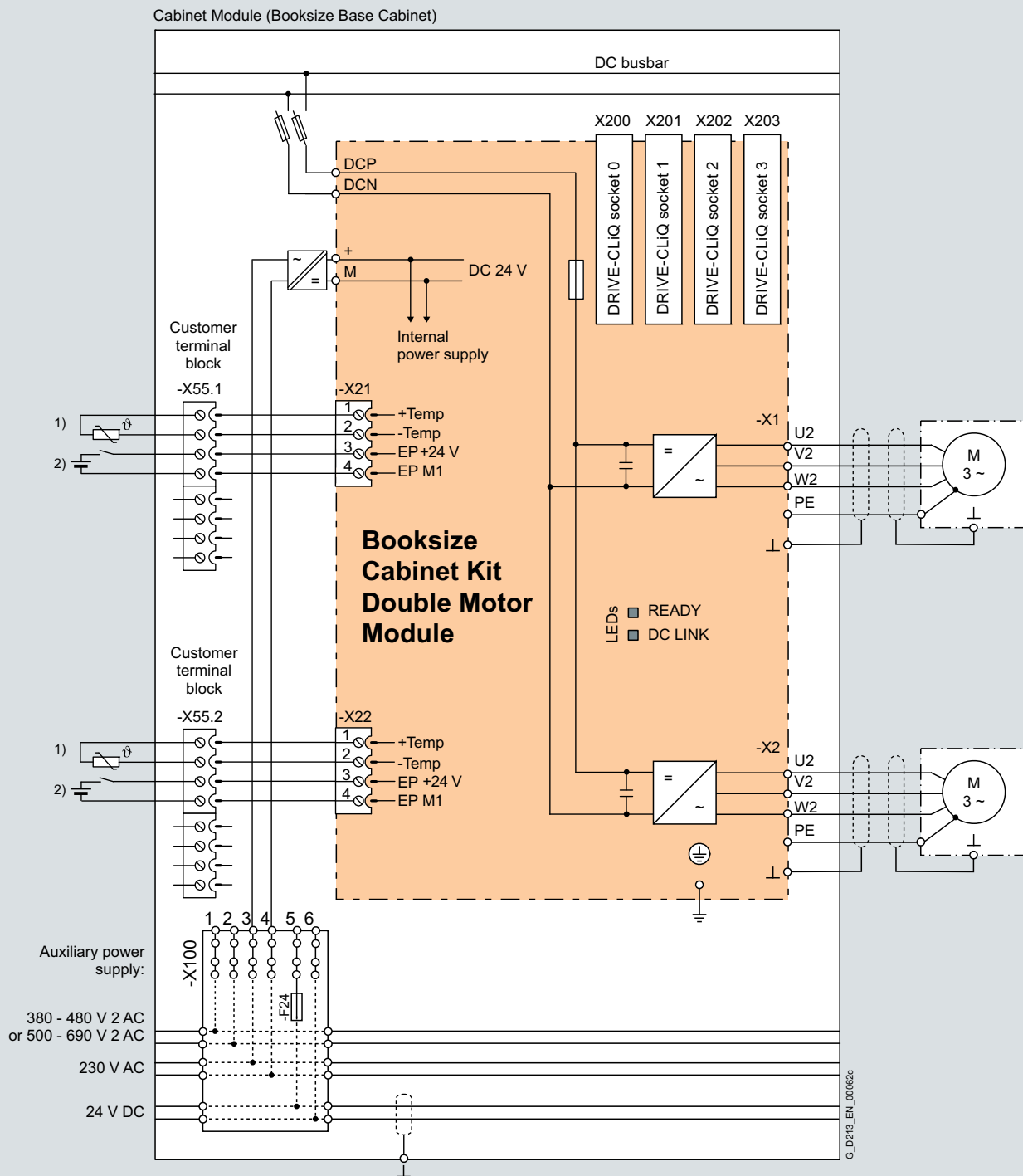
### Integration

3



Connection example: Single Motor Module, Booksize Cabinet Kit format

## Integration



- 1) Connection of temperature sensor for motors without DRIVE-CliQ interface.
- 2) Required for Safety Integrated.

Connection example: Double Motor Module, Booksize Cabinet Kit format

# SINAMICS S120 Cabinet Modules

## Motor Modules Booksize Cabinet Kits format

### Technical data

Line voltage 380 ... 480 V 3 AC DC link voltage 510 ... 720 V DC		Single Motor Modules Booksize Cabinet Kit				
		6SL3720-1TE13-0AB3	6SL3720-1TE15-0AB3	6SL3720-1TE21-0AB3	6SL3720-1TE21-8AB3	
<b>Type rating</b>						
• For $I_L$ (50 Hz 400 V) <sup>1)</sup>	kW	<b>1.6</b>	<b>2.7</b>	<b>4.8</b>	<b>9.7</b>	
• For $I_H$ (50 Hz 400 V) <sup>1)</sup>	kW	1.4	2.3	4.1	8.2	
• For $I_L$ (60 Hz 460 V) <sup>2)</sup>	hp	1.5	3	5	10	
• For $I_H$ (60 Hz 460 V) <sup>2)</sup>	hp	1	2	5	10	
<b>Output current</b>						
• Rated current $I_{NA}$	A	3	5	9	18	
• Base load current $I_H$ <sup>3)</sup>	A	2.3	4.3	7.7	15.3	
• Maximum current $I_{maxA}$	A	6.0	10.0	18.0	36.0	
<b>DC link current <math>I_d</math> <sup>4)</sup></b>	A	3.6	6	11	22	
<b>Current demand</b>						
• 24 V DC, max.	A	0.85	0.85	0.85	0.85	
<b>DC link capacitance</b>		μF	110	110	110	220
<b>Pulse frequency <sup>5)</sup></b>						
• Rated frequency	kHz	4	4	4	4	
• Pulse frequency, max.						
- With current derating	kHz	16	16	16	16	
<b>Power loss, max. <sup>6)</sup></b>						
• At 50 Hz 400 V	kW	0.035	0.055	0.08	0.165	
• At 60 Hz 460 V	kW	0.035	0.055	0.08	0.165	
<b>Cooling air requirement</b>		m <sup>3</sup> /s	0.008	0.008	0.008	0.008
<b>Sound pressure level <math>L_{pA}</math></b> (1 m) at 50/60 Hz		dB	< 60	< 60	< 60	< 60
<b>Motor connection</b> U2, V2, W2		Terminal	Terminal	Terminal	Terminal	
• Conductor cross-section, max. (IEC)	mm <sup>2</sup>	6	6	6	6	
<b>Cable length, max. <sup>7)</sup></b>						
• Shielded	m	50	50	50	70	
• Unshielded	m	75	75	75	100	
<b>PE/GND connection</b>		PE bar	PE bar	PE bar	PE bar	
• Busbar cross-section	mm <sup>2</sup>	600	600	600	600	
• Conductor cross-section, max. (IEC)	mm <sup>2</sup>	240	240	240	240	
<b>Degree of protection</b>		IP20	IP20	IP20	IP20	
<b>Weight, approx.</b>	kg	20.1	20.1	20	20	
<b>Installation width</b>	mm	100	100	100	100	

<sup>1)</sup> Rated power of a typ. 6-pole standard induction motor based on  $I_L$  or  $I_H$  with 400 V 3 AC 50 Hz.

<sup>2)</sup> Rated power of a typ. 6-pole standard induction motor based on  $I_L$  or  $I_H$  with 460 V 3 AC 60 Hz.

<sup>3)</sup> The base load current  $I_L$  is the basis for a duty cycle of 110 % for 60 s or 150 % for 10 s with a duty cycle duration of 300 s.

<sup>4)</sup> For a DC link voltage of 600 V DC.

<sup>5)</sup> Information regarding the correlation between the pulse frequency and max. output current/output frequency is provided in the SINAMICS Low Voltage Engineering Manual.

<sup>6)</sup> The specified power loss represents the maximum value at 100 % utilization. The value is lower under normal operating conditions.

<sup>7)</sup> Sum of all motor cables. Longer cable lengths for specific configurations are available on request.

## Technical data

Line voltage 380 ... 480 V 3 AC DC link voltage 510 ... 720 V DC		Single Motor Modules Booksize Cabinet Kit					
		6SL3720-1TE23-0AB3	6SL3720-1TE24-5AB3	6SL3720-1TE26-0AB3	6SL3720-1TE28-5AB3	6SL3720-1TE31-3AB3	6SL3720-1TE32-0AB3
<b>Type rating</b>							
• For $I_L$ (50 Hz 400 V) <sup>1)</sup>	kW	<b>16</b>	<b>24</b>	<b>32</b>	<b>46</b>	<b>71</b>	<b>107</b>
• For $I_H$ (50 Hz 400 V) <sup>1)</sup>	kW	13.7	21	28	37	57	76
• For $I_L$ (60 Hz 460 V) <sup>2)</sup>	hp	20	30	40	60	100	150
• For $I_H$ (60 Hz 460 V) <sup>2)</sup>	hp	15	25	40	50	75	100
<b>Output current</b>							
• Rated current $I_{NA}$	A	30	45	60	85	132	200
• Base load current $I_H$ <sup>3)</sup>	A	25.5	38	52	68	105	141
• Maximum current $I_{max A}$	A	56	85	113	141	210	282
<b>DC link current <math>I_d</math> <sup>4)</sup></b>	A	36	54	72	102	158	200
<b>Current demand</b>							
• 24 V DC, max.	A	0.9	1.2	1.2	1.5	1.5	1.5
<b>DC link capacitance</b>	μF	710	1175	1410	1880	2820	3995
<b>Pulse frequency <sup>5)</sup></b>							
• Rated frequency	kHz	4	4	4	4	4	4
• Pulse frequency, max. - With current derating	kHz	16	16	16	16	16	16
<b>Power loss, max. <sup>6)</sup></b>							
• At 50 Hz 400 V	kW	0.29	0.43	0.59	0.75	1.25	2.05
• At 60 Hz 460 V	kW	0.29	0.43	0.59	0.75	1.25	2.05
<b>Cooling air requirement</b>	m <sup>3</sup> /s	0.016	0.031	0.031	0.044	0.144	0.144
<b>Sound pressure level <math>L_{pA}</math> (1 m) at 50/60 Hz</b>	dB	< 60	< 65	< 65	< 60	< 73	< 73
<b>Motor connection U2, V2, W2</b>		Terminal	Terminal	Terminal	Terminal	Terminal	Terminal
• Conductor cross-section, max. (IEC)	mm <sup>2</sup>	6	16	16	35	70	95
<b>Cable length, max. <sup>7)</sup></b>							
• Shielded	m	100	100	100	100	100	100
• Unshielded	m	150	150	150	150	150	150
<b>PE/GND connection</b>		PE bar	PE bar	PE bar	PE bar	PE bar	PE bar
• Busbar cross-section	mm <sup>2</sup>	600	600	600	600	600	600
• Conductor cross-section, max. (IEC)	mm <sup>2</sup>	240	240	240	240	240	240
<b>Degree of protection</b>		IP20	IP20	IP20	IP20	IP20	IP20
<b>Weight, approx.</b>	kg	21.9	27	27	33	41	41
<b>Installation width</b>	mm	100	200	200	200	300	300

<sup>1)</sup> Rated power of a typ. 6-pole standard induction motor based on  $I_L$  or  $I_H$  with 400 V 3 AC 50 Hz.

<sup>2)</sup> Rated power of a typ. 6-pole standard induction motor based on  $I_L$  or  $I_H$  with 460 V 3 AC 60 Hz.

<sup>3)</sup> The base load current  $I_L$  is the basis for a duty cycle of 110 % for 60 s or 150 % for 10 s with a duty cycle duration of 300 s.

<sup>4)</sup> For a DC link voltage of 600 V DC.

<sup>5)</sup> Information regarding the correlation between the pulse frequency and max. output current/output frequency is provided in the SINAMICS Low Voltage Engineering Manual.

<sup>6)</sup> The specified power loss represents the maximum value at 100 % utilization. The value is lower under normal operating conditions.

<sup>7)</sup> Sum of all motor cables. Longer cable lengths for specific configurations are available on request.



# SINAMICS S120 Cabinet Modules

## Motor Modules Booksize Cabinet Kits format

### Technical data

Line voltage 380 ... 480 V 3 AC DC link voltage 510 ... 720 V DC		Double Motor Modules Booksize Cabinet Kit				
		6SL3720-2TE13-0AB3	6SL3720-2TE15-0AB3	6SL3720-2TE21-0AB3	6SL3720-2TE21-8AB3	
<b>Type rating</b>						
• For $I_L$ (50 Hz 400 V) <sup>1)</sup>	kW	<b>2 × 1.6</b>	<b>2 × 2.7</b>	<b>2 × 4.8</b>	<b>2 × 9.7</b>	
• For $I_H$ (50 Hz 400 V) <sup>1)</sup>	kW	2 × 1.4	2 × 2.3	2 × 4.1	2 × 8.2	
• For $I_L$ (60 Hz 460 V) <sup>2)</sup>	hp	2 × 1.5	2 × 3	2 × 5	2 × 10	
• For $I_H$ (60 Hz 460 V) <sup>2)</sup>	hp	2 × 1	2 × 2	2 × 5	2 × 10	
<b>Output current</b>						
• Rated current $I_{NA}$	A	2 × 3	2 × 5	2 × 9	2 × 18	
• Base load current $I_H$ <sup>3)</sup>	A	2 × 2.6	2 × 4.3	2 × 7.7	2 × 15.3	
• Maximum current $I_{maxA}$	A	2 × 6	2 × 10	2 × 18	2 × 36	
<b>DC link current <math>I_d</math> <sup>4)</sup></b>	A	7.2	12	22	43	
<b>Current demand</b>						
• 24 V DC, max.	A	0.85	0.85	0.85	0.85	
<b>DC link capacitance</b>		μF	110	220	220	710
<b>Pulse frequency <sup>5)</sup></b>						
• Rated frequency	kHz	4	4	4	4	
• Pulse frequency, max.						
- With current derating	kHz	16	16	16	16	
<b>Power loss, max. <sup>6)</sup></b>						
• At 50 Hz 400 V	kW	0.07	0.11	0.16	0.32	
• At 60 Hz 460 V	kW	0.07	0.11	0.16	0.32	
<b>Cooling air requirement</b>		m <sup>3</sup> /s	0.008	0.008	0.008	0.016
<b>Sound pressure level <math>L_{pA}</math></b> (1 m) at 50/60 Hz		dB	< 60	< 60	< 60	< 60
<b>Motor connection</b> U2, V2, W2		Terminal	Terminal	Terminal	Terminal	
• Conductor cross-section, max. (IEC)	mm <sup>2</sup>	6	6	6	6	
<b>Cable length, max. <sup>7)</sup></b>						
• Shielded	m	50	50	50	70	
• Unshielded	m	75	75	75	100	
<b>PE/GND connection</b>		PE bar	PE bar	PE bar	PE bar	
• Busbar cross-section	mm <sup>2</sup>	600	600	600	600	
• Conductor cross-section, max. (IEC)	mm <sup>2</sup>	240	240	240	240	
<b>Degree of protection</b>		IP20	IP20	IP20	IP20	
<b>Weight, approx.</b>	kg	23.3	23.3	23.3	24.8	
<b>Installation width</b>	mm	200	200	200	200	

<sup>1)</sup> Rated power of a typ. 6-pole standard induction motor based on  $I_L$  or  $I_H$  with 400 V 3 AC 50 Hz.

<sup>2)</sup> Rated power of a typ. 6-pole standard induction motor based on  $I_L$  or  $I_H$  with 460 V 3 AC 60 Hz.

<sup>3)</sup> The base load current  $I_L$  is the basis for a duty cycle of 110 % for 60 s or 150 % for 10 s with a duty cycle duration of 300 s.

<sup>4)</sup> For a DC link voltage of 600 V DC.

<sup>5)</sup> Information regarding the correlation between the pulse frequency and max. output current/output frequency is provided in the SINAMICS Low Voltage Engineering Manual.

<sup>6)</sup> The specified power loss represents the maximum value at 100 % utilization. The value is lower under normal operating conditions.

<sup>7)</sup> Sum of all motor cables. Longer cable lengths for specific configurations are available on request.

## Options

The table below lists the options available for Motor Modules in the Booksize Cabinet Kit format as well as the Booksize Base Cabinets ([Details → Description of the options](#)):

Available options	Order code	Booksize Cabinet Kits	Booksize Base Cabinet
CBC10 Communication Board	<b>G20</b>	✓ <sup>1)</sup>	–
CBE20 Communication Board	<b>G33</b>	✓ <sup>1)</sup>	–
Safety license for 1 to 5 axes	<b>K01 to K05</b>	✓	–
AOP30 Advanced Operator Panel installed in the cabinet door	<b>K08</b>	✓ <sup>1)</sup>	–
SMC10 Sensor Module Cabinet-Mounted	<b>K46</b>	✓ <sup>2)</sup>	–
SMC20 Sensor Module Cabinet-Mounted	<b>K48</b>	✓ <sup>2)</sup>	–
SMC30 Sensor Module Cabinet-Mounted	<b>K50</b>	✓ <sup>2)</sup>	–
VSM10 Voltage Sensing Module	<b>K51</b>	✓ <sup>2)</sup>	–
Terminal module for controlling the Safe Torque Off and Safe Stop 1 safety functions	<b>K82</b>	✓ <sup>2)</sup>	–
TM54F Terminal Module	<b>K87</b>	✓	–
CU320-2 DP Control Unit	<b>K90</b>	✓	–
Performance expansion for CU320-2 Control Unit	<b>K94</b>	✓ <sup>1)</sup>	–
CU320-2 PN Control Unit	<b>K95</b>	✓	–
Motor reactor	<b>L08</b>	✓ <sup>2)</sup>	–
2 motor reactors in series (not available for Double Motor Modules)	<b>L09</b>	✓	–
DC interface incl. pre-charging circuit of the associated DC link capacitance	<b>L37</b>	✓	–
Cabinet anti-condensation heating	<b>L55</b>	–	✓
Base 100 mm high, RAL 7022	<b>M06</b>	–	✓
Cable-marshalling space 200 mm high, RAL 7035	<b>M07</b>	–	✓
IP21 degree of protection	<b>M21</b>	–	✓
IP23 degree of protection (includes <b>M60</b> )	<b>M23</b>	–	✓
Side panel mounted at the right	<b>M26</b>	–	✓
Side panel mounted at the left	<b>M27</b>	–	✓
IP43 degree of protection (includes <b>M60</b> )	<b>M43</b>	–	✓
IP54 degree of protection (includes <b>M60</b> )	<b>M54</b>	–	✓
Closed cabinet door, air intake from below through floor opening	<b>M59</b>	–	✓
EMC shield bus	<b>M70</b>	–	✓
DC busbar system ( $I_d = 1170$ A, 1 × 60 × 10 mm)	<b>M80</b>	–	✓
DC busbar system ( $I_d = 1500$ A, 1 × 80 × 10 mm)	<b>M81</b>	–	✓
DC busbar system ( $I_d = 1840$ A, 1 × 100 × 10 mm)	<b>M82</b>	–	✓
DC busbar system ( $I_d = 2150$ A, 2 × 60 × 10 mm)	<b>M83</b>	–	✓
DC busbar system ( $I_d = 2730$ A, 2 × 80 × 10 mm)	<b>M84</b>	–	✓
DC busbar system ( $I_d = 3320$ A, 2 × 100 × 10 mm)	<b>M85</b>	–	✓
DC busbar system ( $I_d = 3720$ A, 3 × 80 × 10 mm)	<b>M86</b>	–	✓
DC busbar system ( $I_d = 4480$ A, 3 × 100 × 10 mm)	<b>M87</b>	–	✓
Crane transport assembly (top-mounted)	<b>M90</b>	–	✓
Special paint finish for cabinet	<b>Y09</b>	–	✓
Factory assembly as transport units	<b>Y11</b>	–	✓
One-line label for system identification, 40 × 80 mm	<b>Y31</b>	–	✓
Two-line label for system identification, 40 × 180 mm	<b>Y32</b>	–	✓
Four-line label for system identification, 40 × 180 mm	<b>Y33</b>	–	✓

<sup>1)</sup> Only together with option **K90** or **K95**.

<sup>2)</sup> In the case of the Double Motor Modules, these options are available for each inverter.

# SINAMICS S120 Cabinet Modules

## Motor Modules Booksize Cabinet Kits format

### Options

Available options	Order code	Booksize Cabinet Kits	Booksize Base Cabinet
Customer documentation (circuit diagram, terminal diagram, layout diagram) in DXF format	<b>D02</b>	–	✓
Preliminary version of customer documentation in PDF format	<b>D14</b>	–	✓
Documentation in English/French	<b>D58</b>	–	✓
Documentation in English/Spanish	<b>D60</b>	–	✓
Documentation in English/Italian	<b>D80</b>	–	✓
Without Operating Instructions	<b>D99</b>	–	✓
Rating plate data in English/French	<b>T58</b>	–	✓
Rating plate data in English/Spanish	<b>T60</b>	–	✓
Rating plate data in English/Italian	<b>T80</b>	–	✓
Visual acceptance	<b>F03</b>	–	✓
Function test without connected motor	<b>F71</b>	–	✓
Insulation test	<b>F77</b>	–	✓
Customer-specific acceptance inspections (on request)	<b>F97</b>	–	✓

### Option selection matrix for Booksize Cabinet Kits and Booksize Base Cabinets

Certain options can mutually exclude one another (options that are not involved are not shown).

✓	Possible combination
–	Combination not possible

#### Electrical options Booksize Cabinet Kits

	G20	G33	K46	K48	K50	K51	K90	K95	L08	L09
G20		–	✓	✓	✓	✓	✓	✓	✓	✓
G33	–		✓	✓	✓	✓	✓	✓	✓	✓
K46	✓	✓		–	–	–	✓	✓	✓	✓
K48	✓	✓	–		–	–	✓	✓	✓	✓
K50	✓	✓	–	–		–	✓	✓	✓	✓
K51	✓	✓	–	–	–		✓	✓	✓	✓
K90	✓	✓	✓	✓	✓	✓		–	✓	✓
K95	✓	✓	✓	✓	✓	✓	–		✓	✓
L08	✓	✓	✓	✓	✓	✓	✓	✓		–
L09	✓	✓	✓	✓	✓	✓	✓	✓	–	

#### Mechanical options for Booksize Base Cabinets

	M06	M07	M21	M23	M26	M27	M43	M54	M90	Y11	Y31	Y32	Y33
M06		–	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
M07	–		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
M21	✓	✓		–	✓	✓	–	–	✓	✓	✓	✓	✓
M23	✓	✓	–		✓	✓	–	–	✓	✓	✓	✓	✓
M26	✓	✓	✓	✓		–	✓	✓	✓	✓	✓	✓	✓
M27	✓	✓	✓	✓	–		✓	✓	✓	✓	✓	✓	✓
M43	✓	✓	–	–	✓	✓		–	✓	✓	✓	✓	✓
M54	✓	✓	–	–	✓	✓	–		✓	✓	✓	✓	✓
M90	✓	✓	✓	✓	✓	✓	✓	✓		–	✓	✓	✓
Y11	✓	✓	✓	✓	✓	✓	✓	✓	–		✓	✓	✓
Y31	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		–	–
Y32	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	–		–
Y33	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	–	–	

**Options**

DC busbar system mechanical options (busbars between individual Cabinet Modules)

	M80	M81	M82	M83	M84	M85	M86	M87
M80		-	-	✓	-	-	-	-
M81	-		-	-	✓	-	✓	-
M82	-	-		-	-	✓	-	✓
M83	✓	-	-		-	-	-	-
M84	-	✓	-	-		-	✓	-
M85	-	-	✓	-	-		-	✓
M86	-	✓	-	-	✓	-		-
M87	-	-	✓	-	-	✓	-	

Documentation

	D02	D14	D58	D60	D80	D99
D02		✓	✓	✓	✓	-
D14	✓		✓	✓	✓	-
D58	✓	✓		-	-	-
D60	✓	✓	-		-	-
D80	✓	✓	-	-		-
D99	-	-	-	-	-	

Rating plate data

	T58	T60	T80
T58		-	-
T60	-		-
T80	-	-	

# SINAMICS S120 Cabinet Modules

## Motor Modules chassis format

### Overview



Motor Modules in the chassis format are available in the power range from 75 kW to 1200 kW.

Line voltage	DC link voltage	Type rating
380 ... 480 V 3 AC	510 ... 720 V DC	110 ... 800 kW
500 ... 690 V 3 AC	675 ... 1035 V DC	75 ... 1200 kW

By connecting in parallel up to 4 Motor Modules, which are operated on one Control Unit and supply one motor, it is possible to increase the available shaft power to max. approx. 4500 kW (taking into account the derating factors according to the SINAMICS Low Voltage Engineering Manual).

SINAMICS S120 Motor Modules in the chassis format and Cabinet Modules can also be used as a braking module, if, instead of a motor, a 3-phase braking resistor is connected. [For more detailed information on this topic, please refer to the SINAMICS Low Voltage Engineering Manual.](#)

### Design

Motor Modules in the chassis format contain the following components:

- Retaining device for the DC busbar, including the connection to the DC connections of the Motor Module
- Nickel-plated connection busbars for motor cables for Motor Modules, frame sizes FX and GX; for Motor Modules, frame sizes HX and JX, the connection is made directly on the unit
- Cable propping bar for the electric power cables
- DRIVE-CLiQ interface (3 DRIVE-CLiQ sockets), without Control Unit
- Customer interface -X55
- Auxiliary power supply system (6-pole) for the auxiliary power supply, including cable connections for looping through to the next Cabinet Module
- Nickel-plated PE busbar (60 × 10 mm), including jumper for looping through to the next Cabinet Module
- EMC-compliant design thanks to additional shielding measures and appropriate laying of cables.

### Selection and ordering data

Type rating at 400 V or 690 V kW	Rated output current $I_N$ A	Motor Module chassis format Order No.
<b>Line voltage 380 ... 480 V 3 AC (DC link voltage 510 ... 720 V DC)</b>		
110	210	<b>6SL3720-1TE32-1AA3</b>
132	260	<b>6SL3720-1TE32-6AA3</b>
160	310	<b>6SL3720-1TE33-1AA3</b>
200	380	<b>6SL3720-1TE33-8AA3</b>
250	490	<b>6SL3720-1TE35-0AA3</b>
315	605	<b>6SL3720-1TE36-1AA3</b>
400	745	<b>6SL3720-1TE37-5AA3</b>
450	840	<b>6SL3720-1TE38-4AA3</b>
560	985	<b>6SL3720-1TE41-0AA3</b>
710	1260	<b>6SL3720-1TE41-2AA3</b>
800	1405	<b>6SL3720-1TE41-4AA3</b>
<b>Line voltage 500 ... 690 V 3 AC (DC link voltage 675 ... 1035 V DC)</b>		
75	85	<b>6SL3720-1TG28-5AA3</b>
90	100	<b>6SL3720-1TG31-0AA3</b>
110	120	<b>6SL3720-1TG31-2AA3</b>
132	150	<b>6SL3720-1TG31-5AA3</b>
160	175	<b>6SL3720-1TG31-8AA3</b>
200	215	<b>6SL3720-1TG32-2AA3</b>
250	260	<b>6SL3720-1TG32-6AA3</b>
315	330	<b>6SL3720-1TG33-3AA3</b>
400	410	<b>6SL3720-1TG34-1AA3</b>
450	465	<b>6SL3720-1TG34-7AA3</b>
560	575	<b>6SL3720-1TG35-8AA3</b>
710	735	<b>6SL3720-1TG37-4AA3</b>
800	810	<b>6SL3720-1TG38-1AA3</b>
900	910	<b>6SL3720-1TG38-8AA3</b>
1000	1025	<b>6SL3720-1TG41-0AA3</b>
1200	1270	<b>6SL3720-1TG41-3AA3</b>

## Motor Modules chassis format

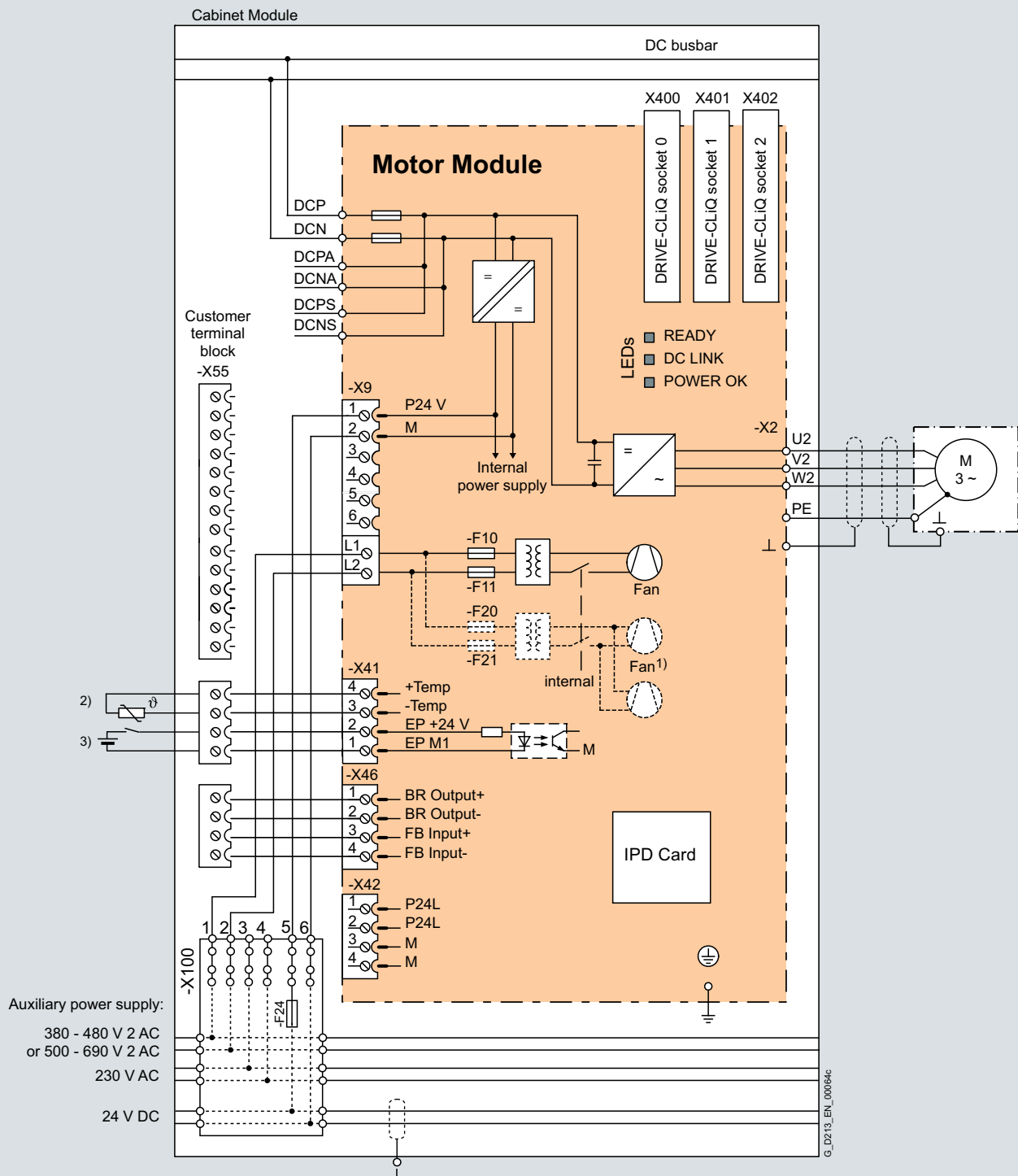
### Integration

Motor Modules are controlled by the CU320-2 DP or CU320-2 PN Control Unit. Communication between the Control Unit and Modules is established via a DRIVE-CLiQ connection.

If the Control Unit is integrated as an option with order code **K90** or **K95** in the same cabinet, then these communication cables

will already be installed. If the Control Unit is to be mounted externally, the DRIVE-CLiQ cable will not be included in the scope of delivery and must be configured on site.

For additional information, please refer to the [SINAMICS Low Voltage Engineering Manual](#).



- 1) The number and the terminals of the fans depend on the frame size.
- 2) Connection of temperature sensor for motors without DRIVE-CLiQ interface.
- 3) Required for Safety Integrated.

Connection example: Motor Module, chassis format

# SINAMICS S120 Cabinet Modules

## Motor Modules chassis format

### Technical data

Line voltage 380 ... 480 V 3 AC DC link voltage 510 ... 720 V DC		Motor Modules chassis format					
		6SL3720-1TE32-1AA3	6SL3720-1TE32-6AA3	6SL3720-1TE33-1AA3	6SL3720-1TE33-8AA3	6SL3720-1TE35-0AA3	6SL3720-1TE36-1AA3
<b>Type rating</b>							
• For $I_L$ (50 Hz 400 V) <sup>1)</sup>	kW	<b>110</b>	<b>132</b>	<b>160</b>	<b>200</b>	<b>250</b>	<b>315</b>
• For $I_H$ (50 Hz 400 V) <sup>1)</sup>	kW	90	110	132	160	200	250
• For $I_L$ (60 Hz 460 V) <sup>2)</sup>	hp	150	200	250	300	400	500
• For $I_H$ (60 Hz 460 V) <sup>2)</sup>	hp	150	200	200	250	350	350
<b>Output current</b>							
• Rated current $I_{NA}$	A	210	260	310	380	490	605
• Base load current $I_L$ <sup>3)</sup>	A	205	250	302	370	477	590
• Base load current $I_H$ <sup>4)</sup>	A	178	233	277	340	438	460
• Maximum current $I_{maxA}$	A	307	375	453	555	715	885
<b>DC link current</b>							
• Rated current $I_{NDC}$ when supplied from							
- Basic/Smart Line Module	A	252	312	372	456	588	726
- Active Line Module	A	227	281	335	411	529	653
• Base load current $I_{LDC}$ <sup>3)</sup> when supplied from							
- Basic/Smart Line Module	A	245	304	362	444	573	707
- Active Line Module	A	221	273	326	400	515	636
• Base load current $I_{HDC}$ <sup>4)</sup> when supplied from							
- Basic/Smart Line Module	A	224	277	331	405	523	646
- Active Line Module	A	202	250	298	365	470	581
<b>Current demand</b>							
• 24 V DC auxiliary power supply	A	0.8	0.8	0.9	0.9	0.9	1.0
• 400 V AC	A	0.63	1.13	1.8	1.8	1.8	3.6
<b>DC link capacitance</b>	μF	4200	5200	6300	7800	9600	12600
<b>Pulse frequency <sup>5)</sup></b>							
• Rated frequency	kHz	2	2	2	2	2	1.25
• Pulse frequency, max.							
- Without current derating	kHz	2	2	2	2	2	1.25
- With current derating	kHz	8	8	8	8	8	7.5
<b>Power loss, max. <sup>6)</sup></b>							
• At 50 Hz 400 V	kW	1.86	2.5	2.96	3.67	4.28	5.84
• At 60 Hz 460 V	kW	1.94	2.6	3.1	3.8	4.5	6.3
<b>Cooling air requirement</b>	m <sup>3</sup> /s	0.17	0.23	0.36	0.36	0.36	0.78
<b>Sound pressure level <math>L_{pA}</math></b> (1 m) at 50/60 Hz	dB	67	69	69	69	69	72

<sup>1)</sup> Rated power of a typ. 6-pole standard induction motor based on  $I_L$  or  $I_H$  with 400 V 3 AC 50 Hz.

<sup>2)</sup> Rated power of a typ. 6-pole standard induction motor based on  $I_L$  or  $I_H$  with 460 V 3 AC 60 Hz.

<sup>3)</sup> The base load current  $I_L$  is the basis for a duty cycle of 110 % for 60 s or 150 % for 10 s with a duty cycle duration of 300 s.

<sup>4)</sup> The base load current  $I_H$  is the basis for a duty cycle of 150 % for 60 s or 160 % for 10 s with a duty cycle duration of 300 s.

<sup>5)</sup> Information regarding the correlation between the pulse frequency and max. output current/output frequency is provided in the SINAMICS Low Voltage Engineering Manual.

<sup>6)</sup> The specified power loss represents the maximum value at 100 % utilization. The value is lower under normal operating conditions.

## Technical data

Line voltage 380 ... 480 V 3 AC DC link voltage 510 ... 720 V DC		Motor Modules chassis format					
		6SL3720-1TE32-1AA3	6SL3720-1TE32-6AA3	6SL3720-1TE33-1AA3	6SL3720-1TE33-8AA3	6SL3720-1TE35-0AA3	6SL3720-1TE36-1AA3
<b>Motor connection</b> U2, V2, W2		M12 screws	M12 screws	M12 screws	M12 screws	M12 screws	M12 screws
• Conductor cross-section, max. (IEC)	mm <sup>2</sup>	2 × 185	2 × 185	2 × 240	2 × 240	2 × 240	4 × 240
<b>Cable length, max. <sup>7)</sup></b>							
• Shielded	m	300	300	300	300	300	300
• Unshielded	m	450	450	450	450	450	450
<b>PE/GND connection</b>		PE bar	PE bar	PE bar	PE bar	PE bar	PE bar
• Bar cross-section	mm <sup>2</sup>	600	600	600	600	600	600
• Conductor cross-section, max. (IEC)	mm <sup>2</sup>	240	240	240	240	240	240
<b>Degree of protection</b>		IP20	IP20	IP20	IP20	IP20	IP20
<b>Dimensions</b>							
• Width <sup>8)</sup>	mm	400	400	400	400	400	600
• Height <sup>9)</sup>	mm	2200	2200	2200	2200	2200	2200
• Depth	mm	600	600	600	600	600	600
<b>Weight, approx.</b>	kg	145	145	286	286	286	490
<b>Frame size</b>		FX	FX	GX	GX	GX	HX

<sup>7)</sup> Sum of all motor cables. Longer cable lengths for specific configurations are available on request. [For additional information, please refer to the SINAMICS Low Voltage Engineering Manual.](#)

<sup>8)</sup> With option **L10** (dv/dt filter plus VPL):  
 - Frame sizes FX/GX/HX/JX → Supplementary cabinet, 600 mm wide  
 With option **L34** (output-side circuit breaker):  
 - Frame sizes FX/GX → Supplementary cabinet, 400 mm wide  
 - Frame sizes HX/JX → Supplementary cabinet, 600 mm wide.

<sup>9)</sup> The cabinet height increases by 250 mm with IP21 degree of protection, and by 400 mm with IP23, IP43 and IP54 degrees of protection.



# SINAMICS S120 Cabinet Modules

## Motor Modules chassis format

### Technical data

Line voltage 380 ... 480 V 3 AC DC link voltage 510 ... 720 V DC		Motor Modules chassis format				
		6SL3720-1TE37-5AA3	6SL3720-1TE38-4AA3	6SL3720-1TE41-0AA3	6SL3720-1TE41-2AA3	6SL3720-1TE41-4AA3
<b>Type rating</b>						
• For $I_L$ (50 Hz 400 V) <sup>1)</sup>	kW	400	450	560	710	800
• For $I_H$ (50 Hz 400 V) <sup>1)</sup>	kW	315	400	450	560	710
• For $I_L$ (60 Hz 460 V) <sup>2)</sup>	hp	600	700	800	1000	1150
• For $I_H$ (60 Hz 460 V) <sup>2)</sup>	hp	450	600	700	900	1000
<b>Output current</b>						
• Rated current $I_{NA}$	A	745	840	985	1260	1405
• Base load current $I_L^{(3)}$	A	725	820	960	1230	1370
• Base load current $I_H^{(4)}$	A	570	700	860	1127	1257
• Maximum current $I_{max A}$	A	1087	1230	1440	1845	2055
<b>DC link current</b>						
• Rated current $I_{NDC}$ when supplied from						
- Basic/Smart Line Module	A	894	1008	1182	1512	1686
- Active Line Module	A	805	907	1064	1361	1517
• Base load current $I_{LDC}^{(3)}$ when supplied from						
- Basic/Smart Line Module	A	871	982	1152	1474	1643
- Active Line Module	A	784	884	1037	1326	1479
• Base load current $I_{HDC}^{(4)}$ when supplied from						
- Basic/Smart Line Module	A	795	897	1051	1345	1500
- Active Line Module	A	716	807	946	1211	1350
<b>Current demand</b>						
• 24 V DC auxiliary power supply	A	1.0	1.0	1.25	1.4	1.4
• 400 V AC	A	3.6	3.6	5.4	5.4	5.4
<b>DC link capacitance</b>						
	μF	15600	16800	18900	26100	28800
<b>Pulse frequency <sup>5)</sup></b>						
• Rated frequency	kHz	1.25	1.25	1.25	1.25	1.25
• Pulse frequency, max.						
- Without current derating	kHz	1.25	1.25	1.25	1.25	1.25
- With current derating	kHz	7.5	7.5	7.5	7.5	7.5
<b>Power loss, max. <sup>6)</sup></b>						
• At 50 Hz 400 V	kW	6.68	7.15	9.5	11.1	12
• At 60 Hz 460 V	kW	7.3	7.8	10.2	12.0	13
<b>Cooling air requirement</b>						
	m <sup>3</sup> /s	0.78	0.78	1.1	1.1	1.1
<b>Sound pressure level <math>L_{pA}</math> (1 m) at 50/60 Hz</b>						
	dB	72	72	72	72	72

<sup>1)</sup> Rated power of a typ. 6-pole standard induction motor based on  $I_L$  or  $I_H$  with 400 V 3 AC 50 Hz.

<sup>2)</sup> Rated power of a typ. 6-pole standard induction motor based on  $I_L$  or  $I_H$  with 460 V 3 AC 60 Hz.

<sup>3)</sup> The base load current  $I_L$  is the basis for a duty cycle of 110 % for 60 s or 150 % for 10 s with a duty cycle duration of 300 s.

<sup>4)</sup> The base load current  $I_H$  is the basis for a duty cycle of 150 % for 60 s or 160 % for 10 s with a duty cycle duration of 300 s.

<sup>5)</sup> Information regarding the correlation between the pulse frequency and max. output current/output frequency is provided in the SINAMICS Low Voltage Engineering Manual.

<sup>6)</sup> The specified power loss represents the maximum value at 100 % utilization. The value is lower under normal operating conditions.

## Technical data

Line voltage 380 ... 480 V 3 AC DC link voltage 510 ... 720 V DC		Motor Modules chassis format				
		6SL3720-1TE37-5AA3	6SL3720-1TE38-4AA3	6SL3720-1TE41-0AA3	6SL3720-1TE41-2AA3	6SL3720-1TE41-4AA3
<b>Motor connection</b> U2, V2, W2		M12 screws	M12 screws	M12 screws	M12 screws	M12 screws
• Conductor cross-section, max. (IEC)	mm <sup>2</sup>	4 × 240	4 × 240	6 × 240	6 × 240	6 × 240
<b>Cable length, max. <sup>7)</sup></b>						
• Shielded	m	300	300	300	300	300
• Unshielded	m	450	450	450	450	450
<b>PE/GND connection</b>		PE bar	PE bar	PE bar	PE bar	PE bar
• Bar cross-section	mm <sup>2</sup>	600	600	600	600	600
• Conductor cross-section, max. (IEC)	mm <sup>2</sup>	240	240	240	240	240
<b>Degree of protection</b>		IP20	IP20	IP20	IP20	IP20
<b>Dimensions</b>						
• Width <sup>8)</sup>	mm	600	600	800	800	800
• Height <sup>9)</sup>	mm	2200	2200	2200	2200	2200
• Depth	mm	600	600	600	600	600
<b>Weight, approx.</b>	kg	490	490	700	700	700
<b>Frame size</b>		HX	HX	JX	JX	JX

<sup>7)</sup> Sum of all motor cables. Longer cable lengths for specific configurations are available on request. [For additional information, please refer to the SINAMICS Low Voltage Engineering Manual.](#)

<sup>8)</sup> With option **L10** (dv/dt filter plus VPL):  
 - Frame sizes FX/GX/HX/JX → Supplementary cabinet, 600 mm wide  
 With option **L34** (output-side circuit breaker):  
 - Frame sizes FX/GX → Supplementary cabinet, 400 mm wide  
 - Frame sizes HX/JX → Supplementary cabinet, 600 mm wide.

<sup>9)</sup> The cabinet height increases by 250 mm with IP21 degree of protection, and by 400 mm with IP23, IP43 and IP54 degrees of protection.

# SINAMICS S120 Cabinet Modules

## Motor Modules chassis format

### Technical data

Line voltage 500 ... 690 V 3 AC DC link voltage 675 ... 1035 V DC		Motor Modules chassis format					
		6SL3720-1TG28-5AA3	6SL3720-1TG31-0AA3	6SL3720-1TG31-2AA3	6SL3720-1TG31-5AA3	6SL3720-1TG31-8AA3	6SL3720-1TG32-2AA3
<b>Type rating</b>							
• For $I_L$ (50 Hz 690 V) <sup>1)</sup>	kW	<b>75</b>	<b>90</b>	<b>110</b>	<b>132</b>	<b>160</b>	<b>200</b>
• For $I_H$ (50 Hz 690 V) <sup>1)</sup>	kW	55	75	90	110	132	160
• For $I_L$ (50 Hz 500 V) <sup>1)</sup>	kW	55	55	75	90	110	132
• For $I_H$ (50 Hz 500 V) <sup>1)</sup>	kW	45	55	75	90	90	110
• For $I_L$ (60 Hz 575 V) <sup>2)</sup>	hp	75	75	100	150	150	200
• For $I_H$ (60 Hz 575 V) <sup>2)</sup>	hp	75	75	100	125	150	200
<b>Output current</b>							
• Rated current $I_{NA}$	A	85	100	120	150	175	215
• Base load current $I_L$ <sup>3)</sup>	A	80	95	115	142	170	208
• Base load current $I_H$ <sup>4)</sup>	A	76	89	107	134	157	192
• Maximum current $I_{max A}$	A	120	142	172	213	255	312
<b>DC link current</b>							
• Rated current $I_{NDC}$ when supplied from							
- Basic/Smart Line Module	A	102	120	144	180	210	258
- Active Line Module	A	92	108	130	162	189	232
• Base load current $I_{LDC}$ <sup>3)</sup> when supplied from							
- Basic/Smart Line Module	A	99	117	140	175	204	251
- Active Line Module	A	89	105	126	157	184	226
• Base load current $I_{HDC}$ <sup>4)</sup> when supplied from							
- Basic/Smart Line Module	A	90	106	128	160	186	229
- Active Line Module	A	81	96	115	144	168	206
<b>Current demand</b>							
• 24 V DC auxiliary power supply	A	0.8	0.8	0.8	0.8	0.9	0.9
• 690 V AC	A	0.4	0.4	0.4	0.4	1.0	1.0
<b>DC link capacitance</b>							
	μF	1200	1200	1600	2800	2800	2800
<b>Pulse frequency <sup>5)</sup></b>							
• Rated frequency	kHz	1.25	1.25	1.25	1.25	1.25	1.25
• Pulse frequency, max.							
- Without current derating	kHz	1.25	1.25	1.25	1.25	1.25	1.25
- With current derating	kHz	7.5	7.5	7.5	7.5	7.5	7.5
<b>Power loss, max. <sup>6)</sup></b>							
• At 50 Hz 690 V	kW	1.17	1.43	1.89	1.8	2.67	3.09
• At 60 Hz 575 V	kW	1.1	1.3	1.77	1.62	2.5	2.91
<b>Cooling air requirement</b>							
	m <sup>3</sup> /s	0.17	0.17	0.17	0.17	0.36	0.36
<b>Sound pressure level <math>L_{pA}</math></b> (1 m) at 50/60 Hz							
	dB	67	67	67	67	69	69

<sup>1)</sup> Rated power of a typ. 6-pole standard induction motor based on  $I_L$  or  $I_H$  with 500 V or 690 V 3 AC 50 Hz.

<sup>2)</sup> Rated power of a typ. 6-pole standard induction motor based on  $I_L$  or  $I_H$  with 575 V 3 AC 60 Hz.

<sup>3)</sup> The base load current  $I_L$  is the basis for a duty cycle of 110 % for 60 s or 150 % for 10 s with a duty cycle duration of 300 s.

<sup>4)</sup> The base load current  $I_H$  is the basis for a duty cycle of 150 % for 60 s or 160 % for 10 s with a duty cycle duration of 300 s.

<sup>5)</sup> Information regarding the correlation between the pulse frequency and max. output current/output frequency is provided in the SINAMICS Low Voltage Engineering Manual.

<sup>6)</sup> The specified power loss represents the maximum value at 100 % utilization. The value is lower under normal operating conditions.

## Technical data

Line voltage 500 ... 690 V 3 AC DC link voltage 675 ... 1035 V DC		Motor Modules chassis format					
		6SL3720-1TG28-5AA3	6SL3720-1TG31-0AA3	6SL3720-1TG31-2AA3	6SL3720-1TG31-5AA3	6SL3720-1TG31-8AA3	6SL3720-1TG32-2AA3
<b>Motor connection</b> U2, V2, W2		M12 screws	M12 screws	M12 screws	M12 screws	M12 screws	M12 screws
• Conductor cross-section, max. (IEC)	mm <sup>2</sup>	2 × 185	2 × 185	2 × 185	2 × 185	2 × 240	2 × 240
<b>Cable length, max. <sup>7)</sup></b>							
• Shielded	m	300	300	300	300	300	300
• Unshielded	m	450	450	450	450	450	450
<b>PE/GND connection</b>		PE bar	PE bar	PE bar	PE bar	PE bar	PE bar
• Busbar cross-section	mm <sup>2</sup>	600	600	600	600	600	600
• Conductor cross-section, max. (IEC)	mm <sup>2</sup>	240	240	240	240	240	240
<b>Degree of protection</b>		IP20	IP20	IP20	IP20	IP20	IP20
<b>Dimensions</b>							
• Width <sup>8)</sup>	mm	400	400	400	400	400	400
• Height <sup>9)</sup>	mm	2200	2200	2200	2200	2200	2200
• Depth	mm	600	600	600	600	600	600
<b>Weight, approx.</b>	kg	145	145	145	145	286	286
<b>Frame size</b>		FX	FX	FX	FX	GX	GX

<sup>7)</sup> Sum of all motor cables. Longer cable lengths for specific configurations are available on request. [For additional information, please refer to the SINAMICS Low Voltage Engineering Manual.](#)

<sup>8)</sup> With option **L10** (dv/dt filter plus VPL):  
 - Frame sizes FX/GX/HX/JX → Supplementary cabinet, 600 mm wide  
 With option **L34** (output-side circuit breaker):  
 - Frame sizes FX/GX → Supplementary cabinet, 400 mm wide  
 - Frame sizes HX/JX → Supplementary cabinet, 600 mm wide.

<sup>9)</sup> The cabinet height increases by 250 mm with IP21 degree of protection, and by 400 mm with IP23, IP43 and IP54 degrees of protection.

# SINAMICS S120 Cabinet Modules

## Motor Modules chassis format

### Technical data

Line voltage 500 ... 690 V 3 AC DC link voltage 675 ... 1035 V DC		Motor Modules chassis format					
		6SL3720-1TG32-6AA3	6SL3720-1TG33-3AA3	6SL3720-1TG34-1AA3	6SL3720-1TG34-7AA3	6SL3720-1TG35-8AA3	6SL3720-1TG37-4AA3
<b>Type rating</b>							
• For $I_L$ (50 Hz 690 V) <sup>1)</sup>	kW	<b>250</b>	<b>315</b>	<b>400</b>	<b>450</b>	<b>560</b>	<b>710</b>
• For $I_H$ (50 Hz 690 V) <sup>1)</sup>	kW	200	250	315	400	450	630
• For $I_L$ (50 Hz 500 V) <sup>1)</sup>	kW	160	200	250	315	400	500
• For $I_H$ (50 Hz 500 V) <sup>1)</sup>	kW	132	160	200	250	315	450
• For $I_L$ (60 Hz 575 V) <sup>2)</sup>	hp	250	300	400	450	600	700
• For $I_H$ (60 Hz 575 V) <sup>2)</sup>	hp	200	250	350	450	500	700
<b>Output current</b>							
• Rated current $I_{NA}$	A	260	330	410	465	575	735
• Base load current $I_L$ <sup>3)</sup>	A	250	320	400	452	560	710
• Base load current $I_H$ <sup>4)</sup>	A	233	280	367	416	514	657
• Maximum current $I_{max A}$	A	375	480	600	678	840	1065
<b>DC link current</b>							
• Rated current $I_{NDC}$ when supplied from							
- Basic/Smart Line Module	A	312	396	492	558	690	882
- Active Line Module	A	281	356	443	502	621	794
• Base load current $I_{LDC}$ <sup>3)</sup> when supplied from							
- Basic/Smart Line Module	A	304	386	479	544	672	859
- Active Line Module	A	273	347	431	489	605	774
• Base load current $I_{HDC}$ <sup>4)</sup> when supplied from							
- Basic/Smart Line Module	A	277	352	437	496	614	784
- Active Line Module	A	250	316	394	446	552	706
<b>Current demand</b>							
• 24 V DC auxiliary power supply	A	0.9	0.9	1.0	1.0	1.0	1.25
• 690 V AC	A	1.0	1.0	2.1	2.1	2.1	3.1
<b>DC link capacitance</b>		μF	3900	4200	7400	7400	11100
<b>Pulse frequency</b> <sup>5)</sup>							
• Rated frequency	kHz	1.25	1.25	1.25	1.25	1.25	1.25
• Pulse frequency, max.							
- Without current derating	kHz	1.25	1.25	1.25	1.25	1.25	1.25
- With current derating	kHz	7.5	7.5	7.5	7.5	7.5	7.5
<b>Power loss, max.</b> <sup>6)</sup>							
• At 50 Hz 690 V	kW	3.62	4.34	6.13	6.8	10.3	10.9
• At 60 Hz 575 V	kW	3.38	3.98	5.71	6.32	9.7	10
<b>Cooling air requirement</b>		m <sup>3</sup> /s	0.36	0.36	0.78	0.78	1.474
<b>Sound pressure level <math>L_{pA}</math></b> (1 m) at 50/60 Hz		dB	69	69	72	72	72

<sup>1)</sup> Rated power of a typ. 6-pole standard induction motor based on  $I_L$  or  $I_H$  with 500 V or 690 V 3 AC 50 Hz.

<sup>2)</sup> Rated power of a typ. 6-pole standard induction motor based on  $I_L$  or  $I_H$  with 575 V 3 AC 60 Hz.

<sup>3)</sup> The base load current  $I_L$  is the basis for a duty cycle of 110 % for 60 s or 150 % for 10 s with a duty cycle duration of 300 s.

<sup>4)</sup> The base load current  $I_H$  is the basis for a duty cycle of 150 % for 60 s or 160 % for 10 s with a duty cycle duration of 300 s.

<sup>5)</sup> Information regarding the correlation between the pulse frequency and max. output current/output frequency is provided in the SINAMICS Low Voltage Engineering Manual.

<sup>6)</sup> The specified power loss represents the maximum value at 100 % utilization. The value is lower under normal operating conditions.

## Technical data

Line voltage 500 ... 690 V 3 AC DC link voltage 675 ... 1035 V DC		Motor Modules chassis format					
		6SL3720-1TG32-6AA3	6SL3720-1TG33-3AA3	6SL3720-1TG34-1AA3	6SL3720-1TG34-7AA3	6SL3720-1TG35-8AA3	6SL3720-1TG37-4AA3
<b>Motor connection</b> U2, V2, W2		M12 screws	M12 screws	M12 screws	M12 screws	M12 screws	M12 screws
• Conductor cross-section, max. (IEC)	mm <sup>2</sup>	2 × 240	2 × 240	4 × 240	4 × 240	4 × 240	6 × 240
<b>Cable length, max. <sup>7)</sup></b>							
• Shielded	m	300	300	300	300	300	300
• Unshielded	m	450	450	450	450	450	450
<b>PE/GND connection</b>		PE bar	PE bar	PE bar	PE bar	PE bar	PE bar
• Busbar cross-section	mm <sup>2</sup>	600	600	600	600	600	600
• Conductor cross-section, max. (IEC)	mm <sup>2</sup>	240	240	240	240	240	240
<b>Degree of protection</b>		IP20	IP20	IP20	IP20	IP20	IP20
<b>Dimensions</b>							
• Width <sup>8)</sup>	mm	400	400	600	600	600	800
• Height <sup>9)</sup>	mm	2200	2200	2200	2200	2200	2200
• Depth	mm	600	600	600	600	600	600
<b>Weight, approx.</b>	kg	286	286	490	490	490	700
<b>Frame size</b>		GX	GX	HX	HX	HX	JX

<sup>7)</sup> Sum of all motor cables. Longer cable lengths for specific configurations are available on request. [For additional information, please refer to the SINAMICS Low Voltage Engineering Manual.](#)

<sup>8)</sup> With option **L10** (dv/dt filter plus VPL):  
 - Frame sizes FX/GX/HX/JX → Supplementary cabinet, 600 mm wide  
 With option **L34** (output-side circuit breaker):  
 - Frame sizes FX/GX → Supplementary cabinet, 400 mm wide  
 - Frame sizes HX/JX → Supplementary cabinet, 600 mm wide.

<sup>9)</sup> The cabinet height increases by 250 mm with IP21 degree of protection, and by 400 mm with IP23, IP43 and IP54 degrees of protection.

# SINAMICS S120 Cabinet Modules

## Motor Modules chassis format

### Technical data

Line voltage 500 ... 690 V 3 AC DC link voltage 675 ... 1035 V DC		Motor Modules chassis format			
		6SL3720-1TG38-1AA3	6SL3720-1TG38-8AA3	6SL3720-1TG41-0AA3	6SL3720-1TG41-3AA3
<b>Type rating</b>					
• For $I_L$ (50 Hz 690 V) <sup>1)</sup>	kW	<b>800</b>	<b>900</b>	<b>1000</b>	<b>1200</b>
• For $I_H$ (50 Hz 690 V) <sup>1)</sup>	kW	710	800	900	1000
• For $I_L$ (50 Hz 500 V) <sup>1)</sup>	kW	560	630	710	900
• For $I_H$ (50 Hz 500 V) <sup>1)</sup>	kW	500	560	630	800
• For $I_L$ (60 Hz 575 V) <sup>2)</sup>	hp	800	900	1000	1250
• For $I_H$ (60 Hz 575 V) <sup>2)</sup>	hp	700	800	900	1000
<b>Output current</b>					
• Rated current $I_{NA}$	A	810	910	1025	1270
• Base load current $I_L$ <sup>3)</sup>	A	790	880	1000	1230
• Base load current $I_H$ <sup>4)</sup>	A	724	814	917	1136
• Maximum current $I_{maxA}$	A	1185	1320	1500	1845
<b>DC link current</b>					
• Rated current $I_{NDC}$ when supplied from					
- Basic/Smart Line Module	A	972	1092	1230	1524
- Active Line Module	A	875	983	1107	1372
• Base load current $I_{LDC}$ <sup>3)</sup> when supplied from					
- Basic/Smart Line Module	A	947	1064	1199	1485
- Active Line Module	A	853	958	1079	1337
• Base load current $I_{HDC}$ <sup>4)</sup> when supplied from					
- Basic/Smart Line Module	A	865	971	1094	1356
- Active Line Module	A	778	874	985	1221
<b>Current demand</b>					
• 24 V DC auxiliary power supply	A	1.25	1.4	1.4	1.4
• 690 V AC	A	3.1	3.1	3.1	3.1
<b>DC link capacitance</b>					
	μF	11100	14400	14400	19200
<b>Pulse frequency</b> <sup>5)</sup>					
• Rated frequency	kHz	1.25	1.25	1.25	1.25
• Pulse frequency, max.					
- Without current derating	kHz	1.25	1.25	1.25	1.25
- With current derating	kHz	7.5	7.5	7.5	7.5
<b>Power loss, max.</b> <sup>6)</sup>					
• At 50 Hz 690 V	kW	11.5	11.7	13.2	16.0
• At 60 Hz 575 V	kW	10.5	10.6	12.0	14.2
<b>Cooling air requirement</b>					
	m <sup>3</sup> /s	1.474	1.474	1.474	1.474
<b>Sound pressure level <math>L_{pA}</math></b> (1 m) at 50/60 Hz					
	dB	72	72	72	72

<sup>1)</sup> Rated power of a typ. 6-pole standard induction motor based on  $I_L$  or  $I_H$  with 500 V or 690 V 3 AC 50 Hz.

<sup>2)</sup> Rated power of a typ. 6-pole standard induction motor based on  $I_L$  or  $I_H$  with 575 V 3 AC 60 Hz.

<sup>3)</sup> The base load current  $I_L$  is the basis for a duty cycle of 110 % for 60 s or 150 % for 10 s with a duty cycle duration of 300 s.

<sup>4)</sup> The base load current  $I_H$  is the basis for a duty cycle of 150 % for 60 s or 160 % for 10 s with a duty cycle duration of 300 s.

<sup>5)</sup> Information regarding the correlation between the pulse frequency and max. output current/output frequency is provided in the SINAMICS Low Voltage Engineering Manual.

<sup>6)</sup> The specified power loss represents the maximum value at 100 % utilization. The value is lower under normal operating conditions.

## Technical data

Line voltage 500 ... 690 V 3 AC DC link voltage 675 ... 1035 V DC		Motor Modules chassis format			
		6SL3720-1TG38-1AA3	6SL3720-1TG38-8AA3	6SL3720-1TG41-0AA3	6SL3720-1TG41-3AA3
<b>Motor connection</b> U2, V2, W2		M12 screws	M12 screws	M12 screws	M12 screws
• Conductor cross-section, max. (IEC)	mm <sup>2</sup>	6 x 240	6 x 240	6 x 240	6 x 240
<b>Cable length, max. <sup>7)</sup></b>					
• Shielded	m	300	300	300	300
• Unshielded	m	450	450	450	450
<b>PE/GND connection</b>		PE bar	PE bar	PE bar	PE bar
• Busbar cross-section	mm <sup>2</sup>	600	600	600	600
• Conductor cross-section, max. (IEC)	mm <sup>2</sup>	240	240	240	240
<b>Degree of protection</b>		IP20	IP20	IP20	IP20
<b>Dimensions</b>					
• Width <sup>8)</sup>	mm	800	800	800	800
• Height <sup>9)</sup>	mm	2200	2200	2200	2200
• Depth	mm	600	600	600	600
<b>Weight, approx.</b>	kg	700	700	700	700
<b>Frame size</b>		JX	JX	JX	JX

<sup>7)</sup> Sum of all motor cables. Longer cable lengths for specific configurations are available on request. [For additional information, please refer to the SINAMICS Low Voltage Engineering Manual.](#)

<sup>8)</sup> With option **L10** (dv/dt filter plus VPL):  
 - Frame sizes FX/GX/HX/JX → Supplementary cabinet, 600 mm wide  
 With option **L34** (output-side circuit breaker):  
 - Frame sizes FX/GX → Supplementary cabinet, 400 mm wide  
 - Frame sizes HX/JX → Supplementary cabinet, 600 mm wide.

<sup>9)</sup> The cabinet height increases by 250 mm with IP21 degree of protection, and by 400 mm with IP23, IP43 and IP54 degrees of protection.



# SINAMICS S120 Cabinet Modules

## Motor Modules chassis format

### Options

The table below lists the options available for Motor Modules (Details → Description of the options):

Available options	Order code
CBC10 Communication Board	<b>G20</b> <sup>1)</sup>
CBE20 Communication Board	<b>G33</b> <sup>1)</sup>
Safety license for 1 to 5 axes	<b>K01 to K05</b>
AOP30 Advanced Operator Panel installed in the cabinet door	<b>K08</b> <sup>1)</sup>
SMC10 Sensor Module Cabinet-Mounted	<b>K46</b>
SMC20 Sensor Module Cabinet-Mounted	<b>K48</b>
SMC30 Sensor Module Cabinet-Mounted	<b>K50</b>
VSM10 Voltage Sensing Module	<b>K51</b>
Terminal module for controlling the Safe Torque Off and Safe Stop 1 safety functions	<b>K82</b>
TM54F Terminal Module	<b>K87</b>
Safe Brake Adapter SBA, 230 V AC	<b>K88</b>
Safe Brake Adapter SBA, 24 V DC	<b>K89</b>
CU320-2 DP Control Unit	<b>K90</b>
Performance expansion for CU320-2 Control Unit	<b>K94</b> <sup>1)</sup>
CU320-2 PN Control Unit	<b>K95</b>
dv/dt filter compact plus Voltage Peak Limiter	<b>L07</b>
Motor reactor	<b>L08</b>
dv/dt filter plus Voltage Peak Limiter	<b>L10</b>
Output-side circuit breaker (motor-driven)	<b>L34</b>
DC interface incl. pre-charging circuit of the associated DC link capacitance (includes <b>M60</b> )	<b>L37</b>
Cabinet anti-condensation heating	<b>L55</b>
25/125 kW braking unit (can be used for frame size FX) for line voltages of 380 ... 480 V and 660 ... 690 V	<b>L61</b>
50/250 kW braking unit (can be used for frame size GX/HX/JX) for line voltages of 380 ... 480 V and 660 ... 690 V	<b>L62</b>
25/125 kW braking unit (can be used for frame size FX) for line voltages of 500 ... 600 V	<b>L64</b>
50/250 kW braking unit (can be used for frame size GX/HX/JX) for line voltages of 500 ... 600 V	<b>L65</b>
Base 100 mm high, RAL 7022	<b>M06</b>
Cable-marshalling space 200 mm high, RAL 7035	<b>M07</b>
IP21 degree of protection	<b>M21</b>
IP23 degree of protection (includes <b>M60</b> )	<b>M23</b>
Side panel mounted at the right	<b>M26</b>
Side panel mounted at the left	<b>M27</b>
IP43 degree of protection (includes <b>M60</b> )	<b>M43</b>

Available options	Order code
IP54 degree of protection (includes <b>M60</b> )	<b>M54</b>
Closed cabinet door, air intake from below through floor opening	<b>M59</b>
Additional touch protection (included in <b>M23</b> , <b>M43</b> and <b>M54</b> )	<b>M60</b>
EMC shield bus	<b>M70</b>
DC busbar system ( $I_d = 1170$ A, $1 \times 60 \times 10$ mm)	<b>M80</b>
DC busbar system ( $I_d = 1500$ A, $1 \times 80 \times 10$ mm)	<b>M81</b>
DC busbar system ( $I_d = 1840$ A, $1 \times 100 \times 10$ mm)	<b>M82</b>
DC busbar system ( $I_d = 2150$ A, $2 \times 60 \times 10$ mm)	<b>M83</b>
DC busbar system ( $I_d = 2730$ A, $2 \times 80 \times 10$ mm)	<b>M84</b>
DC busbar system ( $I_d = 3320$ A, $2 \times 100 \times 10$ mm)	<b>M85</b>
DC busbar system ( $I_d = 3720$ A, $3 \times 80 \times 10$ mm)	<b>M86</b>
DC busbar system ( $I_d = 4480$ A, $3 \times 100 \times 10$ mm)	<b>M87</b>
Crane transport assembly (top-mounted)	<b>M90</b>
Special paint finish for cabinet	<b>Y09</b>
Factory assembly as transport units	<b>Y11</b>
One-line label for system identification, $40 \times 80$ mm	<b>Y31</b>
Two-line label for system identification, $40 \times 180$ mm	<b>Y32</b>
Four-line label for system identification, $40 \times 180$ mm	<b>Y33</b>
Customer documentation (circuit diagram, terminal diagram, layout diagram) in DXF format	<b>D02</b>
Preliminary version of customer documentation in PDF format	<b>D14</b>
Documentation in English/French	<b>D58</b>
Documentation in English/Spanish	<b>D60</b>
Documentation in English/Italian	<b>D80</b>
Without Operating Instructions	<b>D99</b>
Rating plate data in English/French	<b>T58</b>
Rating plate data in English/Spanish	<b>T60</b>
Rating plate data in English/Italian	<b>T80</b>
Visual acceptance	<b>F03</b>
Function test without connected motor	<b>F71</b>
Insulation test	<b>F77</b>
Customer-specific acceptance inspections (on request)	<b>F97</b>

<sup>1)</sup> Only together with option **K90** or **K95**.

## Options

## Option selection matrix for Motor Modules in the chassis format

Certain options can mutually exclude one another (options that are not involved are not shown).

✓	Possible combination
–	Combination not possible

## Electrical options

	G20	G33	K46	K48	K50	K51	K88	K89	K90	K95	L07	L08	L10	L34	L37	L61/64	L62/65
G20		–	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
G33	–		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
K46	✓	✓		–	–	–	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
K48	✓	✓	–		–	–	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
K50	✓	✓	–	–		–	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
K51	✓	✓	–	–	–		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
K88	✓	✓	✓	✓	✓	✓		–	✓	✓	✓	✓	✓	✓	✓	✓	✓
K89	✓	✓	✓	✓	✓	✓	–		✓	✓	✓	✓	✓	✓	✓	✓	✓
K90	✓	✓	✓	✓	✓	✓	✓	✓		–	✓	✓	✓	✓	✓	✓	✓
K95	✓	✓	✓	✓	✓	✓	✓	✓	–		✓	✓	✓	✓	✓	✓	✓
L07	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		–	–	✓	–	✓	✓
L08	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	–		–	✓	✓	✓	✓
L10	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	–	–		✓	✓	✓	✓
L34	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	–		✓	✓	✓
L37	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	–	✓	✓	✓		–	–
L61/64	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	–		–
L62/65	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	–	–	

## Mechanical/electrical options

	M06	M07	M21	M23	M26	M27	M43	M54	M60	M90	Y11	Y31	Y32	Y33
M06		–	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
M07	–		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
M21	✓	✓		–	✓	✓	–	–	✓	✓	✓	✓	✓	✓
M23	✓	✓	–		✓	✓	–	–	– <sup>1)</sup>	✓	✓	✓	✓	✓
M26	✓	✓	✓	✓		–	✓	✓	✓	✓	✓	✓	✓	✓
M27	✓	✓	✓	✓	–		✓	✓	✓	✓	✓	✓	✓	✓
M43	✓	✓	–	–	✓	✓		–	– <sup>1)</sup>	✓	✓	✓	✓	✓
M54	✓	✓	–	–	✓	✓	–		– <sup>1)</sup>	✓	✓	✓	✓	✓
M60	✓	✓	✓	– <sup>1)</sup>	✓	✓	– <sup>1)</sup>	– <sup>1)</sup>		✓	✓	✓	✓	✓
M90	✓	✓	✓	✓	✓	✓	✓	✓	✓		–	✓	✓	✓
Y11	✓	✓	✓	✓	✓	✓	✓	✓	✓	–		✓	✓	✓
Y31	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		–	–
Y32	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	–		–
Y33	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	–	–	

<sup>1)</sup> The option **M60** is included in **L37**, **M23**, **M43** and **M54**.

# SINAMICS S120 Cabinet Modules

## Motor Modules chassis format

### Options

DC busbar system mechanical options (busbars between individual Cabinet Modules)

	M80	M81	M82	M83	M84	M85	M86	M87
M80		-	-	✓	-	-	-	-
M81	-		-	-	✓	-	✓	-
M82	-	-		-	-	✓	-	✓
M83	✓	-	-		-	-	-	-
M84	-	✓	-	-		-	✓	-
M85	-	-	✓	-	-		-	✓
M86	-	✓	-	-	✓	-		-
M87	-	-	✓	-	-	✓	-	

Documentation

	D02	D14	D58	D60	D80	D99
D02		✓	✓	✓	✓	-
D14	✓		✓	✓	✓	-
D58	✓	✓		-	-	-
D60	✓	✓	-		-	-
D80	✓	✓	-	-		-
D99	-	-	-	-	-	

Rating plate data

	T58	T60	T80
T58		-	-
T60	-		-
T80	-	-	

## Overview



Central Braking Modules limit the DC link voltage at a central location in the drive line-up when the motors are operating in generator mode and energy recovery to the supply system is not possible. If the voltage of the DC busbar exceeds a limit value in generator operation, an externally installed braking resistor is switched in, thus restricting the voltage from increasing further. The regenerative energy is converted into heat. The braking resistor is switched in by the Braking Unit integrated in the Cabinet Module, which is equipped with state-of-the-art MOSFET/IGBT semiconductors.

Central Braking Modules are an alternative to the optional Braking Modules (options **L61/L62** or **L64/L65**) and are particularly suitable when high braking powers are required in a drive line-up. The required braking power can also be increased by connecting units in parallel.

Line voltage	DC link voltage	Braking power $P_{150}$
380 ... 480 V 3 AC	510 ... 720 V DC	500 kW / 1000 kW
500 ... 600 V 3 AC	675 ... 900 V DC	550 kW / 1100 kW
660 ... 690 V 3 AC	890 ... 1035 V DC	630 kW / 1200 kW

Central Braking Modules operate as fully stand-alone modules. They only require a connection to the DC link. An external control voltage is not required.

The built-in fan means that Central Braking Modules are also suitable for high continuous power levels.

## Design

The Central Braking Module is a cabinet unit with integrated braking chopper. Using state-of-the-art MOSFET/IGBT semiconductors, the power unit controls when the braking resistor is switched-in.

Central Braking Modules are designed as a 400 mm wide cabinet module. The connection to the DC link busbars is established through fuses.

Central Braking Modules require braking resistors that must be externally mounted and which can be ordered separately. The cables to the resistors can be connected to lugs which are specially prepared for plant application and which are located in the connection area of the cabinet.

The power units have diagnostics LEDs for the display of faults and also a control output for the communication of faults. The Central Braking Module can be disabled externally via a control input.

The engineering specifications must be applied regarding the arrangement in the DC link line-up. [For additional information, please refer to the SINAMICS Low Voltage Engineering Manual.](#)

## Selection and ordering data

Braking powers				Central Braking Module
$P_{15}$	$P_{150}$	$P_{270}$	$P_{DB}$	Order No.
kW	kW	kW	kW	
<b>DC link voltage 510 ... 720 V DC</b>				
730	500	300	200	<b>6SL3700-1AE35-0AA3</b>
1380	1000	580	370	<b>6SL3700-1AE41-0AA3</b>
<b>DC link voltage 675 ... 900 V DC</b>				
830	550	340	220	<b>6SL3700-1AF35-5AA3</b>
1580	1100	650	420	<b>6SL3700-1AF41-1AA3</b>
<b>DC link voltage 890 ... 1035 V DC</b>				
920	630	380	240	<b>6SL3700-1AH36-3AA3</b>
1700	1200	720	460	<b>6SL3700-1AH41-2AA3</b>

## Note:

In contrast to the optional Braking Modules (options **L61**, **L62** or **L64**, **L65**), the braking resistors for the Central Braking Modules must be separately ordered.

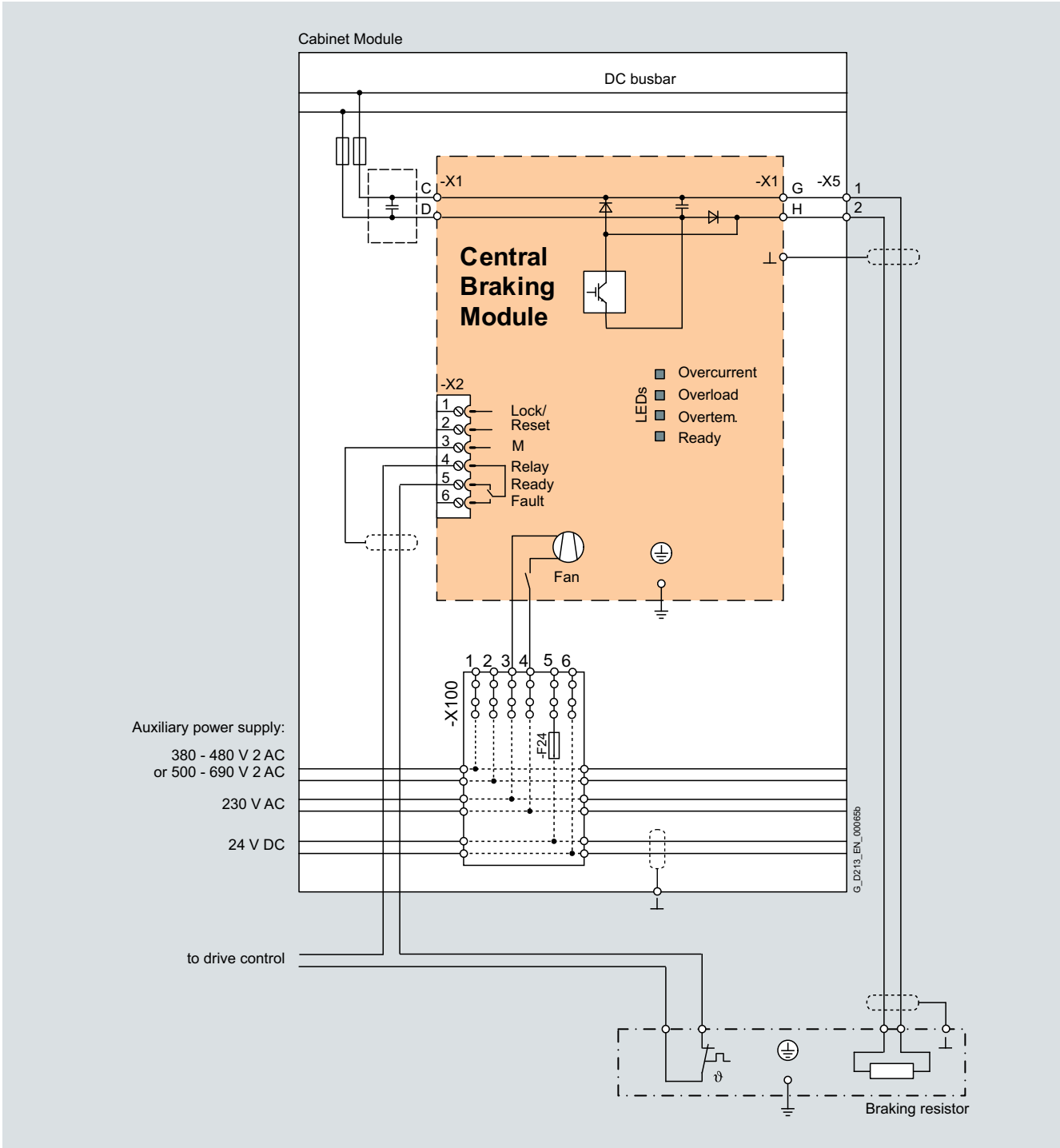
Braking power $P_{BR}$	Dimensions (W × D × H)	Braking resistor in IP21 degree of protection
kW	mm	Order No.
<b>DC link voltage 510 ... 720 V DC</b>		
500	960 × 620 × 790	<b>6SL3000-1BE35-0AA0</b>
1000	960 × 620 × 1430	<b>6SL3000-1BE41-0AA0</b>
<b>DC link voltage 675 ... 900 V DC</b>		
550	960 × 620 × 1110	<b>6SL3000-1BF35-5AA0</b>
1100	960 × 620 × 1430	<b>6SL3000-1BF41-1AA0</b>
<b>DC link voltage 890 ... 1035 V DC</b>		
630	960 × 620 × 1110	<b>6SL3000-1BH36-3AA0</b>
1200	960 × 620 × 1430	<b>6SL3000-1BH41-2AA0</b>

# SINAMICS S120 Cabinet Modules

## Central Braking Modules

### Integration

3



Example of connection of a Central Braking Module

## Technical data

		Central Braking Modules					
		6SL3700-1AE35-0AA3	6SL3700-1AE41-0AA3	6SL3700-1AF35-5AA3	6SL3700-1AF41-1AA3	6SL3700-1AH36-3AA3	6SL3700-1AH41-2AA3
<b>Line voltage</b>		380 ... 480 V		500 ... 600 V		660 ... 690 V	
<b>Braking power <math>P_{150}</math></b>	kW	500	1000	550	1100	630	1200
<b>Continuous braking power <math>P_{DB}</math></b>	kW	200	370	220	420	240	460
<b>Braking current for <math>P_{150}</math></b>	A	650	1200	580	1100	520	1000
<b>Current demand <sup>1)</sup></b>							
• 230 V 2 AC	A	0.4	0.4	0.4	0.4	0.4	0.4
<b>Power loss, max. <sup>2)</sup></b> at 50 Hz 400/500/690 V	kW	0.8	1.5	0.8	1.5	0.8	1.5
<b>DC link capacitance</b>	µF	8160	9720	7640	8680	7640	8680
<b>Cooling air requirement</b>	m <sup>3</sup> /s	0.14	0.14	0.14	0.14	0.14	0.14
<b>Sound pressure level <math>L_{pA}</math></b> (1 m) at 50/60 Hz	dB	55	55	55	55	55	55
<b>Braking resistor connection terminal</b>		M12 screws	M12 screws	M12 screws	M12 screws	M12 screws	M12 screws
• Conductor cross-section, max. (IEC)	mm <sup>2</sup>	2 × 240	2 × 240	2 × 240	2 × 240	2 × 240	2 × 240
<b>PE/GND connection</b>		PE bar	PE bar	PE bar	PE bar	PE bar	PE bar
• Busbar cross-section	mm <sup>2</sup>	600	600	600	600	600	600
• Conductor cross-section, max. (IEC)	mm <sup>2</sup>	240	240	240	240	240	240
<b>Degree of protection</b>		IP20	IP20	IP20	IP20	IP20	IP20
<b>Dimensions</b>							
• Width	mm	400	400	400	400	400	400
• Height <sup>3)</sup>	mm	2200	2200	2200	2200	2200	2200
• Depth	mm	600	600	600	600	600	600
<b>Weight, approx.</b>	kg	230	230	230	230	230	230
<b>Frame size</b>	mm	400	400	400	400	400	400

		Braking resistors					
		6SL3000-1BE35-0AA0	6SL3000-1BE41-0AA0	6SL3000-1BF35-5AA0	6SL3000-1BF41-1AA0	6SL3000-1BH36-3AA0	6SL3000-1BH41-2AA0
<b>Line voltage</b>		380 ... 480 V		500 ... 600 V		660 ... 690 V	
<b>Braking power <math>P_{BR}</math></b>	kW	500	1000	550	1100	630	1200
<b>Continuous braking power <math>P_{DB}</math></b>	kW	23	58	34	62	42	75
<b>Resistance value</b>	Ω	0.95	0.49	1.35	0.69	1.8	0.95
<b>Degree of protection</b>		IP21	IP21	IP21	IP21	IP21	IP21
<b>Dimensions</b>							
• Width	mm	960	960	960	960	960	960
• Height	mm	620	620	620	620	620	620
• Depth	mm	790	1430	1110	1430	1110	1430
<b>Weight, approx.</b>	kg	82	170	110	180	124	196

<sup>1)</sup> Current demand of the fans.

<sup>2)</sup> The specified power loss represents the maximum value at 100 % utilization. The value is lower under normal operating conditions.

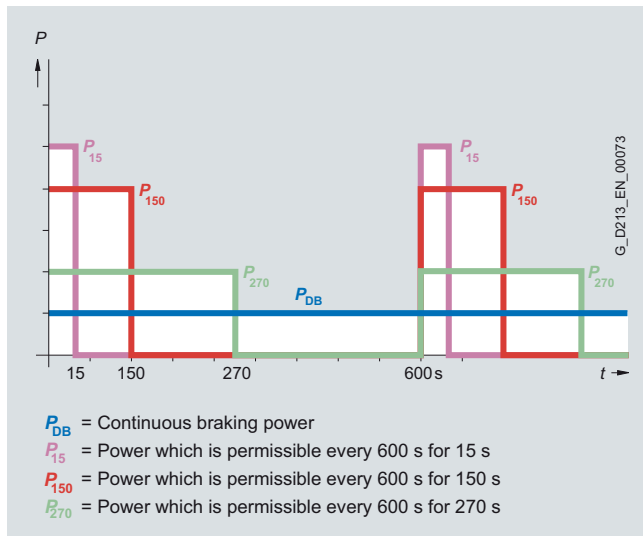
<sup>3)</sup> The cabinet height increases by 250 mm with IP21 degree of protection, and by 400 mm with IP23, IP43 and IP54 degrees of protection.

# SINAMICS S120 Cabinet Modules

## Central Braking Modules

### Characteristic curves

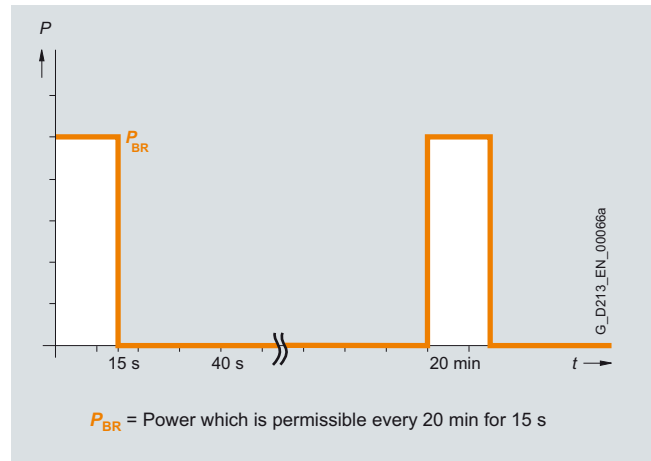
Central Braking Modules are dimensioned for braking powers with the following duty cycles:



Braking powers of the Central Braking Modules

The braking powers are subject to a cycle time of 600 s.  $P_{150}$  is assumed to be the rated braking power. The braking resistors can be assigned according to these power ratings.

In most applications, Central Braking Modules are only used for occasional braking operations, e.g. stopping a drive in an emergency. Low-cost braking resistors in IP21 degree of protection are specifically offered for these types of applications; these braking resistors are dimensioned for braking powers  $P_{BR}$  with the following duty cycle:



Duty cycle for braking resistors

Braking resistors with a higher braking power and shorter cycle times are available on request.

### Options

The following options are available for the Central Braking Modules:

Available options	Order code
Cabinet anti-condensation heating	<b>L55</b>
Base 100 mm high, RAL 7022	<b>M06</b>
Cable-marshalling space 200 mm high, RAL 7035	<b>M07</b>
IP21 degree of protection	<b>M21</b>
IP23 degree of protection	<b>M23</b>
Side panel mounted at the right	<b>M26</b>
Side panel mounted at the left	<b>M27</b>
IP43 degree of protection	<b>M43</b>
IP54 degree of protection	<b>M54</b>
Closed cabinet door, air intake from below through floor opening	<b>M59</b>
DC busbar system ( $I_d = 1170$ A, $1 \times 60 \times 10$ mm)	<b>M80</b>
DC busbar system ( $I_d = 1500$ A, $1 \times 80 \times 10$ mm)	<b>M81</b>
DC busbar system ( $I_d = 1840$ A, $1 \times 100 \times 10$ mm)	<b>M82</b>
DC busbar system ( $I_d = 2150$ A, $2 \times 60 \times 10$ mm)	<b>M83</b>
DC busbar system ( $I_d = 2730$ A, $2 \times 80 \times 10$ mm)	<b>M84</b>
DC busbar system ( $I_d = 3320$ A, $2 \times 100 \times 10$ mm)	<b>M85</b>
DC busbar system ( $I_d = 3720$ A, $3 \times 80 \times 10$ mm)	<b>M86</b>
DC busbar system ( $I_d = 4480$ A, $3 \times 100 \times 10$ mm)	<b>M87</b>
Crane transport assembly (top-mounted)	<b>M90</b>

Available options	Order code
Special paint finish for cabinet	<b>Y09</b>
Factory assembly as transport units	<b>Y11</b>
One-line label for system identification, $40 \times 80$ mm	<b>Y31</b>
Two-line label for system identification, $40 \times 180$ mm	<b>Y32</b>
Four-line label for system identification, $40 \times 180$ mm	<b>Y33</b>
Customer documentation (circuit diagram, terminal diagram, layout diagram) in DXF format	<b>D02</b>
Preliminary version of customer documentation in PDF format	<b>D14</b>
Documentation in English/French	<b>D58</b>
Documentation in English/Spanish	<b>D60</b>
Documentation in English/Italian	<b>D80</b>
Without Operating Instructions	<b>D99</b>
Rating plate data in English/French	<b>T58</b>
Rating plate data in English/Spanish	<b>T60</b>
Rating plate data in English/Italian	<b>T80</b>
Visual acceptance	<b>F03</b>
Function test without connected motor	<b>F71</b>
Insulation test	<b>F77</b>
Customer-specific acceptance inspections (on request)	<b>F97</b>

## Options

## Option selection matrix for Central Braking Modules

Certain options can mutually exclude one another (options that are not involved are not shown).

✓	Possible combination
–	Combination not possible

## Mechanical/electrical options

	M06	M07	M21	M23	M26	M27	M43	M54	M90	Y11	Y31	Y32	Y33
M06		–	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
M07	–		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
M21	✓	✓		–	✓	✓	–	–	✓	✓	✓	✓	✓
M23	✓	✓	–		✓	✓	–	–	✓	✓	✓	✓	✓
M26	✓	✓	✓	✓		–	✓	✓	✓	✓	✓	✓	✓
M27	✓	✓	✓	✓	–		✓	✓	✓	✓	✓	✓	✓
M43	✓	✓	–	–	✓	✓		–	✓	✓	✓	✓	✓
M54	✓	✓	–	–	✓	✓	–		✓	✓	✓	✓	✓
M90	✓	✓	✓	✓	✓	✓	✓	✓		–	✓	✓	✓
Y11	✓	✓	✓	✓	✓	✓	✓	✓	–		✓	✓	✓
Y31	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		–	–
Y32	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	–		–
Y33	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	–	–	

## Mechanical options, DC busbar (busbars between individual Cabinet Modules)

	M80	M81	M82	M83	M84	M85	M86	M87
M80		–	–	✓	–	–	–	–
M81	–		–	–	✓	–	✓	–
M82	–	–		–	–	✓	–	✓
M83	✓	–	–		–	–	–	–
M84	–	✓	–	–		–	✓	–
M85	–	–	✓	–	–		–	✓
M86	–	✓	–	–	✓	–		–
M87	–	–	✓	–	–	✓	–	

## Documentation

	D02	D14	D58	D60	D80	D99
D02		✓	✓	✓	✓	–
D14	✓		✓	✓	✓	–
D58	✓	✓		–	–	–
D60	✓	✓	–		–	–
D80	✓	✓	–	–		–
D99	–	–	–	–	–	

## Rating plate data

	T58	T60	T80
T58		–	–
T60	–		–
T80	–	–	



# SINAMICS S120 Cabinet Modules

## Auxiliary Power Supply Modules

### Overview



Auxiliary Power Supply Modules supply the auxiliary power supply for the SINAMICS S120 Cabinet Modules. Units connected to this auxiliary power supply system include the fans of the SINAMICS S120 devices installed in the Cabinet Modules. In addition, the auxiliary power supply system supplies the electronic modules with an external 24 V DC voltage. This is required when the DC link is not charged, for instance, in order to maintain PROFIBUS/PROFINET communication.

### Design

The Auxiliary Power Supply Module is connected in the customer's plant to a voltage corresponding to the respective rated unit voltage.

The standard version contains the following components:

- Fuse switch disconnecter with fuse monitoring for external evaluation
- Supply of the auxiliary power supply system with 3 fused auxiliary voltages:
  - 24 V DC for the electronics power supply
  - 230 V 2 AC to supply 230 V loads
  - 380 V to 690 V 2 AC to supply the equipment fans
- Transformer with 230 V output voltage
- SITOP 24 V DC power supply
- 6-pole auxiliary power supply system (ready-wired), including connections for looping through to the next Cabinet Module
- Nickel-plated PE busbar (60 mm × 10 mm), including jumper for looping through to the next Cabinet Module

### Selection and ordering data

System-side power supply (380 ... 690 V 3 AC)	Auxiliary Power Supply Module
A	Order No.
125	<b>6SL3700-0MX14-0AA3</b>
160	<b>6SL3700-0MX16-3AA3</b>
200	<b>6SL3700-0MX21-0AA3</b>
250	<b>6SL3700-0MX21-4AA3</b>

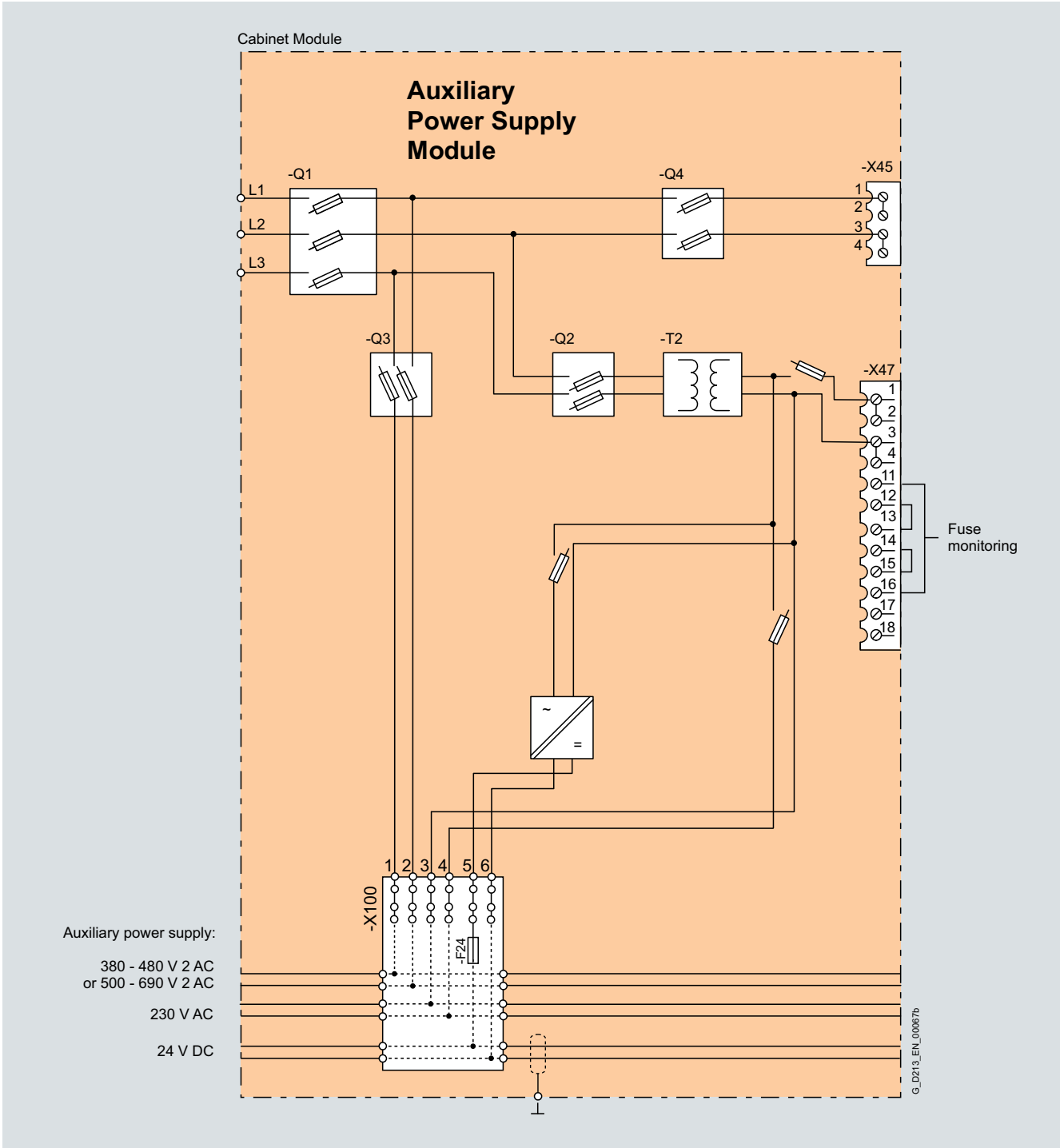
#### Note:

In smaller systems, there is often no need for an additional Cabinet Module for the auxiliary power supply. In such cases, the in-feed for the auxiliary power supply system can also be supplied by the Line Connection Module. This must then be separately ordered (order code **K76**).

## Auxiliary Power Supply Modules

### Integration

3



Block diagram, Auxiliary Power Supply Module

# SINAMICS S120 Cabinet Modules

## Auxiliary Power Supply Modules

### Technical data

		Auxiliary Power Supply Modules			
		6SL3700-0MX14-0AA3	6SL3700-0MX16-3AA3	6SL3700-0MX21-0AA3	6SL3700-0MX21-4AA3
<b>System-side power supply</b> 380 ... 690 V 3 AC	A	<b>125</b>	<b>160</b>	<b>200</b>	<b>250</b>
<b>Line supply connection</b>					
• Conductor cross-section, max. (IEC)	mm <sup>2</sup>	150	150	150	150
<b>Current carrying capacity, max.</b>					
• Load connection 380 V ... 690 V AC					
- to auxiliary power supply	A	63	80	100	100
- to customer terminal -X45	A	50	63	80	80
• Load connection 230 V 2 AC					
- to auxiliary power supply	A	6	10	10	20
- to customer terminal -X45	A	8	10	10	20
• Load connection 24 V DC					
- to auxiliary power supply	A	20	40	80	80
<b>Cable cross-section, max.</b>					
• Connection -X45	mm <sup>2</sup>	16	16	16	16
• Connection -X47	mm <sup>2</sup>	2.5	2.5	2.5	2.5
<b>Cooling air requirement</b>	m <sup>3</sup> /s	Natural convection	Natural convection	Natural convection	Natural convection
<b>PE/GND connection</b>		PE bar	PE bar	PE bar	PE bar
• Busbar cross-section	mm <sup>2</sup>	600	600	600	600
• Conductor cross-section, max. (IEC)	mm <sup>2</sup>	240	240	240	240
<b>Degree of protection</b>		IP20	IP20	IP20	IP20
<b>Dimensions</b>					
• Width	mm	600	600	600	600
• Height <sup>1)</sup>	mm	2200	2200	2200	2200
• Depth	mm	600	600	600	600
<b>Weight, approx.</b>	kg	170	180	210	240

<sup>1)</sup> The cabinet height increases by 250 mm with IP21 degree of protection, and by 400 mm with IP23, IP43 and IP54 degrees of protection.

## Options

The table below lists the options available for Auxiliary Power Supply Modules ([Details → Description of the options](#)):

Available options	Order code
Cabinet anti-condensation heating	<b>L55</b>
Base 100 mm high, RAL 7022	<b>M06</b>
Cable-marshalling space 200 mm high, RAL 7035	<b>M07</b>
IP21 degree of protection	<b>M21</b>
IP23 degree of protection	<b>M23</b>
Side panel mounted at the right	<b>M26</b>
Side panel mounted at the left	<b>M27</b>
IP43 degree of protection	<b>M43</b>
IP54 degree of protection	<b>M54</b>
Closed cabinet door, air intake from below through floor opening	<b>M59</b>
EMC shield bus	<b>M70</b>
DC busbar system ( $I_d = 1170$ A, $1 \times 60 \times 10$ mm)	<b>M80</b>
DC busbar system ( $I_d = 1500$ A, $1 \times 80 \times 10$ mm)	<b>M81</b>
DC busbar system ( $I_d = 1840$ A, $1 \times 100 \times 10$ mm)	<b>M82</b>
DC busbar system ( $I_d = 2150$ A, $2 \times 60 \times 10$ mm)	<b>M83</b>
DC busbar system ( $I_d = 2730$ A, $2 \times 80 \times 10$ mm)	<b>M84</b>
DC busbar system ( $I_d = 3320$ A, $2 \times 100 \times 10$ mm)	<b>M85</b>
DC busbar system ( $I_d = 3720$ A, $3 \times 80 \times 10$ mm)	<b>M86</b>
DC busbar system ( $I_d = 4480$ A, $3 \times 100 \times 10$ mm)	<b>M87</b>
Crane transport assembly (top-mounted)	<b>M90</b>
Special paint finish for cabinet	<b>Y09</b>
Factory assembly as transport units	<b>Y11</b>
One-line label for system identification, $40 \times 80$ mm	<b>Y31</b>
Two-line label for system identification, $40 \times 180$ mm	<b>Y32</b>
Four-line label for system identification, $40 \times 180$ mm	<b>Y33</b>
Customer documentation (circuit diagram, terminal diagram, layout diagram) in DXF format	<b>D02</b>
Preliminary version of customer documentation in PDF format	<b>D14</b>
Documentation in English/French	<b>D58</b>
Documentation in English/Spanish	<b>D60</b>
Documentation in English/Italian	<b>D80</b>
Without Operating Instructions	<b>D99</b>
Rating plate data in English/French	<b>T58</b>
Rating plate data in English/Spanish	<b>T60</b>
Rating plate data in English/Italian	<b>T80</b>
Visual acceptance	<b>F03</b>
Function test without connected motor	<b>F71</b>
Insulation test	<b>F77</b>
Customer-specific acceptance inspections (on request)	<b>F97</b>

# SINAMICS S120 Cabinet Modules

## Auxiliary Power Supply Modules

### Options

#### Option selection matrix for Auxiliary Power Supply Modules

Certain options can mutually exclude one another (options that are not involved are not shown).

✓	Possible combination
–	Combination not possible

#### Mechanical/electrical options

	M06	M07	M21	M23	M43	M54	M90	Y11	Y31	Y32	Y33
M06		–	✓	✓	✓	✓	✓	✓	✓	✓	✓
M07	–		✓	✓	✓	✓	✓	✓	✓	✓	✓
M21	✓	✓		–	–	–	✓	✓	✓	✓	✓
M23	✓	✓	–		–	–	✓	✓	✓	✓	✓
M43	✓	✓	–	–		–	✓	✓	✓	✓	✓
M54	✓	✓	–	–	–		✓	✓	✓	✓	✓
M90	✓	✓	✓	✓	✓	✓		–	✓	✓	✓
Y11	✓	✓	✓	✓	✓	✓	–		✓	✓	✓
Y31	✓	✓	✓	✓	✓	✓	✓	✓		–	–
Y32	✓	✓	✓	✓	✓	✓	✓	✓	–		–
Y33	✓	✓	✓	✓	✓	✓	✓	✓	–	–	

#### Mechanical options, DC busbar (busbars between individual Cabinet Modules)

	M80	M81	M82	M83	M84	M85	M86	M87
M80		–	–	✓	–	–	–	–
M81	–		–	–	✓	–	✓	–
M82	–	–		–	–	✓	–	✓
M83	✓	–	–		–	–	–	–
M84	–	✓	–	–		–	✓	–
M85	–	–	✓	–	–		–	✓
M86	–	✓	–	–	✓	–		–
M87	–	–	✓	–	–	✓	–	

#### Documentation

	D02	D14	D58	D60	D80	D99
D02		✓	✓	✓	✓	–
D14	✓		✓	✓	✓	–
D58	✓	✓		–	–	–
D60	✓	✓	–		–	–
D80	✓	✓	–	–		–
D99	–	–	–	–	–	

#### Rating plate data

	T58	T60	T80
T58		–	–
T60	–		–
T80	–	–	

## Options

**D02****Customer documentation (circuit diagram, terminal diagram, layout diagram) in DXF format**

Option **D02** can be used to order documents such as circuit diagrams, terminal diagrams, layout diagrams, and dimension drawings in DXF format, e.g. for further processing in AutoCAD systems.

**D14****Preliminary version of customer documentation in PDF format**

If documents such as circuit diagrams, terminal diagrams, layout diagrams and dimension drawings are required in advance for the purpose of system engineering (integration of drive into higher-level systems, interface definition, installation, building planning, etc.), it is possible to order a draft copy of the documentation when ordering the Cabinet Modules. These documents are then supplied electronically a few working days following receipt of the order. If the order includes options that fall outside the scope of standard delivery, these will not be covered by the documentation due to the obvious time constraints.

Documentation relating to the order is sent to the buyer by e-mail. The recipient's e-mail address must be specified with the order for this purpose. In the e-mail, the recipient will also receive a link (Internet address) for downloading general, non-order-specific documentation such as the Operating Instructions, Equipment Manual and Commissioning Instructions.

**D58, D60, D80****Documentation language**

Option	Language
<b>D58</b>	English/French
<b>D60</b>	English/Spanish
<b>D80</b>	English/Italian

**D99****Without Operating Instructions**

The Cabinet Modules or Booksize Cabinet Kit are shipped without a documentation CD.

**F03, F71, F77, F97****Equipment acceptance in the presence of the customer**

Option	Description
<b>F03</b>	<p><b>Visual acceptance</b></p> <p>The inspection includes the following:</p> <ul style="list-style-type: none"> <li>• Check of degree of protection</li> <li>• Check of equipment (components)</li> <li>• Check of equipment identifiers</li> <li>• Check of clearance and creepage distances</li> <li>• Check of cables</li> <li>• Check of customer documentation</li> <li>• Submission of the acceptance report</li> </ul> <p>All the above checks are performed with the equipment in a no-voltage condition.</p>
<b>F71</b>	<p><b>Function test without connected motor</b></p> <p>The inspection includes the following:</p> <ul style="list-style-type: none"> <li>• Visual inspection as described for option <b>F03</b></li> <li>• Check of power supply</li> <li>• Check of protective and monitoring devices (simulation)</li> <li>• Check of fans</li> <li>• Pre-charging test</li> <li>• Function test without connected motor</li> <li>• Submission of the acceptance report</li> </ul> <p>After the visual inspection with the equipment in a no-voltage condition, the rated voltage is connected to the equipment. No current at the equipment output.</p>
<b>F77</b>	<p><b>Insulation test</b></p> <p>The inspection includes the following:</p> <ul style="list-style-type: none"> <li>• High-voltage test</li> <li>• Measurement of insulation resistance</li> </ul>
<b>F97</b>	<p><b>Customer-specific acceptance inspections (on request)</b></p> <p>If acceptance inspections that are not covered by the options <b>F03</b>, <b>F71</b>, <b>F75</b> or <b>F77</b> are required, then customer-specific acceptance inspections/supplementary tests can be ordered using order code <b>F97</b> on request and following technical clarification.</p>

# SINAMICS S120 Cabinet Modules

## Description of the options

### Options

#### **G20** **CBC10 Communication Board**

The CBC10 Communication Board is used to interface the CU320-2 Control Unit and thus the SINAMICS S120 Cabinet Modules to the CAN (Controller Area Network) protocol. The board's driver software fulfills the standards of the following CANopen specification of the CiA organization (CAN in Automation):

Communication profiles in accordance with DS 301:

- Drive profile in accordance with DSP 402 (in this case Profile Velocity Mode)
- EDS (Electronic Data Sheet) in accordance with DSP 306
- Operational status signaling in accordance with DSP 305

The CBC10 Communication Board plugs into the option slot on the CU320-2 Control Unit. The CAN interface on the CBC10 has 2 SUB-D connections for input and output.

The CBC10 Communication Board can only be ordered in conjunction with a CU320-2 Control Unit (option **K90** or **K95**) and is supplied in an accessories pack for possible configuration. It cannot be combined with option **G33**.

[Description of the CBC10 Communication Board → Chapter 2.](#)

#### **G33** **CBE20 Communication Board**

The CBE20 Communication Board can be used to connect the SINAMICS S120 Cabinet Modules to a PROFINET IO network via a CU320-2 Control Unit. The CBE20 Communication Board plugs into the option slot on the CU320-2 Control Unit.

The CBE20 Communication Board can only be ordered as option **G33** in conjunction with a CU320-2 Control Unit (option **K90** or **K95**) and is supplied in an accessories pack for possible configuration. It cannot be combined with option **G20**.

[Description of the CBE20 Communication Board → Chapter 2.](#)

#### **K01 to K05** **Safety license for 1 to 5 axes**

The Safety Integrated Basic Functions do not require a license. A license is, however, required for each axis with safety functions in the case of Safety Integrated Extended Functions. It is irrelevant which safety functions are used and how many.

Option **K01** includes the license for 1 axis, **K02** for 2 axes, etc. up to option **K05** for 5 axes.

The required licenses can be optionally ordered with the CompactFlash card.

Subsequent licensing is possible in the Internet via the WEB License Manager by generating a license key:  
[www.siemens.com/automation/license](http://www.siemens.com/automation/license)

#### **K08** **AOP30 Advanced Operator Panel installed in the cabinet door**

The AOP30 Advanced Operator Panel is an optional input/output device for the Cabinet Modules. If, for the Cabinet Module or the Booksize Cabinet Kit, an autonomous closed-control (option **K90** or **K95**) is selected, then using option **K08** this module can be assigned to its own operator panel.

The AOP30 Advanced Operator Panel is installed in the cabinet door of each Cabinet Module.

[Description of the AOP30 Advanced Operator Panel → Chapter 2.](#)

#### **K46** **SMC10 Sensor Module Cabinet-Mounted**

The SMC10 Sensor Module Cabinet-Mounted can be used to simultaneously sense the speed and the rotor position angle. The signals received from the resolver are converted here and made available to the closed-loop controller via the DRIVE-CLiQ interface for evaluation purposes.

The following encoder signals can be evaluated:

- 2-pole resolver
- Multipole resolver

The motor temperature can also be detected using KTY84-130 or PTC thermistors.

[Description of the SMC10 Sensor Module Cabinet-Mounted → Chapter 2.](#)

## Options

**K48****SMC20 Sensor Module Cabinet-Mounted**

The SMC20 Sensor Module Cabinet-Mounted can be used to simultaneously sense the speed and position. The signals received from the incremental encoder are converted here and made available to the closed-loop controller via the DRIVE-CLiQ interface for evaluation purposes.

The following encoder signals can be evaluated:

- Incremental encoder sin/cos  $1 V_{pp}$
- EnDat absolute encoder
- SSI encoder with incremental signals sin/cos  $1 V_{pp}$  (firmware version 2.4 and later)

The motor temperature can also be detected using KTY84-130 or PTC thermistors.

[Description of the SMC20 Sensor Module Cabinet-Mounted](#)  
→ Chapter 2.

**K50****SMC30 Sensor Module Cabinet-Mounted**

The SMC30 Sensor Module Cabinet-Mounted can be used to evaluate the encoders of motors without a DRIVE-CLiQ interface. External encoders can also be connected via the SMC30.

The following encoder signals can be evaluated:

- Incremental encoders TTL/HTL with/without open-circuit detection (open-circuit detection is only available with bipolar signals)
- SSI encoder with TTL/HTL incremental signals
- SSI encoder without incremental signals

The motor temperature can also be detected using KTY84-130 or PTC thermistors.

[Description of the SMC30 Sensor Module Cabinet-Mounted](#)  
→ Chapter 2.

**K51****VSM10 Voltage Sensing Module**

The VSM10 Voltage Sensing Module is used to sense the voltage characteristic on the motor side, so that the following function can be implemented:

- Operation of a permanent-magnet synchronous motor without encoder with the requirement to be able to connect to a motor that is already running (flying restart function)

[Description of the VSM10 Voltage Sensing Module](#) → Chapter 2.

**K76****Auxiliary voltage generation in the Line Connection Module**

Cabinet Modules require an auxiliary energy supply to function properly. This current demand must be included in the configuration and supplied from an external source. If an external supply is not possible, the required auxiliary voltages can be supplied by means of an Auxiliary Power Supply Module.

Alternatively, option **K76** can be selected, where the auxiliary voltages are generated in the Line Connection Module. This is particularly advisable for smaller device configurations.

With option **K76**, the following auxiliary voltages are provided:

- 380 V to 480 V or 500 V to 690 V 2 AC (possible tap, approx. 80 A)
  - 230 V 2 AC (possible tap Line Connection Modules < 800 A: approx. 4 A, > 800 A: approx. 6 A)
- 24 V DC (possible tap Line Connection Modules < 800 A: approx. 20 A, > 800 A: approx. 40 A)

The supply for the auxiliary power supply system is connected at the auxiliary voltage module of the Line Connection Module.

**K82****Terminal module for controlling the Safe Torque Off and Safe Stop 1 safety functions**

The terminal module controls the Basic Safety Functions Safe Torque Off (STO) and Safe Stop 1 (SS1) (time-controlled) over a wide voltage range from 24 V to 240 V DC/AC (terminology as defined in draft IEC 61800-5-2).

The integrated safety functions, starting from the Safety Integrated (SI) input terminals of the components (Control Unit and Motor Module), satisfy the requirements of EN 61800-5-2, EN 60204-1, DIN EN ISO 13849-1 Category 3 (previously EN 954-1) for Performance Level (PL) d and IEC 61508 SIL 2.

With option **K82**, the requirements specified in EN 61800-5-2, EN 60204-1, DIN EN ISO 13849-1 Category 3 (previously EN 954-1) for Performance Level (PL) d and IEC 61508 SIL 2 are fulfilled.

The Safety Integrated functions using option **K82** are only available in conjunction with certified components and software versions.

The Safety Integrated functions of SINAMICS are generally certified by independent institutes. An up-to-date list of certified components is available on request from your local Siemens office.

**K87****TM54F Terminal Module**

The TM54F Terminal Module is a terminal expansion module with safe digital inputs and outputs to control the Safety Integrated functions.

The TM54F must be connected directly to a Control Unit via DRIVE-CLiQ. Each Control Unit can be precisely assigned to one TM54F.

**Note:** It is not permissible to connect Motor Modules or Line Modules to a TM54F.

The TM54F has 4 fail-safe digital outputs and 10 fail-safe digital inputs. A fail-safe digital output consists of one 24 V DC switching output, an output switching to ground and one digital input to check the switching state. A fail-safe digital input consists of two digital inputs.

**K88****Safe Brake Adapter SBA, 230 V AC**

The Safe Brake Control (SBC) is a safety function, which is used in safety-relevant applications, for example in presses or rolling mills. In the no-current state, the brake acts on the drive motor using spring force. The brake is released when current flows in it (low active).

The Safe Brake Adapter 230 V AC is factory installed in the cabinet unit. A source of power is connected to terminal -X12 on the Safe Brake Adapter. For control, a connection is established between the Safe Brake Adapter and the Control Interface Module in the factory using a cable harness.

On the plant side, to control the brake, a connection must be established between terminal -X14 on the Safe Brake Adapter and the brake.



# SINAMICS S120 Cabinet Modules

## Description of the options

### Options

#### K89

##### Safe Brake Adapter SBA, 24 V DC

The Safe Brake Control (SBC) is a safety function, which is used in safety-relevant applications, for example in presses or rolling mills. In the no-current state, the brake acts on the drive motor using spring force. The brake is released when current flows in it (low active).

The Safe Brake Adapter 24 V DC is factory installed in the cabinet unit. A source of power is connected to terminal -X13 on the Safe Brake Adapter. For control, a connection is established between the Safe Brake Adapter and the Control Interface Module in the factory using a cable harness.

On the plant side, to control the brake, a connection must be established between terminal -X14 on the Safe Brake Adapter and the brake.

#### K90

##### CU320-2 DP (PROFIBUS) Control Unit

Option **K90** assigns a CU320-2 DP Control Unit to the Line Modules and Motor Modules. This unit handles the communication and open-loop/closed-loop control functions. DRIVE-CLiQ is used to establish a connection to the various modules and where required, to additional I/O modules. A PROFIBUS interface is available as standard for the higher-level communication.

The computational performance required from the CU320-2 DP Control Unit increases with the number of connected Motor Modules and system components – as well as the dynamic performance demanded.

Without performance expansion, it is generally possible to operate 2 Motor Modules with 1 Line Module.

The full computational performance of the CU320-2 DP is only available on systems with performance expansion (option **K94**).

#### K94

##### Performance expansion for CU320-2 Control Unit

With option **K94**, the CU320-2 Control Unit (option **K90** or **K95**) is supplied with a CompactFlash card with performance expansion. This therefore provides the full computational performance of the CU320-2 Control Unit.

In addition to the firmware, the CompactFlash card also contains licensing codes that are required to enable firmware options, such as the performance expansion and the Safety Integrated Extended functions.

#### K95

##### CU320-2 PN (PROFINET) Control Unit

With option **K95**, the cabinet unit includes a CU320-2 PN Control Unit, which handles the communication, open-loop and closed-loop control functions.

A PROFINET interface is available for the higher-level communication.

#### L00

##### Use in the first environment according to EN 61800-3, Category C2 (TN/TT supply systems with grounded neutral point)

With option **L00**, the Line Modules have a line filter as well as additional measures installed in the factory; this means that the Cabinet Modules can also comply with the limit values for use in the first environment (Category C2) according to EN 61800-3.

Notes on the measures required on the customers side are provided in the SINAMICS Low Voltage Engineering Manual.

In order to achieve the full filter effect, the optional line filter must always be used in conjunction with a line reactor.

**Note:** Option **L00** is not available for Line Modules in a parallel connection.

#### L07

##### dv/dt filter compact plus Voltage Peak Limiter

dv/dt filter compact plus VPL (**V**oltage **P**eak **L**imiter) limits the voltage rate-of-rise dv/dt to values < 1600 V/μs, and the typical voltage peaks to the following values according to the limit value curve A according to IEC 60034-25: 2007:

- < 1150 V at  $U_{line} < 575$  V
- < 1400 V at  $660$  V <  $U_{line} < 690$  V

The dv/dt filter compact plus VPL functionally comprises two components, which are mechanically supplied as a compact unit, the dv/dt reactor and the voltage limiting network VPL, which cuts off voltage peaks and feeds back the energy into the DC link.

It is so compact that it can be completely integrated into the cabinet, even for high power ratings. An additional cabinet is not required.

By using a dv/dt filter compact plus VPL, standard motors with standard insulation and without insulated bearings can be used with supply voltages up to 690 V in converter operation.

dv/dt filter compact plus VPL are designed for the following maximum motor cable lengths:

- Shielded cables: 100 m (e.g. Protodur NYCWY)
- Unshielded cables: 150 m (e.g. Protodur NYY)

For longer cable lengths (> 100 m shielded, > 150 m unshielded) use the dv/dt filter plus VPL (option **L10**).

#### Notice:

- The max. permissible cable length between the dv/dt filter and Motor Module is 5 m.
- Operation with output frequencies < 10 Hz is permissible for max. 5 min.

Also observe the appropriate notes in the SINAMICS Low Voltage Engineering Manual (as PDF on the CD-ROM provided with the catalog).

#### Note:

Option **L07** cannot be combined with the following options:

- **L08** (motor reactor)
- **L10** (dv/dt filter plus VPL).

## Options

**L08****Motor reactor**

Motor reactors reduce the voltage load on the motor windings by reducing the voltage gradients on the motor terminals generated when the converter is used. At the same time, the capacitive charge/discharge currents that place an additional load at the Motors Module output when long motor cables are used are reduced.

Suitably dimensioned motor reactors or connecting several motor reactors in series offers the possibility of larger capacitances, therefore allowing longer motor cable length to be connected.

In the case of multi-motor drives, the use of motor reactors is recommended as a general principle.

The motor reactor is accommodated in the Cabinet Module. A supplementary cabinet 600 mm wide located to the right of the Motor Module is only required for the chassis format in frame sizes HX and JX.

**Note:** The terminal lugs of the reactors are not nickel-plated.

For Motor Modules in the chassis format, the maximum motor cable lengths when using motor reactors are 300 m (shielded) or 450 m (unshielded).

For Motor Modules in the Booksize Cabinet Kit format, by using motor reactors (option **L08**) the maximum motor cable lengths, specified in the following table, can be reached:

Booksize Cabinet Kit	Rated output current of Motor Module	Maximum motor cable length when using motor reactors for Booksize Cabinet Kits					
		Shielded cable			Unshielded cable		
		Without reactor	With one reactor (option <b>L08</b> )	With two reactors in series (option <b>L09</b> )	Without reactor	With one reactor (option <b>L08</b> )	With two reactors in series (option <b>L09</b> )
6SL3720-...	A	m	m	m	m	m	m
1TE13-0AB3	3	50	100	–	75	150	–
2TE13-0AB3	2 × 3	50	100	–	75	150	–
1TE15-0AB3	5	50	100	–	75	150	–
2TE15-0AB3	2 × 5	50	100	–	75	150	–
1TE21-0AB3	9	50	135	–	75	200	–
2TE21-0AB3	2 × 9	50	135	–	75	200	–
1TE21-8AB3	18	70	160	320	100	240	480
2TE21-8AB3	2 × 18	50	160	–	75	240	–
1TE23-0AB3	30	100	190	375	150	280	560
1TE24-5AB3	45	100	200	400	150	300	600
1TE26-0AB3	60	100	200	400	150	300	600
1TE28-5AB3	85	100	200	400	150	300	600
1TE31-3AB3	132	100	200	400	150	300	600
1TE32-0AB3	200	100	200	400	150	300	600

# SINAMICS S120 Cabinet Modules

## Description of the options

### Options

#### L09

##### Two motor reactors in series

In the Booksize Cabinet Kit format, for Single Motor Modules with the option **L09** two motor reactors are used in series, which can be located within the standard width of the Cabinet Kit. For space reasons, option **L09** is not possible for Cabinet Kits with Double Motor Modules.

The maximum permissible motor cable lengths when using option **L09** are specified in the table under option **L08**.

Note: The terminal lugs of the reactors are not nickel-plated.

#### L10

##### dv/dt filter plus Voltage Peak Limiter

dv/dt filter plus VPL (Voltage Peak Limiter) limits the voltage rate-of-rise dv/dt to values < 500 V/μs, and the typical voltage peaks to the following values according to the limit value curve to IEC/TS 60034-17: 2006:

- < 1000 V at  $U_{\text{line}} < 575 \text{ V}$
- < 1250 V at  $660 \text{ V} < U_{\text{line}} < 690 \text{ V}$

The dv/dt filter plus VPL functionally comprises two components, the dv/dt reactor and the voltage limiting network VPL, which cuts off voltage peaks and feeds back the energy into the DC link.

Option **L10** is installed in an additional cabinet with a width of 600 mm that is located on the right-hand side of the Motor Module.

By using a dv/dt filter plus VPL, standard motors with standard insulation and without insulated bearings can be used with supply voltages up to 690 V in converter operation.

dv/dt filter plus VPL are designed for the following maximum motor cable lengths:

- Shielded cables: 300 m (e.g. Protodur NYCWY)
- Unshielded cables: 450 m (e.g. Protodur NYY)

For cable lengths < 100 m shielded or < 150 m unshielded, the dv/dt filter compact plus VPL (option **L07**) can be advantageously used.

[When using dv/dt filters, restrictions regarding permissible pulse and output frequencies must be observed. The corresponding notes are provided in the SINAMICS Low Voltage Engineering Manual \(as PDF on the CD-ROM provided with the catalog\).](#)

Note:

Parts of option **L10** do not have nickel-plated copper busbars.

Option **L10** cannot be combined with the following options:

- **L07** (dv/dt filter compact plus VPL)
- **L08** (motor reactor).

#### L13

##### Main contactor (for the supply current ≤ 800 A)

Line Connection Modules for current ratings up to 800 A feature only a manually operated fuse switch disconnecter as standard. Option **L13** is needed if a switching element is also required for disconnecting the cabinet from the supply (needed for EMERGENCY OFF). The contactor is controlled by the closed-loop control in this case. Option **L13** can be ordered for Line Connection Modules together with Basic Line Modules (option **L43**); for Smart Line Modules and Active Line Modules, the contactor is already included for the purpose of pre-charging.

#### L22

##### Delivery scope without line reactor

Basic Line Modules or Smart Line Modules are supplied as standard with line reactors; the reason for this is that frequently in practice the line configuration at the connection point of the drive line-up and/or the line supply short-circuit power is not known.

If the supply is realized through a separate transformer, if the line has a suitably low short-circuit power or for other reasons the standard integrated line reactor is not supplied, then this can be indicated by selecting option **L22**.

Option **L22** can be selected for Line Connection Modules (rated current < 2000 A) in conjunction with Basic Line Modules (option **L43**) and for Smart Line Modules.

For Basic Line Modules connected in parallel, a line reactors must always be used, i.e. option **L22** cannot be selected.

[For additional information, please refer to the SINAMICS Low Voltage Engineering Manual.](#)

#### L25

##### Circuit breaker in a withdrawable unit design

Line Connection Modules with an input current of > 800 A are equipped with fixed-mounted circuit breakers as standard. Where the customer requires a visible isolating distance, a withdrawable circuit breaker can be ordered as an option.

#### L34

##### Output-side circuit breaker

Option **L34** can be used to disconnect the motor terminals from the Motor Module chassis.

A rotating permanent-magnet synchronous motor generates a voltage at its motor terminals proportional to the speed. The motor terminal voltage is also available at the inverter output terminals as well as at the DC link and the components connected to it.

Option **L34** is available for disconnection in the case of a fault or if maintenance work is to be carried out.

Option **L34** is completely prewired and is accommodated in an additional cabinet, which is arranged at the right-hand side of the Motor Module (400 mm wide for frame sizes FX/GX, 600 mm wide for frame size HX/JX). It is controlled using a TM31 Terminal Module, which is included with this option. This means that the output switch is automatically controlled via the Motor Module.

Option **L34** cannot be combined with option **L10** (dv/dt filter plus Voltage Peak Limiter).

## Options

**L37****DC interface incl. pre-charging circuit of the relevant DC link capacitance**

If, for reasons relating to the process or availability, the Motor Module needs to be disconnected from or connected to the common DC link for an entire drive line-up during operation, a manually operated isolating distance can be ordered as an option. With chassis format power units, this takes the form of switch disconnectors, and with Booksize Cabinet Kits, a contactor combination.

Option **L37** is installed on the busbar between the Motor Module and the main DC busbar. To ensure that the module can be connected to a pre-charged DC link, the option also includes a pre-charging circuit for the DC link capacitors of the relevant Motor Module.

The switching operation is performed externally. The operating levers can be locked using a padlock (padlock not included in scope of delivery). The degree of protection of the cabinets is not influenced.

Option **L37** also includes option **M60** (additional touch protection) for guiding the air.

Options **L61/L62** and **L64/L65** (braking units) cannot be ordered together with option **L37** for space reasons.

**L41****Current transformer upstream of main circuit breaker**

If additional current transformers are required for measuring or monitoring purposes, these can be ordered as option **L41** for the Line Connection Modules. The current transformers are installed upstream of the main circuit breaker in all three infeed phases.

The transformers have an accuracy class of 1.0. The secondary current is 1 A, maximum.

The transformer measuring connections are routed to the terminal block in the Line Connection Module.

**Comment:** These current transformers are already included in options **P10** and **P11** (measuring instrument for the display of line values).

**L42****Line Connection Module for Active Line Modules**

Order code **L42** is specified in the order to indicate that the Line Connection Module will be connected to an Active Line Module. The Line Connection Module is then adapted accordingly (pre-charging circuit, connection busbars, etc.). Also refer to the assignment table for the Line Connection Modules.

**L43****Line Connection Module for Basic Line Modules**

Order code **L43** is specified in the order to indicate that the Line Connection Module will be connected to a Basic Line Module. The Line Connection Module is then adapted accordingly (line reactors, pre-charging circuit, connection busbars, etc.). Also refer to the assignment table for the Line Connection Modules.

**L44****Line Connection Module for Smart Line Modules**

Order code **L44** is specified in the order to indicate that the Line Connection Module will be connected to a Smart Line Module. The Line Connection Module is then adapted accordingly (pre-charging circuit, connection busbars, etc.). Also refer to the assignment table for the Line Connection Modules.

**L45****EMERGENCY OFF pushbutton, installed in the cabinet door**

The EMERGENCY OFF pushbutton with protective collar is installed in the cabinet door of the Line Connection Module and its contacts are connected to a terminal block. From here, the EMERGENCY OFF pushbutton can be integrated into the plant-side EMERGENCY OFF chain.

**L46****Grounding switch upstream of main circuit breaker**

The grounding switch is upstream of the circuit breaker in the Line Connection Module and short-circuits the incoming supply system to ground. The grounding switch is manually engaged using a rotary operating mechanism to ensure isolation from the line supply when maintenance is being carried out. Measures must be taken at the plant to ensure that the grounding switch cannot be engaged when voltage is applied.

It is also essential to ensure that the supply system cannot be connected when the grounding switch is engaged.

The signals required for mutual interlocking are available on the terminal block.

**L47****Grounding switch downstream of main circuit breaker**

The grounding switch is installed downstream of the circuit breaker in the Line Connection Module and short-circuits the incoming supply system to ground downstream of the main circuit breaker. The grounding switch is manually engaged using a rotary operating mechanism to ensure isolation from the line supply when maintenance work is being carried out on the converter.

In this case, the grounding switch and the main circuit breaker for the Line Connection Module are interlocked with each other, which ensures that the grounding switch cannot be closed when the main circuit breaker is closed.

If the grounding switch is engaged, it is interconnected to ensure that the main circuit breaker cannot be closed.

**L55****Cabinet anti-condensation heating**

The anti-condensation heating is recommended at low ambient temperatures and high levels of humidity to prevent condensation. Depending on the cabinet width, a 100 W cabinet heater is installed for each Cabinet Module.

1 heating element for cabinet width up to 600 mm, 2 heating elements for cabinet width over 800 mm.

The power supply for the anti-condensation heating (110 V to 230 V AC, at terminal block -X240) must be provided externally and fused with max. 16 A.

Option **L55** cannot be ordered together with option **K82** (terminal module for the control of safety functions).

# SINAMICS S120 Cabinet Modules

## Description of the options

### Options

#### L61, L62, L64, L65 Braking units

Braking units may be required for drives in which motors might operate in generator mode but have no other facility for feeding energy back into the supply system.

The braking unit comprises two components:

- A Braking Module which can be installed in the air discharge of the chassis format power units
- A braking resistor to be mounted externally (IP20 degree of protection).

The braking unit functions as an autonomous unit, and does not require an external power supply. During the braking process, the kinetic energy is converted into heat in the externally mounted braking resistor.

A max. cable length of 100 m is permissible between the Braking Module and the braking resistor. This allows the braking resistor to be mounted externally so that heat losses can be dissipated outside the converter enclosure. The braking resistor is directly connected to the Braking Module.

For SINAMICS S120 Cabinet Modules the following braking modules are available, depending on the frame size:

Option	Can be used with frame sizes	Braking Module		
		Rated power $P_{DB}$ kW	Braking power $P_{20}$ kW	Peak power $P_{15}$ kW
<b>380 ... 480 V 3 AC, 660 ... 690 V 3 AC</b>				
<b>L61</b>	FX	25	100	125
<b>L62</b>	GX, HX, JX	50	200	250
<b>500 ... 600 V 3 AC</b>				
<b>L64</b>	FX	25	100	125
<b>L65</b>	GX, HX, JX	50	200	250

$P_{DB}$ : Rated power (continuous braking power)

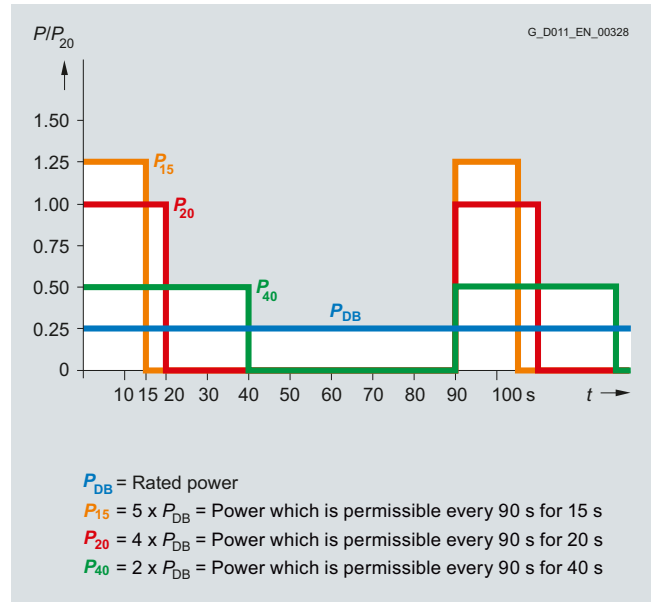
$P_{20}$ : 20 s power referred to a braking interval of 90 s

$P_{15}$ : 15 s power referred to a braking interval of 90 s

If the braking units listed here do not provide adequate braking power, up to 4 braking units on a DC link busbar may be connected in parallel. Braking power can be shared among several Modules. In this case, a Braking Module is assigned to each braking resistor.

**Comment:** It is only possible to use a Braking Module, if, for the Motor Module, a DC coupling (option **L37**) was not selected.

When engineering the system, it should be ensured, that the module in which the Braking Module is installed, is switched-on when braking so that the Braking Module cooling is guaranteed. Failure to follow this instruction means that the Braking Module could overheat and shut down, so that the drive will no longer be able to operate in braking mode. In this case, the Braking Modules should preferably be located in the Line Modules.



Load diagram for Braking Modules and braking resistors

Additional notes about possible duty cycles of the braking resistors and other engineering notes are included in the SINAMICS Low Voltage Engineering Manual.

#### L87

##### Insulation monitoring

An insulation monitor must be used if the converter is connected to an ungrounded line supply. The device monitors the entire galvanically coupled circuit for insulation faults.

An alarm is output in the event of a fault.

**Notice:** Only **one** insulation monitor can be used in each galvanically coupled network.

As there are different response strategies when a ground fault occurs in an ungrounded system, output relays of the insulation monitor are provided for integration in a plant-side control. It is also possible to integrate the outputs into the Cabinet Modules monitoring system on the plant side.

## Options

**M06****Base 100 mm high, RAL 7022**

The additional cabinet base allows larger bending radii for cables (cable inlet from below) and enables them to be routed within the cabinet base.

The cabinet base is supplied in RAL 7022 in all cases. A special paint finish is not available for the base. It is delivered completely assembled with the cabinet. The mounting height of the operator panel changes accordingly.

**M07****Cable-marshalling space 200 mm high, RAL 7035**

The cable-marshalling space is made of strong sheet steel and allows cables to be connected more flexibly (entry from below). It also allows routing of cables within the marshalling compartment. It is delivered completely assembled with the cabinet. The mounting height of the operator panel changes accordingly.

**Notice:** The cable-marshalling space is painted as standard with RAL 7035. If a special color is requested for the cabinet (option **Y09**), the cable-marshalling space is also painted in this color.

**M21****IP21 degree of protection**

Cabinet version in IP20, but with additional top or drip protection cover. This increases the cabinet height by 250 mm.

For transport reasons, the top or drip protection covers are delivered separately and must be fitted on site.

**Notice:** The top or drip protection covers are painted in RAL 7035 as standard. If a special color is requested for the cabinet (option **Y09**), the roof sections or drip protection panel are also painted in this color.

**M23****IP23 degree of protection**

Cabinet Modules with IP23 degree of protection are supplied with additional roof sections, plastic ventilation grilles, and a filter medium in the air inlet and outlet. This increases the cabinet height by 400 mm. The filter medium must be maintained according to the local environmental conditions. The covers provided with option **M60** are also included in the scope of supply.

For transport reasons, the roof sections are delivered separately and must be fitted on site.

**Notice:** The roof sections are colored RAL 7035 as standard. If a special color is requested for the cabinet (option **Y09**), the roof section is also painted in this color. The molded plastic parts (e.g. ventilation grilles) are colored RAL 7035 and cannot be painted.

**M26****Side panel mounted at the right**

For side-by-side installation of Cabinet Modules from left to right, cabinets can be ordered ready-prepared at the factory for assembly on-site. If option **M26** is ordered, the Cabinet Module is shipped with a side panel fitted on the right.

This side panel is essential for ensuring compliance with IP20 and higher degrees of protection.

**M27****Side panel mounted to the left**

For side-by-side installation of Cabinet Modules from right to left, cabinets can be ordered ready-prepared at the factory for assembly on-site. If option **M27** is ordered, the Cabinet Module is shipped with a side panel fitted on the left.

This side panel is essential for ensuring compliance with IP20 and higher degrees of protection.

**M43****IP43 degree of protection**

Cabinet Modules with IP43 degree of protection are supplied with additional roof sections, plastic ventilation grilles, and a filter medium in the air inlet and outlet. This increases the cabinet height by 400 mm. The filter medium must be maintained according to the local environmental conditions.

For transport reasons, the roof sections are delivered separately and must be fitted on site.

**Notice:** The roof sections are colored RAL 7035 as standard. If a special color is requested for the cabinet (option **Y09**), the roof section is also painted in this color. The molded plastic parts (e.g. ventilation grilles) are colored RAL 7035 and cannot be painted.

**M54****IP54 degree of protection**

Cabinet Modules with IP54 degree of protection are supplied with additional roof sections, plastic ventilation grilles, and a filter medium in the air inlet and outlet, which ensures compliance with IP54 degree of protection. This increases the cabinet height by 400 mm.

The filters must be maintained according to the local environmental conditions.

For transport reasons, the roof sections are delivered separately and must be fitted on site.

**Notice:**

- The roof sections are colored RAL 7035 as standard. If a special color is requested for the cabinet (option **Y09**), the roof section is also painted in this color. The molded plastic parts (e.g. ventilation grilles) are colored RAL 7035 and cannot be painted.
- For units with IP54 degree of protection, it is important to observe the derating factor for output currents in relation to ambient temperature and installation altitude.



# SINAMICS S120 Cabinet Modules

## Description of the options

### Options

#### M59

#### *Closed cabinet doors, air inlet from below through floor opening*

If the Cabinet Modules are erected on a false floor or duct which forms part of a forced ventilation system, the modules can be ordered with closed cabinet doors. To ensure an adequate air inlet cross-section, the units are shipped without the standard base plates. In this case, the customer must ensure that no dirt/dust or moisture can enter the Cabinet Module. Cables must not be routed in such a way that they impede the flow of air through the cabinet floor opening. If the area beneath the Cabinet Modules can be accessed, the customer must provide touch protection.

#### M60

#### *Additional touch protection*

The Cabinet Modules are designed in accordance with BGV A3 as standard. With option **M60**, additional covers (out of reach) at accessible operator control and switching elements, are provided in the area of the AC and DC busbars and in front of the power unit.

#### M70

#### *EMC shield bus*

The EMC shield bus is used for the connection of line and motor shielded supply cables. The supplied EMC shield clamps provide a large surface area for the connection.

#### M80 to M87

#### *DC busbar system*

The correct DC busbar for the Cabinet Module must be ordered. This is fitted in the upper section of the Cabinet Modules and connects the Line Modules to the Motor Modules.

The busbar is dimensioned according to the load requirements and demand factor associated with operation of the individual drives, and according to the specific Cabinet Module layout. For this reason, the DC busbar is not supplied as standard, but must be ordered as an option.

When selecting busbars, it is important to ensure that the systems of adjacent Cabinet Modules are compatible with one another (refer to the table below and option selection matrix for the Cabinet Modules in question).

Where Cabinet Modules are ordered as a factory-assembled transport unit with option **Y11**, all busbars in the transport unit must be identical.

Option	DC busbar system, rated current $I_N$ A	Number	Dimensions mm	Compatible with
<b>M80</b>	1170	1	60 × 10	<b>M83</b>
<b>M81</b>	1500	1	80 × 10	<b>M84</b> and <b>M86</b>
<b>M82</b>	1840	1	100 × 10	<b>M85</b> and <b>M87</b>
<b>M83</b>	2150	2	60 × 10	<b>M80</b>
<b>M84</b>	2730	2	80 × 10	<b>M81</b> and <b>M86</b>
<b>M85</b>	3320	2	100 × 10	<b>M82</b> and <b>M87</b>
<b>M86</b>	3720	3	80 × 10	<b>M81</b> and <b>M84</b>
<b>M87</b>	4480	3	100 × 10	<b>M82</b> and <b>M85</b>

The DC busbars are nickel-plated as standard and are available in different designs for a variety of current-carrying capacities. The scope of delivery also includes the jumpers required to link the busbar systems of individual Cabinet Modules.

#### M90

#### *Crane transport assembly (top-mounted)*

A top-mounted crane transport assembly can be ordered as an option for Cabinet Modules.

Depending on the width of the module, it consists of either transport eyebolts (width ≤ 800 mm) or transport rails (width > 800 mm).

When Cabinet Modules are ordered as factory-assembled transport units (option **Y11**), they are shipped with transport rails, i.e. option **M90** is automatically included in the scope of delivery of option **Y11** and does not need to be ordered separately.

#### N52

#### *DC link fuses for the Basic Line Module*

The Basic Line Modules do not have DC link fuses as standard.

If fuses are required, they can be ordered with option **N52**. The fuses are mounted on the connecting rail to the DC busbar in the cabinet rather than in the power unit.

DC link fuses are recommended when connecting Basic Line Modules in parallel.

## Options

**P10****Measuring instrument for line values, mounted in the cabinet door**

A measuring instrument with display, installed in the cabinet door of the Line Connection Module, for acquiring measured values of the power supply. In addition to these measured values, additional plant values (such as power and power factor, etc.) are calculated from the measured values using powerful, state-of-the-art microprocessors.

The current transformers (option **L41**) are already included in the scope of delivery.

**P11****Measuring instrument for line values with PROFIBUS connection, mounted in the cabinet door**

A measuring instrument with display, installed in the cabinet door of the Line Connection Module, for acquiring measured values of the power supply. In addition to these measured values, additional plant values (such as power and power factor, etc.) are calculated from the measured values using powerful, state-of-the-art microprocessors. The measuring instrument has a PROFIBUS interface that permits a data transfer rate of up to 12 Mbaud.

The current transformers (option **L41**) are already included in the scope of delivery.

**T58, T60, T80****Rating plate data**

The rating plate is provided in English/German as standard. A rating plate in another language can be selected by specifying the following option order codes.

Option	Rating plate language
<b>T58</b>	English/French
<b>T60</b>	English/Spanish
<b>T80</b>	English/Italian

**Y09****Special cabinet paint finish**

The Cabinet Modules are delivered in RAL 7035 as standard. The special paint finish must be stated in plain text in the order. Any RAL colors that are available as powdered coatings can be selected.

Notice: If options such as cable-marshalling space (order code **M07**), top or drip protection covers (option **M21**), roof sections (options **M23/M43/M54**) are ordered for the Cabinet Modules, they will also be supplied in the paint finish specified in the order. The molded plastic parts (e.g. ventilation grilles) are colored RAL 7035 and cannot be painted.

**Y11****Factory assembly into transport units**

With this option, Cabinet Modules can be ordered as factory-assembled transport units with a maximum total width of up to 2400 mm. In this case, the relevant modules are shipped as interconnected units (both electrically and mechanically).

When DC busbars (options **M80 to M87**) are selected, it must be ensured that identical busbars are installed within the transport unit and are compatible with all adjacent Cabinet Modules.

In the case of a transport unit order, all the Cabinet Modules to be included in the unit and their installation sequence from left to right must be specified in plain text according to the syntax below:

Plain text data for the order:	TE	1	-	1 ... 6
Transport Unit				
Serial number of transport unit				
Position of Cabinet Module within transport unit from left to right				

Option **Y11** is particularly recommended for units comprising Line Connection Modules and Line Modules because the required pre-charging circuits and connection busbars, for example, can be incorporated for certain versions. Please refer to the assignment tables for the Line Connection Modules.

The transport unit is shipped with a crane transport rail, which means that option **M90** is not required.



# SINAMICS S120 Cabinet Modules

## Description of the options

### Options

#### Y31

##### One-line label for system identification, 40 × 80 mm

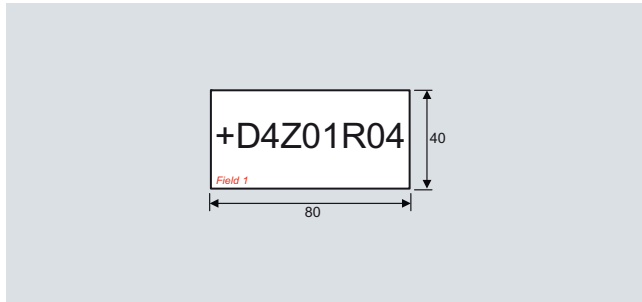
Resopal labeling plates (white with black lettering) for identifying Cabinet Modules are available.

The labels are attached to the cabinet door.

Dimensions H × W: 40 × 80 mm

The text must be specified in plain text when ordering.

Field 1: Max. 9 characters, font size 10 mm.



#### Y32

##### Two-line label for system identification, 40 × 180 mm

Resopal labeling plates (white with black lettering) for identifying Cabinet Modules are available.

The labels are attached to the cabinet door.

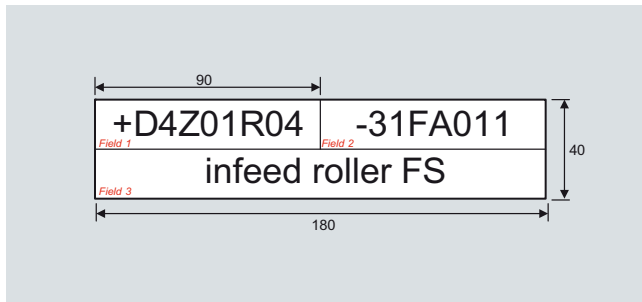
Dimensions H × W: 40 × 180 mm

The text must be specified in plain text when ordering.

Field 1: Max. 9 characters, font size 10 mm

Field 2: Max. 9 characters, font size 10 mm

Field 3: Max. 20 characters, font size 10 mm.



#### Y33

##### Four-line label for system identification, 40 × 180 mm

Resopal labeling plates (white with black lettering) for identifying Cabinet Modules are available.

The labels are attached to the cabinet door.

Dimensions H × W: 40 × 180 mm

The text must be specified in plain text when ordering.

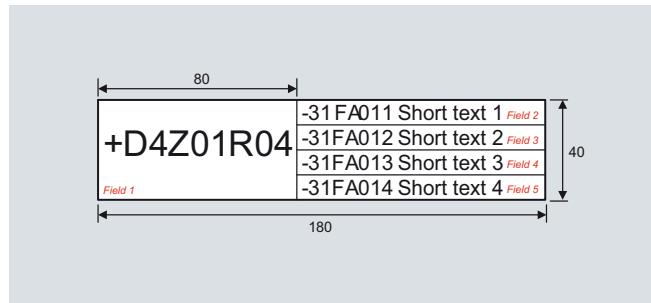
Field 1: Max. 9 characters, font size 10 mm

Field 2: Max. 20 characters, font size 6 mm

Field 3: Max. 20 characters, font size 6 mm

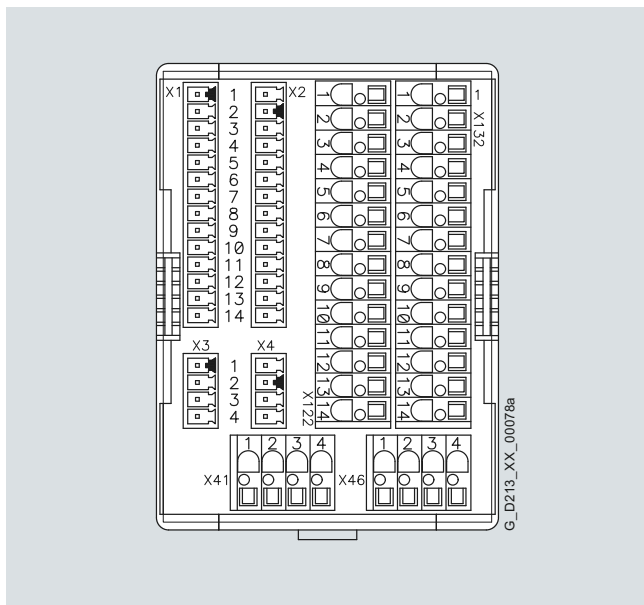
Field 4: Max. 20 characters, font size 6 mm

Field 5: Max. 20 characters, font size 6 mm.



## Customer terminal block -X55

## Overview



Customer terminal block -X55 represents the interface to the I/O devices and marshals a range of cabinet-internal signals to a central terminal block module mounted in the lower part of the cabinet.

It can be used for Motor Modules in the chassis format as well as together with options **K90** (CU320-2 DP Control Unit) or **K95** (CU320-2 PN Control Unit) for Basic Line Modules, Smart Line Modules, Active Line Modules and Booksize Cabinet Kits.

## Design

To connect signal cables on the customer side, terminal block -X55 includes terminals -X122, -X132, -X41 and -X46 (terminals -X1 to -X4 are used inside the cabinet and are not available). As a consequence, depending on the version (with/without option **K90** or **K95**) the following digital inputs/outputs and/or signals are available:

The customer terminal block -X55 includes:	Motor Modules chassis format		Line Modules	
	Without CU320-2 ( <b>K90/K95</b> )	with	Without CU320-2 ( <b>K90/K95</b> )	with
<b>-X122, -X132</b>				
12 digital inputs DI	–	✓	–	✓
8 bidirectional inputs/outputs (DI/DO)	–	✓	–	✓
<b>-X41</b>				
Connection, safety function Safe Torque Off/Safe Stop 1	✓	✓	– <sup>1)</sup>	– <sup>1)</sup>
Connection temperature sensor KTY84/PTC/Pt100	✓	✓	– <sup>1)</sup>	– <sup>1)</sup>
<b>-X46</b>				
Connection, Safe Brake Adapter	✓	✓	–	–

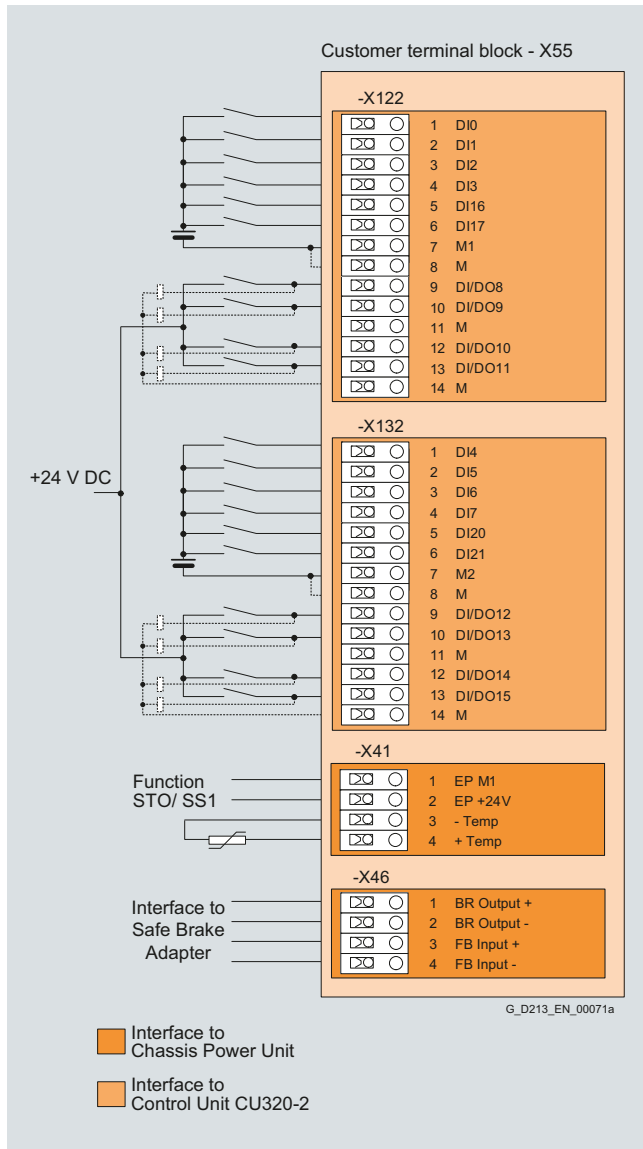
<sup>1)</sup> For Booksize Cabinet Kits, a connection is provided at the separate customer terminal block -X55.1 or -X55.2.

# SINAMICS S120 Cabinet Modules

## Customer terminal block -X55

### Design

#### Pin assignment



Terminal assignment of customer terminal block -X55

#### Terminal block -X55-X122 digital inputs/outputs

Terminal	Designation <sup>1)</sup>	Technical data
1	DI 0	Voltage -30 V to +30 V DC
2	DI 1	Current drain, typical: 9 mA at 24 V DC
3	DI 2	Electrical isolation: Terminal M1 is the reference potential
4	DI 3	Level (including ripple): High level: 15 V ... 30 V Low level: -30 V ... +5 V
5	DI 16	
6	DI 17	Input delay (typ.): at 0 → 1: 50 μs at 1 → 0: 150 μs
7	M1	Reference potential for terminals 1 to 6
8	M	Ground
9	DI/DO 8	<u>As input:</u>
10	DI/DO 9	Voltage -30 V ... +30 V DC
11	M	Current drain, typical: 9 mA at 24 V DC
12	DI/DO 10	Level (including ripple): High level: 15 V ... 30 V Low level: -30 V ... +5 V
13	DI/DO 11	Fast inputs: <sup>2)</sup>
14	M	DI/DO 8, 9, 10 and 11
		Input delay (typ.): at 0 → 1: 5 μs at 1 → 0: 50 μs
		<u>As output:</u>
		Voltage 24 V DC
		Max. load current for each output: 500 mA
		continuously short-circuit proof
		Output delay (typ./max.): <sup>3)</sup> at 0 → 1: 150 μs/400 μs at 1 → 0: 75 μs/100 μs
		Switching frequency: For resistive load: max. 100 Hz For inductive load: max. 0.5 Hz For lamp load: max. 10 Hz Max. lamp load: 5 W

Max. connectable cross-section: 1.5 mm<sup>2</sup>

<sup>1)</sup> DI: Digital input  
DI/DO: bidirectional digital input/output  
M: Electronics ground  
M1: Reference ground

<sup>2)</sup> Can be used as measuring probe input or input for the external zero mark

<sup>3)</sup> Data for:  $U_{CC} = 24$  V; load 48 Ω; High (1) = 90 %  $U_{out}$ ; Low (0) = 10 %  $U_{out}$

## Design

## Terminal block -X55-X132 digital inputs/outputs

Terminal	Designation <sup>1)</sup>	Technical data
1	DI 4	Voltage -30 V to +30 V DC Current drain, typical: 9 mA at 24 V DC
2	DI 5	Electrical isolation: Terminal M2 is the reference potential
3	DI 6	
4	DI 7	Level (including ripple): High level: 15 V ... 30 V Low level: -30 V ... +5 V
5	DI 20	Input delay (typ.): at 0 → 1: 50 μs at 1 → 0: 150 μs
6	DI 21	
7	M2	Reference potential for terminals 1 to 6
8	M	Ground
9	DI/DO 12	<u>As input:</u> Voltage -30 V ... +30 V DC Current drain, typical: 9 mA at 24 V DC
10	DI/DO 13	Level (including ripple): High level: 15 V ... 30 V Low level: -30 V ... +5 V
11	M	
12	DI/DO 14	Fast inputs: <sup>2)</sup> DI/DO 12, 13, 14 and 15
13	DI/DO 15	
14	M	Input delay (typ.): at 0 → 1: 5 μs at 1 → 0: 50 μs <u>As output:</u> Voltage 24 V DC Max. load current for each output: 500 mA continuously short-circuit proof Output delay (typ./max.): <sup>3)</sup> at 0 → 1: 150 μs/400 μs at 1 → 0: 75 μs/100 μs Switching frequency: For resistive load: max. 100 Hz For inductive load: max. 0.5 Hz For lamp load: max. 10 Hz Max. lamp load: 5 W

Max. connectable cross-section: 1.5 mm<sup>2</sup>

## Terminal block -X55-X41 temperature sensor connection

Terminal	Function	Technical data
1	EP M1 (enable pulses)	Supply voltage 24 V DC (20.4 ... 28.8 V) Current drain: 10 mA
2	EP +24 V (enable pulses)	Signal propagation times: L → H: 100 μs H → L: 1000 μs The pulse inhibit function is only provided if Safety Integrated Basic Functions have been enabled
3	- Temp	Temperature sensor connection for motor temperature sensing: KTY84-1C130, PTC, Pt100
4	+ Temp	

Max. connectable cross-section: 2.5 mm<sup>2</sup>

## Terminal block -X55-X46 brake control and monitoring

Terminal	Function	Technical data
1	BR output +	The interface is used to connect the Safe Brake Adapter
2	BR output -	
3	FB input +	
4	FB input -	

Max. connectable cross-section: 1.5 mm<sup>2</sup>

<sup>1)</sup> DI: Digital input  
DI/DO: bidirectional digital input/output  
M: Electronics ground  
M2: Reference ground

<sup>2)</sup> Can be used as measuring probe input or input for the external zero mark

<sup>3)</sup> Data for:  $U_{CC} = 24 \text{ V}$ ; load  $48 \Omega$ ; High (1) = 90 %  $U_{out}$ ; Low (0) = 10 %  $U_{out}$

# SINAMICS S120 Cabinet Modules

## Supplementary system components

### Overview

#### Mounting device for power blocks



Power block mounting device for installing and removing the power blocks for the Basic Line Modules, Smart Line Modules, Active Line Modules and Motor Modules in chassis format.

The mounting device is a mounting aid. It is placed in front of the module and attached to the module. The telescopic rails allow the device to be adjusted to the installation height of the power blocks.

Once the mechanical and electrical connections have been released, the Power block can be removed from the module.

The power block is guided and supported by the guide rails on the handling device.

### Selection and ordering data

Description	Order No.
<b>Mounting device</b> for installing and removing power blocks	<b>6SL3766-1FA00-0AA0</b>

## Overview

Just like the SINAMICS S120 chassis units, SINAMICS S120 Cabinet Modules form a modular drive system that consists of various intelligent drive objects such as Line Modules, Motor Modules, Control Units, Sensor Modules, etc.

As a consequence, SINAMICS S120 Cabinet Modules are supplied with documentation that only includes and describes the individual Cabinet Modules (circuit diagram, layout diagram, terminal diagram and additional Operating Instructions).

With option **Y11** only the mechanical assembly of the individual Cabinet Modules to form transport units is involved which are then supplied in the form of transport units.

Higher-level documentation, for example showing the signal connections between the individual Cabinet Modules that make up the order is not included in the normal scope of delivery.

In this case, only a collection of the individual documents are shipped with the converter.

If the documentation shall include a complete representation of the equipment supplied, then the equipment and documentation must be additionally processed, which can then be ordered with the integration engineering.

The scope of delivery of the integration engineering is as follows:

- Checking the combinations and options ordered, in relation to the device configurations
- Defining how the individual drive objects are to be connected, coordinated with the customer if required.
- Checking the performance of the ordered CompactFlash card
- Installing the required DRIVE-CLiQ cables within the transport units. Cables between the transport units are connected at one end.
- Higher-level documentation of the scope of delivery (layout diagram, circuit diagram, terminal diagram, dimension drawing, spare parts list).
- Summary of the individual documents included in a shipment, in conjunction with a delivery address separate from the equipment
- Customer-specific system and location designations, coordinated with the customer/client

## Selection and ordering data

The following engineering services can be ordered depending on the number of drives/axes included in an order:

Integration engineering	Order No.
<b>For 1 drive</b> (also parallel connection) including the associated Line Modules, Sensor Modules, Terminal Modules etc.	<b>6SL3780-0AA00-0AA0</b>
<b>For up to 3 drives</b> (also parallel connection) including the associated Line Modules, Sensor Modules, Terminal Modules etc.	<b>6SL3780-0AC00-0AA0</b>
<b>For up to 5 drives</b> (also parallel connection) including the associated Line Modules, Sensor Modules, Terminal Modules etc.	<b>6SL3780-0AE00-0AA0</b>
<b>For up to 10 drives</b> (also parallel connection) including the associated Line Modules, Sensor Modules, Terminal Modules etc.	<b>6SL3780-0AJ00-0AA0</b>

Engineering services for larger drive systems is also available on request.

## Options

The table below lists the options available for the order-specific integration engineering ([Details → Description of the options](#)):

Available options	Order code
Customer documentation (circuit diagram, terminal diagram, layout diagram) in DXF format	<b>D02</b>
Preliminary version of customer documentation in PDF format	<b>D14</b>
Documentation in English/French	<b>D58</b>
Documentation in English/Spanish	<b>D60</b>
Documentation in English/Italian	<b>D80</b>

When ordering the order-specific integration engineering, the required documentation options must always be ordered together with the order engineering (not to the individual Cabinet Modules).

Ordering the documentation options for the particular Cabinet Modules is only required if equipment is ordered without integration engineering.

### Option selection matrix of the order-specific integration engineering

Certain options are mutually exclusive.

#### Documentation

	D02	D14	D58	D60	D80
<b>D02</b>		✓	✓	✓	✓
<b>D14</b>	✓		✓	✓	✓
<b>D58</b>	✓	✓		–	–
<b>D60</b>	✓	✓	–		–
<b>D80</b>	✓	✓	–	–	

# SINAMICS S120 Cabinet Modules

## Customized solutions

### More information

#### Customized solutions

In addition to the wide range of possibilities of configuring drives with the available modules and options to address specific plant and system requirements, for special applications we also offer customized applications to fully comply with the actual requirement.

These are based on the standard SINAMICS S120 Cabinet Modules and are supplied as completely wired units that are ready to be connected up.

Examples of applications such as these include:

- **SINAMICS S120 Liquid-Cooled Cabinet Applications**

To comply with high requirements regarding installation and ambient conditions, SINAMICS S120 Cabinet Modules can also be supplied in a liquid-cooled conversion.

The power loss of the units is transferred to the cooling liquid and dissipated, without noticeably increasing the temperature of the direct environment. As a consequence it is not necessary to control the climate of the electrical room, a costly process.

The application involves using liquid-cooled Line and Motor Modules in the chassis format, installed in Cabinet Modules and a cooling unit that is appropriately adapted for the application.

- **SINAMICS S120 Switch-Over Modules**

The SINAMICS S120 Switch-Over Module is used to operate various motors at different times at a common converter.

A Switch-Over Module switches the output of the Motor Module to the motor that is currently required.

If, for example processes powered by specific motors run at different times, or if the individual motor is only briefly used during the day, then costs and space can be saved by using just one converter, supplemented with the corresponding Switch-Over Module.

Such an application involves, for instance, pump drives on tankers when various ship's compartments have to be emptied one after the other. Another application involves container cranes, if in addition to the drive for loading and unloading, also the drive for operating the boom must be fed from the converter.

- **SINAMICS S120 Motor Multi-Connection Modules**

SINAMICS S120 Motor Multi-Connection Modules are intended for applications in conjunction with group drives where a different number of multi-motor outputs are required.

These involve supplementing Motor Modules by a corresponding control and switching and protection devices. This configuration allows the associated motors with small power ratings (motor groups) to be operated from a common inverter with a high power rating.

The completely prewired cabinet units that are ready to be connected up simplify and shorten commissioning. The transparent and flexible design allows changes and additions to be made at any time, without involving high associated costs.

Simply contact us if you are interested or require these or any other applications.

Notes regarding the addresses of contact persons are provided in the appendix under "Contact partners for Industry Automation and Drive Technologies"



Cement mill



Ship in a port with container crane



Oil rig

# SINAMICS S150 Converter Cabinet Units



<b>4/2</b>	<b>System overview</b>
4/2	Overview
4/2	Benefits
4/2	Applications
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4/5	Function
4/14	Technical data
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4/23	Selection and ordering data
4/24	Options
<b>4/27</b>	<b>Description of the options</b>
<b>4/39</b>	<b>Line-side components</b>
	<b>Recommended fuses</b>
<b>4/40</b>	<b>Cable cross-sections and connections</b>
<b>4/42</b>	<b>Supplementary system components</b>
4/42	Mounting device for power blocks



# SINAMICS S150 Converter Cabinet Units

## System overview

### Overview



SINAMICS S150 Converter Cabinet Units are particularly suitable for all variable-speed single-axis drives with high performance requirements, i.e., drives with:

- high dynamic requirements
- frequent braking cycles and high braking energy levels
- four-quadrant operation

SINAMICS S150 offers high-performance speed control with excellent accuracy and a high dynamic response.

The following voltages and power ratings are available:

Line voltage	Type rating
380 ... 480 V 3 AC	110 ... 800 kW
500 ... 690 V 3 AC	75 ... 1200 kW

Degrees of protection are IP20 (standard), and as an option IP21, IP23, IP43 and IP54.

Line and motor-side components as well as additional monitoring devices can be installed in the converter cabinet units.

A wide range of electrical and mechanical components enable the drive system to be optimized individually to suit customer requirements.

### Benefits

The self-commutating, pulsed infeed/regenerative unit uses IGBT technology and is equipped with a Clean Power Filter. This combination guarantees extremely line-friendly behavior which is characterized by the following:

- Negligible line harmonics as a result of the innovative Clean Power Filter ( $\ll 1\%$ )
- The stringent limit values of IEEE 519-1992 are complied with, without any exceptions.
- Regenerative feedback (four-quadrant operation)
- Tolerant to fluctuations in the line voltage
- Operation on weak line supplies
- Reactive power compensation is possible (inductive or capacitive)
- High drive dynamic performance

Simple drive handling from engineering to operation thanks to

- Compact, modular design with an optimum degree of service friendliness
- Straightforward engineering
- Simple installation, as it is ready to be connected up
- Fast, menu-prompted commissioning without complex parameterization
- Clear and convenient operation using a user-friendly graphical operator panel with measured values displayed in plain text or in a quasi-analog bar display.

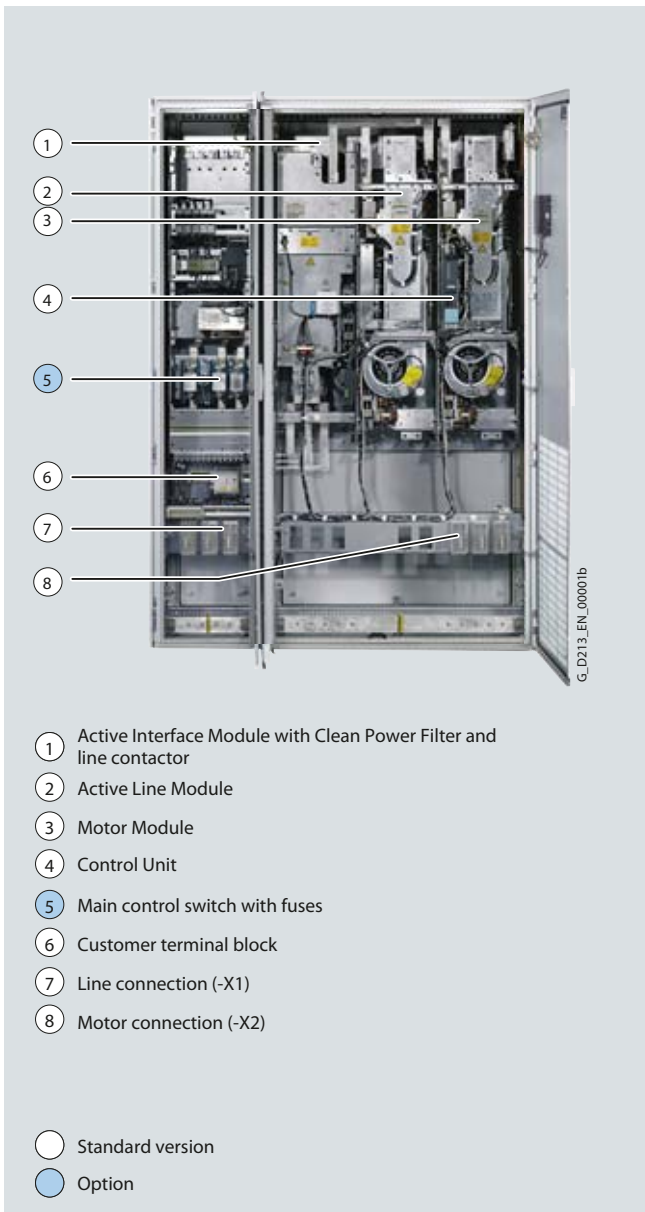
### Applications

- Test bays
- Centrifuges
- Elevators and cranes
- Cross cutters and shears
- Conveyor belts with a high power demand and energy recovery
- Presses
- Cable winches

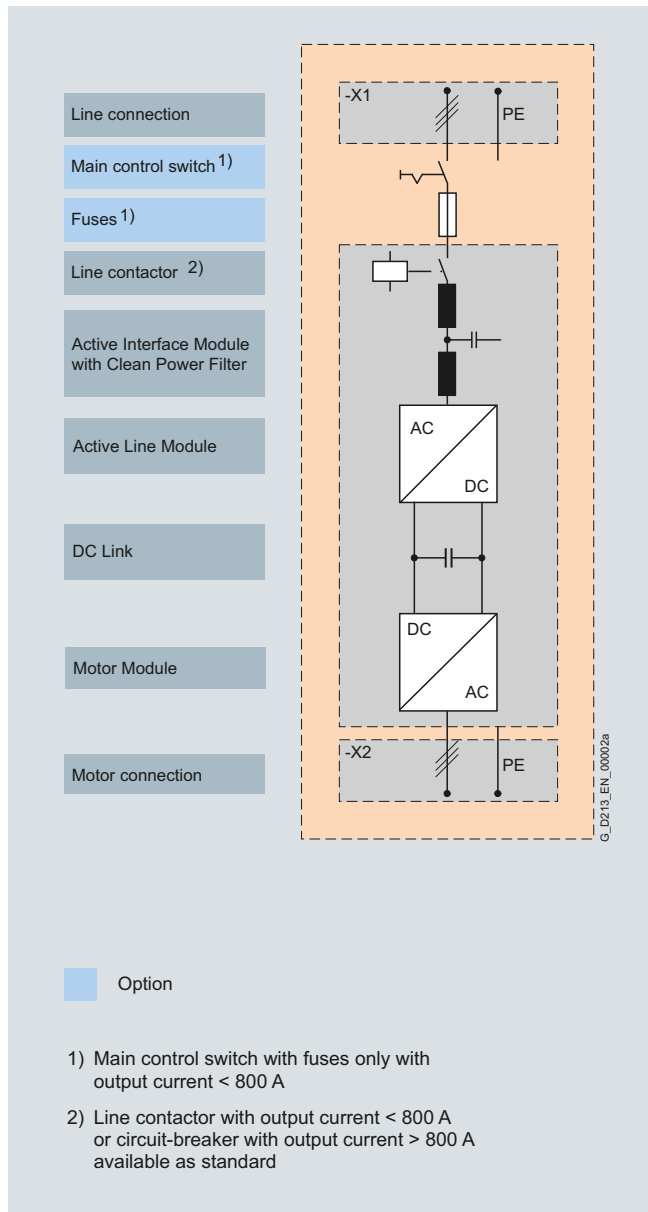
## System overview

### Design

The SINAMICS S150 Converter Cabinet Units are characterized by their compact, modular and service-friendly design.



Design example of a SINAMICS S150 Converter Cabinet Unit



Basic design of a SINAMICS S150 Converter Cabinet Unit with a number of version-specific options

## System overview

### Design

#### Varnished PCBs

The following drive units are equipped as standard with varnished PCBs:

- Chassis format units
- Control Units
- Sensor Modules
- Terminal Modules
- Advanced Operator Panel (AOP30)

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

#### Nickel-plated busbars

All of the copper busbars used in the converter cabinets are nickel-plated in order to achieve the best possible immunity to environmental effects. Further, the bare copper connections do not have to be cleaned for customer connections.

**Note:** For technical reasons, some parts of the copper busbars are not nickel-plated for some of the options.

#### Degrees of protection

The EN 60529 standard covers the protection of electrical equipment by means of housings, covers or equivalent, and includes:

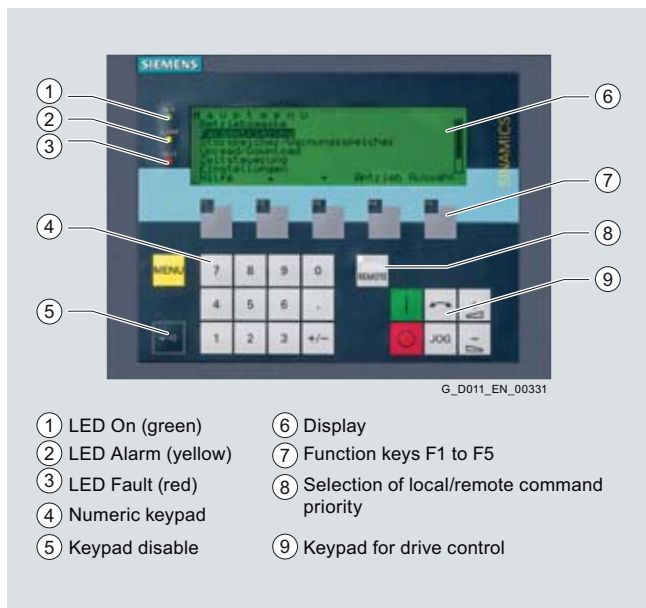
- Protection of persons against accidental contact with live or moving parts within the housing and protection of the equipment against the ingress of solid foreign matter (touch protection and protection against ingress of solid foreign bodies)
- Protection of the equipment against the ingress of water (water protection)
- Abbreviations for the internationally agreed degrees of protection

The degrees of protection are specified by abbreviations comprising the code letters IP and two digits.

Degree of protection	First code number (touch protection and protection against foreign bodies)	Second code number (protection of the equipment against the ingress of water)
<b>IP20</b> (Standard)	Protection against solid foreign bodies diameter $\geq 12.5$ mm	No water protection
<b>IP21</b> (Option <b>M21</b> )	Protection against solid foreign bodies diameter $\geq 12.5$ mm	Protected against drip water  Vertically falling water drops shall not have a harmful effect.
<b>IP23</b> (Option <b>M23</b> )	Protection against solid foreign bodies diameter $\geq 12.5$ mm	Protected against spray water  Water sprayed on both sides of the vertical at an angle of up to $60^\circ$ shall not have a harmful effect.
<b>IP43</b> (Option <b>M43</b> )	Protection against solid foreign bodies diameter $\geq 1$ mm	Protected against spray water  Water sprayed on both sides of the vertical at an angle of up to $60^\circ$ shall not have a harmful effect.
<b>IP54</b> (Option <b>M54</b> )	Dust protected  Ingress of dust is not totally prevented, but dust must not be allowed to enter in such quantities that the functioning or safety of the equipment is impaired.	Protected against splash water  Water splashing onto the enclosure from any direction shall not have a harmful effect.

## Function

### AOP30 Advanced Operator Panel



An Advanced Operator Panel (AOP30) is installed in the cabinet door of the converter for operation, monitoring and commissioning tasks.

The user is guided by interactive menus through the drive-commissioning screens. When commissioning the drive for the first time, only 6 motor parameters (which can be found on a motor rating plate) have to be entered on the AOP30. The control is then optimized automatically to fine-tune the converter to the motor.

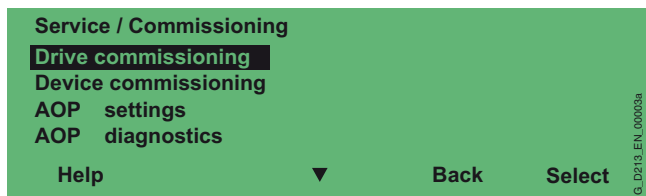
The AOP30's two-stage safety concept prevents unintentional or unauthorized changes to settings. Operation of the drive from the operator panel can be disabled by the keyboard lock so that only parameter values and process variables can be displayed on the operating panel. The OFF key is factory-set to active but can also be deactivated by the customer. A password can be used to prevent the unauthorized modification of converter parameters.

German, English, French, Italian, Spanish and Chinese are stored on the CU320-2 Control Unit CompactFlash card as operator panel languages. Russian, Polish and Czech are available in addition to these standard panel languages. These can be downloaded free of charge from the Internet under the following link:

<http://support.automation.siemens.com/>

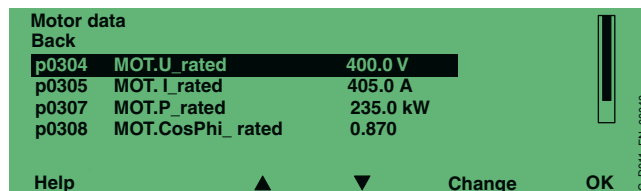
Examples of plain-text displays at various phases of operation are shown below.

The **First commissioning** process is performed using the operator panel.

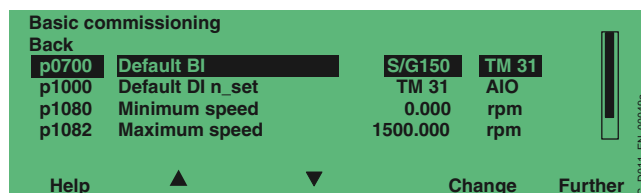


Only 6 motor parameters have to be entered: Power, speed, current, cos φ, voltage and frequency of the motor.

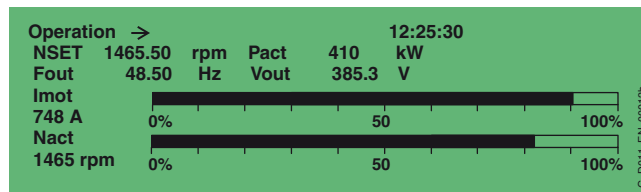
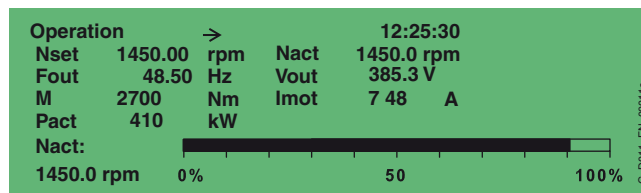
This information can be found on the motor rating plate, and must be entered into the screens on the display by following a short, menu-assisted procedure. The motor cooling method must also be specified.



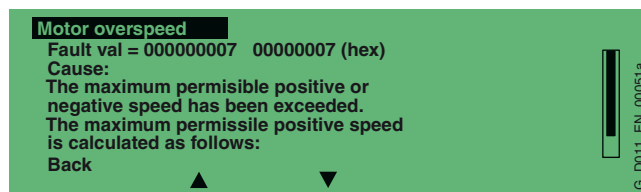
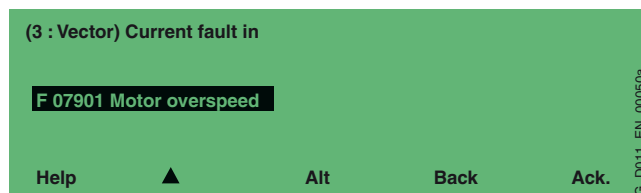
The next screen contains the parameter values that are used to automatically optimize the control.



During operation, actual data are output on the display as absolute values, such as setpoint and actual values, or it is possible to parameterize up to three process variables as a quasi-analog bar display.



Any **alarms** which occur are signaled by flashing of the yellow ALARM LED, **faults** by the red FAULT LED which is then lit. There is also an indication of the cause displayed in plain text on the display's status line (with counter/remedial measures).



## System overview

## Function

**Communication with higher-level control and customer terminal block**

A PROFIBUS or PROFINET interface on the CU320-2 Control Unit is provided as standard as the customer control interface.

This interface can be used to connect the system to the higher-level controller using analog and digital signals, or to connect additional units.

The inputs and outputs available as standard can be optionally expanded by up to 2 TM31 Terminal Modules (refer to the description of options, option **G60** or **G61**). To simplify configuration and commissioning of the drive, the TM31 Terminal Module can be preset to a variety of factory settings.

For additional information, please refer to the [SINAMICS Low Voltage Engineering Manual](#).

**Open-loop and closed-loop control functions**

SINAMICS S150 has a high-dynamic vector control with speed and current control – with and without speed actual value feedback.

**Software and protective functions**

The software functions available as standard are described below:

Software and protective functions	Description
<b>Setpoint input</b>	The setpoint can be input both internally and externally. It is applied internally as a fixed setpoint, motorized potentiometer setpoint or jog setpoint and externally via the communications interface or an analog input on the TM31 Terminal Module. The internal fixed setpoint and the motorized potentiometer setpoint can be switched over or adjusted using control commands from any interface.
<b>Motor identification</b>	The automatic motor identification function makes commissioning faster and easier and optimizes closed-loop control of the drive.
<b>Ramp-function generator</b>	A user-friendly ramp-function generator with separately adjustable ramp-up and ramp-down times, together with adjustable rounding times in the lower and upper speed ranges, allows the drive to be smoothly accelerated and braked. This results in a good speed control response and plays its role in reducing the stress on the mechanical system. The down ramps can be parameterized separately for quick stop.
<b><math>V_{dc\ max}</math> controller</b>	The $V_{dc\ max}$ controller automatically prevents overvoltages in the DC link if the down ramp is too short, for example. This may also extend the set ramp-down time.
<b>Kinetic buffering (KIP)</b>	For brief line supply failures, the kinetic energy of the rotating drive is used to buffer the DC link and therefore prevents fault trips. The drive converter remains operational as long as the drive can provide regenerative energy as a result of its motion and the DC link voltage does not drop below the shutdown threshold. When the line supply recovers within this time, the drive is again bumplessly accelerated up to its setpoint speed.
<b>Automatic restart</b>	The automatic restart switches the drive on again when the power is restored after a power failure, and ramps up to the current speed setpoint.
<b>Flying restart</b>	The flying restart function allows the converter to be switched to a motor that is still turning.
<b>Technology controller</b>	Using the technology controller (PID controller) function module, level or flow controls and complex tension controls can be implemented, for example. The existing D component can act both on the system deviation as well as on the actual value (factory setting). The P, I, and D components are separately set.
<b>Free function blocks</b>	Using the freely programmable function blocks, it is easy to implement logic and arithmetic functions for controlling the SINAMICS drive. The blocks can be programmed by means of an operator panel or the STARTER commissioning tool.
<b>Drive Control Chart (DCC)</b>	Drive Control Chart (DCC) is an additional tool for the easy configuration of technological functions for SINAMICS. The block library contains a large selection of control, arithmetic and logic blocks as well as extensive open-loop and closed-loop control functions. 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. DCC is an add-on to the STARTER commissioning tool (→ Tools and engineering).
<b><math>I^2t</math> detection for motor protection</b>	A motor model stored in the converter software calculates the motor temperature based on the current speed and load. More exact sensing of the temperature, which also takes into account the influence of the ambient temperature, is possible by means of direct temperature sensing using KTY84 sensors in the motor winding.
<b>Motor temperature evaluation</b>	Motor protection by evaluating a KTY84, PTC or Pt100 temperature sensor. When a KTY84 temperature sensor is connected, the limit values can be set for alarm or shutdown. When a PTC thermistor is connected, the system reaction to triggering of the thermistor (alarm or shutdown) can be defined.
<b>Motor blocking protection</b>	A blocked motor is detected and protected against thermal overloading by a fault trip.

**Function****Power unit protection**

Power unit protection	Description
<b>Ground fault monitoring at the output</b>	A ground fault at the output end is detected by an aggregate current monitor and results in shutdown in grounded-neutral systems.
<b>Electronic short-circuit protection at the output</b>	A short-circuit at the output (e.g. at the converter output terminals, in the motor cable or in the motor terminal box) is detected and the converter shuts down with a "fault".
<b>Thermal overload protection</b>	An alarm is issued first when the overtemperature threshold responds. If the temperature continues to rise, the unit either shuts down or independently adjusts the pulse frequency or output current so that thermal load is reduced. Once the cause of the fault has been eliminated (e.g. cooling has been improved), the original operating values are automatically resumed.

**Safety Integrated functions**

The integrated safety functions of SINAMICS provide highly-effective application-oriented protection for personnel and machinery. The Safety Integrated functions are implemented electronically and therefore offer short response times in comparison to solutions with externally implemented monitoring functions.

The trend toward greater complexity and increasing modularity of machines is increasingly seeing a shift in safety functions away from the classical central safety functions (for example, shutdown of the complete machine using a main switch) and into the machine control system and the drives. Frequently, this also significantly increases the productivity. This is because, for instance, equipping times can be reduced and during these equipping times, depending on the machine type, other parts can still continue to produce.

Integrated safety functions act much faster than those of a conventional design. The safety of a machine is increased further with Safety Integrated. Furthermore, thanks to the faster method of operation, safety measures controlled by integrated safety systems are perceived as less of a hindrance by the machine operator, therefore significantly reducing the motivation to consciously bypass safety functions.

The safety functions in the device and communication via PROFIsafe have already been certified. This simplifies configuring the safety functions and especially the acceptance of the plant or system by an authorized testing body when compared to safety solutions made up of individual safety components.

**Legal framework**

Machine and plant builders must ensure that their machines or plants neither present risks due to electric shock, heat or radiation nor due to functional faults. In Europe, for example, compliance with the machinery directive is legally stipulated by the EU industrial safety directive.

In order to ensure compliance with this directive, it is recommended that the corresponding harmonized European standards are applied. This initiates the assumption of conformity and gives manufacturers and operators the legal security when complying with both national regulations and EU directives. The machine manufacturer uses the CE marking to document the compliance with all relevant directives and regulations in the free movement of goods.

**Safety-related standards**

Functional safety is specified in various standards. EN ISO 12100 and EN ISO 14121-1, for example, are concerned with the design and risk assessment of machines. EN 62061 (only applicable for electrical and electronic control systems) and EN ISO 13849-1 (previously EN 954-1) define the functional and safety-related requirements of control systems with relevance to safety.

The above-mentioned standards define different safety requirements that the machine has to satisfy in accordance with the risk, frequency of a dangerous situation, probability of occurrence and the opportunities for recognizing impending danger.

- EN 954-1: Categories B, 1 ... 4 (from the end of 2011 will be replaced by EN ISO 13849-1)
- EN ISO 13849-1: Performance Level PL a ... e
- EN 62061: Safety Integrity Level SIL 1 ... 3

**Safety functions integrated in the drive with SINAMICS**

The safety functions integrated in SINAMICS satisfy the requirements of

- Category 3 according to EN 954-1 (from the end of 2011 will be replaced by EN ISO 13849-1)
- Safety Integrity Level (SIL) 2 according to EN 61508
- Performance Level (PL) d according to EN ISO 13849-1

In addition, the Safety Integrated functions of SINAMICS are generally certified by independent institutes. An up-to-date list of certified components is available on request from your local Siemens office.



## System overview

### Function

#### Safety Basic Functions and Safety Extended Functions

The Safety Integrated functions of the SINAMICS drive system are subdivided into what are known as Safety Basic Functions and Safety Extended Functions (terminology according to IEC 61800-5-2):

#### • **Basic Functions**

- Safe Torque Off (STO)
- Safe Stop 1 (SS1, time-controlled)
- Safe Brake Control (SBC)

The Safety Basic functions are included in the standard scope of delivery of the drive and can be used without requiring any additional license. The user can activate these functions at any time. An encoder is not required for their use.

The Safety Basic Functions are controlled as follows:

- Via terminals at the Control Unit and at the power unit
- Via PROFIBUS or PROFINET with PROFIsafe profile (from version 3 (last position of the Order No.  $\geq 3$ ) and Drives SW Version V2.6 SP2)

#### • **Extended Functions**

- Safe Torque Off (STO)
- Safe Stop 1 (SS1, time-controlled and acceleration controlled)
- Safe Stop 2 (SS2)
- Safe Operating Stop (SOS)
- Safely-Limited Speed (SLS)
- Safe Speed Monitor (SSM)
- Safe Direction (SDI)

Safety Extended Functions require a safety license depending on the axes. Depending on the control, additional DRIVE-CLiQ components are required.

**Note:** Extended Functions require a sine-cosine encoder and therefore a SMC20 Sensor Module Cabinet Mounted to evaluate the encoder signals (option **K48**).

The Safety Extended Functions are controlled as follows:

- Via the TM54F Terminal Module
- Via PROFIBUS or PROFINET with the PROFIsafe profile

The Safety Integrated functions currently available in SINAMICS S150 are subsequently described in more detail (terms as defined in IEC 61800-5-2):

#### **Safe Torque Off (STO)**

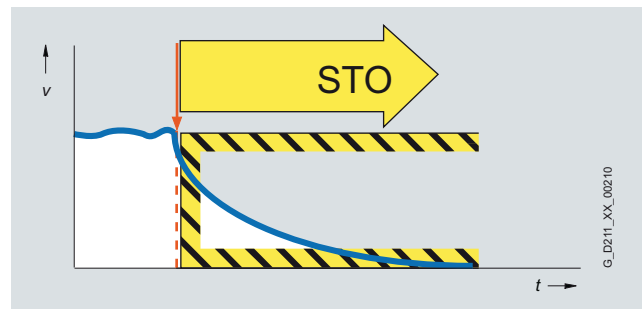
##### Function description

This function prevents unexpected starting according to EN 60204-1 Section 5.4. Safe Torque Off disables the control of the power unit, preventing a potentially hazardous torque (corresponds to Stop Category 0 according to EN 60204-1). The drive is reliably torque-free. This state is monitored internally in the drive.

Under Extended Functions, STO can also be controlled via the TM54F Terminal Module or PROFIsafe.

##### Application, customer benefits

STO has the immediate effect that the drive cannot supply any torque-generating energy. STO can be used wherever the drive will naturally reach a standstill due to load torque or friction in a sufficiently short time or when "coasting down" of the drive will not have any relevance for safety.



## Function

### Safe Brake Control (SBC)

#### Function description

The Safe Brake Control SBC is used to control holding brakes, which are active in the no-current state, e.g. motor holding brakes (actuated using spring force). The brake is controlled through two channels in a safety-relevant fashion.

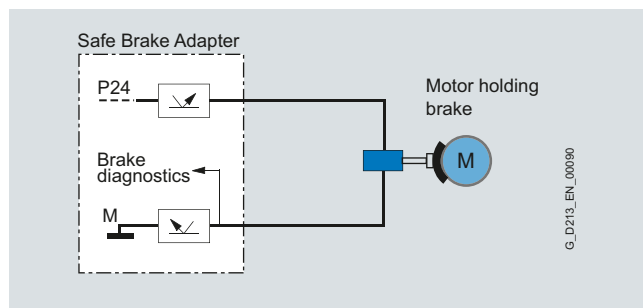
Safe Brake Control is executed when activating the operational brake control, Safe Torque Off function and when safety monitoring functions respond, which cause the power unit to be safely inhibited.

**Note 1:** The Safe Brake Control does not detect mechanical faults in the brake, for example worn brake pads.

**Note 2:** An additional Safe Brake Adapter (SBA) is required (option **K88** or **K89**, for a description see SINAMICS S120 Chassis Format Units, Supplementary system components).

#### Application, customer benefits

In conjunction with STO and SS1, SBC can also be activated. After switching off the torque-generating energy, SBC offers the possibility to safely control a holding brake at the motor; for example, to prevent hanging/suspended axes from sagging.



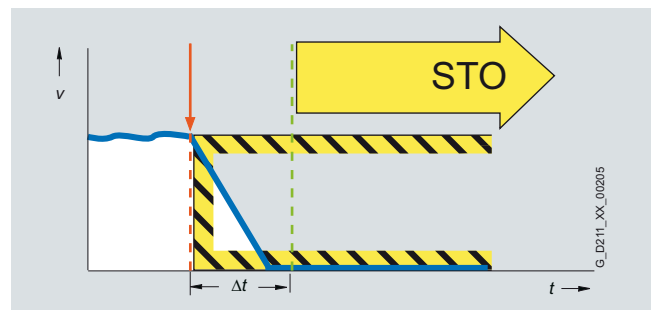
### Safe Stop 1 (SS1, time-controlled, without encoder; Basic Safety Function)

#### Function description

The Safe Stop 1 function can safely stop the drive in accordance with EN 60204-1, Stop Category 1. When the SS1 function is selected, the drive independently brakes along a quick stop ramp (OFF3) and Safe Torque Off and Safe Brake Control (if enabled) are activated when the selected safety delay time has expired.

#### Application, customer benefits

When activating the stop function, if the drive does not come quickly enough to a standstill as a result of the load torque, then it can be actively braked by the converter. As a result of this integrated fast brake function, frequently it is possible to eliminate mechanical brakes which wear, or to reduce the load on them. This means that maintenance costs and stress on the machine can be reduced.



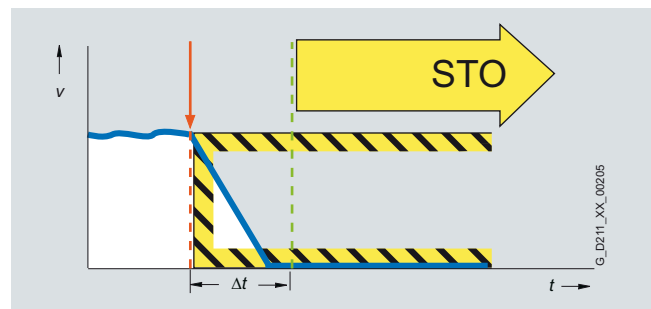
### Safe Stop 1 (SS1, time and acceleration controlled, with sine-cosine encoder; Extended Safety Function)

#### Function description

The Safe Stop 1 function can safely stop the drive in accordance with EN 60204-1, Stop Category 1. When the SS1 function is selected, the drive independently brakes along a quick stop ramp, the deceleration is monitored (OFF3) and Safe Torque Off and Safe Brake Control (if enabled) are automatically activated when the selected safety delay time has expired.

#### Application, customer benefits

When activating the stop function, if the drive does not come quickly enough to a standstill as a result of the load torque, then it can be actively braked by the converter. As a result of this integrated fast brake function, frequently it is possible to eliminate mechanical brakes which wear, or to reduce the load on them. This means that maintenance costs and stress on the machine can be reduced.





## System overview

### Function

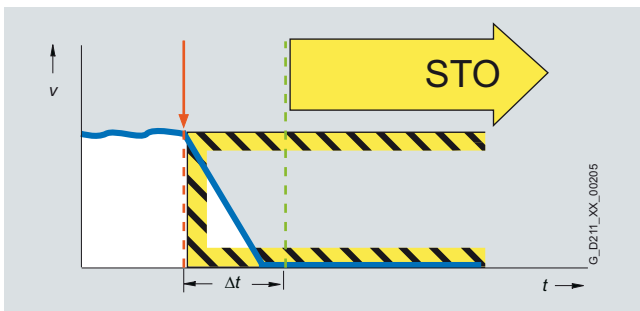
#### Safe Stop 2 (SS2, with sine-cosine encoder)

##### Function description

The Safe Stop 2 function can safely stop the drive in accordance with EN 60204-1, Stop Category 2. When the SS2 function is selected, the drive brakes autonomously along a quick stop ramp (OFF3). In contrast to SS1, the drive control remains operational afterwards, i.e. the motor can supply the full torque required to maintain the actual position. Standstill is safely monitored (Safe Operating Stop function, SOS).

##### Application, customer benefits

Just the same as for SS1, the drive is independently braked when the stop function is selected. Contrary to SS1, also at standstill, the drive can provide the full torque.



#### Safe Stop 1 (SS1) and Safe Stop 2 (SS2) with Safe Acceleration Monitor (SAM, with sine-cosine encoder)

For the Extended Functions Safe Stop 1 (SS1) and Safe Stop 2 (SS2) with SAM, during braking, the acceleration is safely monitored (SAM) in order to identify faults already during the braking phase.

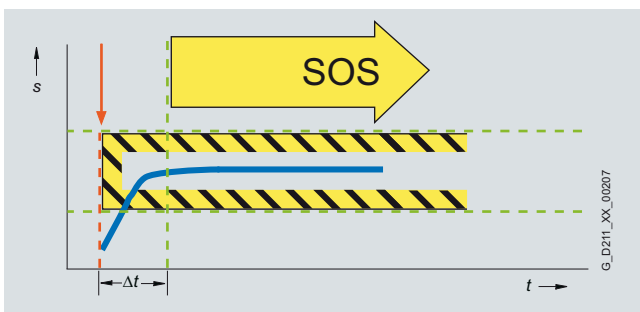
#### Safe Operating Stop (SOS, with sine-cosine encoder)

##### Function description

The Safe Operating Stop function constitutes safe standstill monitoring. The drive control remains in operation. The motor can therefore deliver the full torque to hold the current position. The actual position is reliably monitored. In contrast to safety functions SS1 and SS2, the speed setpoint is not influenced autonomously. After SOS has been selected, the higher-level control must bring the drive to a standstill within a parameterized safe time  $\Delta t$  and then hold the position setpoint. After the time  $\Delta t$  has expired, SOS is activated and monitored to ensure that the actual standstill position is not left.

##### Application, customer benefits

SOS is the ideal function for all those applications for which the machine or parts of the machine must be at a safe standstill for certain machining steps, but where the drive must also supply a holding torque.



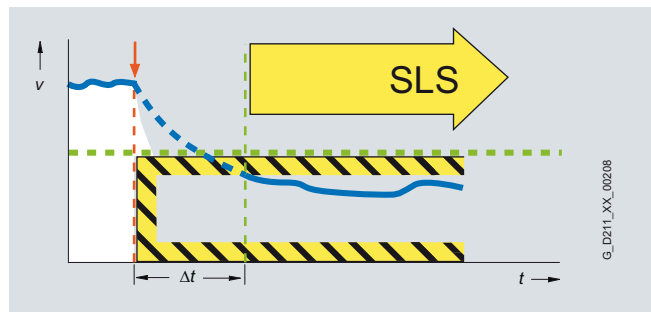
#### Safely-Limited Speed (SLS, with sine-cosine encoder)

##### Function description

Using the Safely-Limited Speed function, the drive is monitored against a parameterizable maximum velocity. Four different limit values can be activated. Just the same as for SOS, the speed setpoint is not independently influenced. After SLS has been selected, the higher-level control must bring the drive to below the selected velocity limit within a parameterizable time  $\Delta t$ .

##### Application, customer benefits

When setting-up many machines operating personnel must work on the machine as it rotates. This must either be done in steps, because the dangerous area must always be exited at each start, or alternatively, the operator works at the machine while it moves and is therefore exposed to an increased risk. When using the SLS function, a considerable amount of time can be saved – and it is still guaranteed that the operating personnel are safe. For this purpose, the drive velocity can be safely limited to a safe low level. The selectable wait time until SLS is activated allows the drive control to run-down the coordinated axes in a controlled fashion.



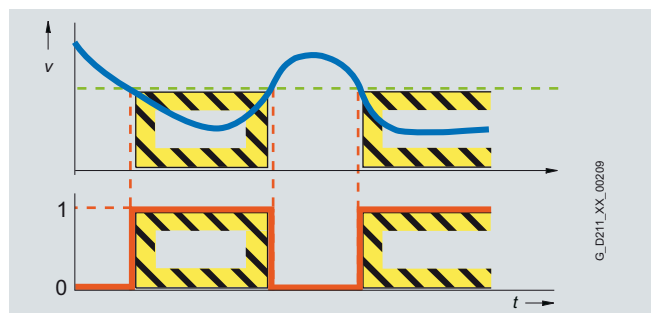
#### Safe Speed Monitor (SSM, with sine-cosine encoder)

##### Function description

The Safe Speed Monitor function supplies a safety feedback signal (high active) if the drive falls below a selectable velocity limit value. Contrary to the functions described above, there is no drive-based fault response when the limit value is exceeded.

##### Application, customer benefits

The safety SSM feedback signal can be used in a higher-level control for safety-relevant responses. The higher-level safety control can flexibly respond to the signal, depending on the particular situation, as there is no drive-based response when the limit value is exceeded. For example, using the SSM signal, a protective door can be released after a non-hazardous velocity is reached.



**Function****Safe Direction (SDI, with sine-cosine encoder)**Function description

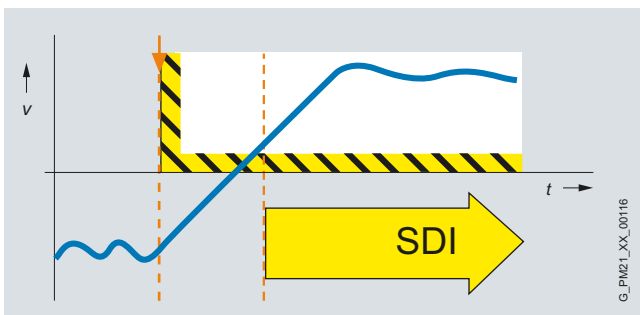
The SDI function ensures that the drive can only rotate in the selected direction.

Deviation from the direction of rotation currently being monitored is detected reliably and the configured drive-integrated fault reaction is initiated. It is possible to select which direction of rotation is to be monitored.

Application, customer benefits

The SDI function is used when the drive may only move in one direction. A typical application is to permit the operator access to a danger zone, as long as the machine is rotating in the safe direction, i.e. away from the operator. In this state, the operator can feed material into the work zone/remove material from the work zone without danger.

The function saves the use of external components e.g. speed monitors and the associated wiring. The release of a danger zone, while the machine is moving away from the operator, increases productivity. Without the SDI function, the machine must be safely stopped during material loading and removal.

**PROFIsafe**

PROFIsafe is an open communication standard, that facilitates standard and safety-relevant communication along one communication path (hard-wired or wireless). As a consequence, a second, separate bus system is not required. The telegrams that are sent are continually monitored to ensure safety-relevant communication. Possible errors such as telegrams that have been lost, repeated or received in the incorrect sequence etc. are avoided. This is done by consecutively numbering the telegrams in a safety-relevant fashion, monitoring their reception within a defined time and transferring an ID for transmitter and receiver of a telegram. Further, a cyclic redundancy check CRC (cyclic redundancy check) is performed.

SINAMICS S150 supports the PROFIsafe profile, based on PROFIBUS as well as on PROFINET.

**Licensing**

The Safety Integrated Basic Functions do not require a license.

A license is, however, required for each axis with safety functions in the case of Safety Integrated Extended Functions. It is irrelevant which safety functions are used and how many.

A license required for SINAMICS S150 can be optionally ordered with the equipment (option **K01**).

Refer to the section [Supplementary system components for the order numbers of the CompactFlash cards](#).

# SINAMICS S150 Converter Cabinet Units

## System overview

### Function

An overview of the SINAMICS Safety Integrated functions plus their boundary conditions is provided in the following table:

Function	Control	Underlying function	Reaction to limit overshoot	Encoder required	License required
<b>Safety Basic Functions</b>					
<b>STO</b>	<ul style="list-style-type: none"> <li>• EP terminals on the power unit and digital input at the CU3xx/D4xx/CX32</li> <li>• PROFIsafe</li> <li>• Terminal module (24 V to 230 V), option <b>K82</b><sup>1)</sup></li> </ul>	SBC (if activated)	–	No	No
<b>SS1</b>	<ul style="list-style-type: none"> <li>• EP terminals on the power unit and digital input at the CU3xx/D4xx/CX32</li> <li>• PROFIsafe</li> <li>• Terminal module (24 V to 230 V), option <b>K82</b><sup>1)</sup></li> </ul>	STO, after a parameterized delay time has expired	STO	No	No
<b>SBC</b>	<ul style="list-style-type: none"> <li>• Via Safe Brake Adapter<sup>2)</sup></li> </ul>	–	–	No	No
<b>Safety Extended Functions</b>					
<b>STO</b>	<ul style="list-style-type: none"> <li>• Terminals on the TM54F<sup>3)</sup></li> <li>• PROFIsafe</li> </ul>	SBC (if activated)	–	Yes <sup>4)</sup>	Yes (each safety axis)
<b>SS1</b>	<ul style="list-style-type: none"> <li>• Terminals on the TM54F<sup>3)</sup></li> <li>• PROFIsafe</li> </ul>	STO is activated after the shutdown conditions have been fulfilled	STO	Yes <sup>4)</sup>	Yes (each safety axis)
<b>SBC</b>	<ul style="list-style-type: none"> <li>• Via Safe Brake Adapter</li> </ul>	–	–	Yes <sup>4)</sup>	Yes (each safety axis)
<b>SS2</b>	<ul style="list-style-type: none"> <li>• Terminals on the TM54F<sup>3)</sup></li> <li>• PROFIsafe</li> </ul>	STO is activated after the shutdown conditions have been fulfilled	STO	Yes <sup>4)</sup>	Yes (each safety axis)
<b>SLS</b>	<ul style="list-style-type: none"> <li>• Terminals on the TM54F<sup>3)</sup></li> <li>• PROFIsafe</li> </ul>	Up to four maximum speeds for operation can be parameterized	STO, SS1 or SOS (can be parameterized)	Yes <sup>4)</sup>	Yes (each safety axis)
<b>SOS</b>	<ul style="list-style-type: none"> <li>• Terminals on the TM54F<sup>3)</sup></li> <li>• PROFIsafe</li> </ul>	For closed-loop speed control: The position is monitored from standstill	STO or SS1 (can be parameterized)	Yes <sup>4)</sup>	Yes (each safety axis)
<b>SSM</b>	<ul style="list-style-type: none"> <li>• Terminals on the TM54F<sup>3)</sup></li> <li>• PROFIsafe</li> </ul>	Safe limit value monitoring in both directions of rotation, no independent drive response. A safety-relevant signal for further operation is generated.	–	Yes <sup>4)</sup>	Yes (each safety axis)
<b>SDI</b>	<ul style="list-style-type: none"> <li>• Terminals on the TM54F<sup>3)</sup></li> <li>• PROFIsafe</li> </ul>	–	STO, SS1 or SOS (can be parameterized)	Yes <sup>4)</sup>	Yes (each safety axis)

<sup>1)</sup> In addition for SINAMICS S120 Cabinet Modules and SINAMICS S150 Converter Cabinet Units.

<sup>2)</sup> Safe Brake Adapter has been released from firmware version 4.4.

<sup>3)</sup> For SINAMICS S120 Cabinet Modules and SINAMICS S150 Converter Cabinet Units as option **K87**.

<sup>4)</sup> The Safety Integrated Extended Functions require a sine-cosine encoder to sense the motor speed. Possible encoder evaluation units SMC20, SMI20, SME20/25/120/125.

**Function***The principle of operation of Safety Integrated*Two independent shutdown paths

There are two shutdown paths that are independent of one another.

All shutdown paths are low active. This therefore ensures that when a component fails or there is a wire break, then the system always goes into the safe state. When a fault is detected in the shutdown paths, the Safe Torque Off or Safe Stop 1 function (depending on the parameterization, also refer to the table on the Page 4/12) is activated and a restart is prevented.

Two-channel monitoring structure

All of the hardware and software functions important for Safety Integrated are implemented in two independent monitoring channels (e.g. shutdown paths, data management, data comparison). The safety-relevant data in the two monitoring channels is cyclically compared crosswise.

The monitoring functions in each monitoring channel are based on the principle that before a particular action, there must be a defined state, and after the action there must be a specific feedback. If this expectation is not fulfilled in a monitoring channel, then the drive is shutdown through two channels and the appropriate signal output.

Forced checking procedure using a test stop

In order to fulfill the requirements of EN 954-1 (at the end of 2011, will be replaced by EN ISO 13849-1) and IEC 61508 regarding early fault detection, the functions and the shutdown paths must be tested within a specific time period at least once to ensure that they are operating correctly. This must be realized either cyclically and manually or the test stop must be automatically initiated as part of the process. The test stop cycle is monitored, and after a specific time has been exceeded, an alarm is output.

A test stop does not require a power on. The acknowledgment is realized when deselecting the test stop request.

When the machine is operational, it can be assumed that there is no risk for personnel as a result of the appropriate safety equipment (e.g. protective doors). As a consequence, the user is only made aware of the forced checking procedure that is required using an alarm, and is requested to perform the forced checking procedure at the next possible opportunity.

Examples for performing the forced checking procedure:

- When the drives are stationary after switching-on the system
- Before opening the protective door
- In a specified rhythm (e.g. every 8 hours)
- In the automatic mode, time and event-triggered

# SINAMICS S150 Converter Cabinet Units

## System overview

### Technical data

The most important directives and standards are listed below. These are used as basis for the SINAMICS S150 Converter Cabinet Units drive system and they must be carefully observed to achieve an EMC-compliant configuration that is safe both functionally and in operation.

#### European directives

<b>2006/95/EC</b>	Low-voltage directive: Legal guidelines of the EU member states concerning electrical equipment for use within specified voltage limits
<b>2004/108/EC</b>	EMC directive: Legal guidelines of the EU member states for electromagnetic compatibility

#### European standards

<b>EN 954-1</b> <sup>1)</sup>	Safety of machinery – safety-related parts of control systems; Part 1: General design principles
<b>EN ISO 13849-1</b>	Safety of machinery – safety-related parts of control systems; Part 1: General design guidelines (ISO 13849-1: 2006) (replaces EN 954-1)
<b>EN 60146-1-1</b>	Semiconductor converters – General requirements and line-commutated converters Part 1-1: Specification of basic requirements
<b>EN 60204-1</b>	Safety of machinery – Electrical equipment of machines; Part 1: General requirements
<b>EN 60529</b>	Degrees of protection provided by enclosures (IP code)
<b>EN 61508-1</b>	Functional safety of electrical/electronic/programmable electronic safety-related systems Part 1: General requirements
<b>EN 61800-2</b>	Variable-speed electric drives Part 2: General requirements – Rating specifications for low-voltage adjustable frequency AC power drive systems
<b>EN 61800-3</b>	Variable-speed electric drives Part 3: EMC requirements including specific test methods
<b>EN 61800-5-1</b>	Adjustable-speed electrical power drive systems Part 5: Safety requirements Main section 1: Electrical and thermal requirements
<b>EN 61800-5-2</b>	Adjustable speed electrical power drive systems Part 5-2: Safety requirements – Functional safety (IEC 61800-5-2: 2007)

### General technical specifications

#### Electrical specifications

<b>Line voltages</b>	380 ... 480 V 3 AC, $\pm 10\%$ (-15% < 1 min) 500 ... 690 V 3 AC, $\pm 10\%$ (-15% < 1 min)
<b>Line supply types</b>	Grounded TN/TT systems and non-grounded IT systems
<b>Line frequency</b>	47 ... 63 Hz
<b>Output frequency</b> <sup>2)</sup>	
• Control type Servo	0 ... 650 Hz
• Control type Vector	0 ... 600 Hz
• Control type V/f	0 ... 600 Hz
<b>Line power factor</b>	Adjustable (factory-set to $\cos \varphi = 1$ )
<b>Efficiency</b>	> 96 %
<b>Overvoltage category</b>	III to EN 61800-5-1

<sup>1)</sup> Will be replaced by EN ISO 13849-1 at the end of 2011.

<sup>2)</sup> Please note:

- The correlation between the maximum output frequency, pulse frequency and current derating. Higher output frequencies for specific configurations are available on request.
- The correlation between the maximum output frequency and permissible output current (current derating).

Information is provided in the [SINAMICS Low Voltage Engineering Manual](#).

## Technical data

## General technical data (continued)

Electrical specifications			
<b>Control method</b>	Vector control with and without encoder or V/f control		
<b>Fixed speeds</b>	15 fixed speeds plus 1 minimum speed, parameterizable (in the default setting, 3 fixed setpoints plus 1 minimum speed are selectable using terminal block/PROFIBUS/PROFINET)		
<b>Skipped speed ranges</b>	4, parameterizable		
<b>Setpoint resolution</b>	0.001 rpm digital (14 bits + sign) 12 bit analog		
<b>Braking operation</b>	Four-quadrant operation is possible as standard (optional via a braking unit if braking is required when power fails)		
Mechanical specifications			
<b>Degree of protection</b>	IP20 (higher degrees of protection up to IP54 optional)		
<b>Protection class</b>	I acc. to EN 61800-5-1		
<b>Touch protection</b>	EN 50274/BGV A3 for the intended purpose		
<b>Cabinet system</b>	Rittal TS 8, doors with double-barb lock, three-section base plates for cable entry		
<b>Paint finish</b>	RAL 7035 (indoor requirements)		
<b>Type of cooling</b>	Forced air cooling AF to EN 60146		
Ambient conditions	Storage <sup>1)</sup>	Transport <sup>1)</sup>	Operation
<b>Ambient temperature</b>	-25 ... +55 °C	-25 ... +70 °C from -40 °C <sup>2)</sup> for 24 hours	0 ... +40 °C to +50 °C, see derating data
<b>Relative humidity</b> (condensation not permissible)	5 ... 95 % <sup>2)</sup> Class 1K4 acc. to EN 60721-3-1	5 ... 95 % at 40 °C Class 2K3 acc. to IEC 60721-3-2	5 ... 95 % <sup>2)</sup> Class 3K3 acc. to EN 60721-3-3
<b>Environmental class/harmful chemical substances</b>	Class 1C2 acc. to EN 60721-3-1	Class 2C2 acc. to EN 60721-3-2	Class 3C2 acc. to EN 60721-3-3
<b>Organic/biological influences</b>	Class 1B1 acc. to EN 60721-3-1	Class 2B1 acc. to EN 60721-3-2	Class 3B1 acc. to EN 60721-3-3
<b>Degree of pollution</b>	2 acc. to EN 61800-5-1	2 acc. to EN 61800-5-1	2 acc. to EN 61800-5-1
<b>Installation altitude</b>	Cabinet Modules, chassis format: up to 2000 m above sea level, without derating, > 2000 m, see characteristic curves/derating data For Motor Modules Booksize Cabinet Kit format as well as Central Braking Modules: up to 1000 m above sea level without derating, > 1000 m, see characteristic curves/derating data		
Mechanical stability	Storage <sup>1)</sup>	Transport <sup>1)</sup>	Operation
<b>Vibration load</b>	Class 1M2 acc. to EN 60721-3-1	Class 2M2 acc. to EN 60721-3-2	–
• Deflection	1.5 mm at <u>5</u> ... 9 Hz	3.1 mm at <u>5</u> ... 9 Hz	0.075 mm at 10 ... 58 Hz
• Acceleration	5 m/s <sup>2</sup> at > 9 ... 200 Hz	10 m/s <sup>2</sup> at > 9 ... 200 Hz	9.8 m/s <sup>2</sup> at > 58 ... 200 Hz
<b>Shock load</b>	Class 1M2 acc. to EN 60721-3-1	Class 2M2 acc. to EN 60721-3-2	Class 3M4 acc. to EN 60721-3-3
• Acceleration	40 m/s <sup>2</sup> at 22 ms	100 m/s <sup>2</sup> at 11 ms	100 m/s <sup>2</sup> at 11 ms
Compliance with standards			
<b>Conformances/approvals, according to</b>	CE (EMC Directive No. 2004/108/EC and Low-Voltage Directive No. 2006/95/EC)		
<b>Radio interference suppression</b>	SINAMICS drive converter systems are not designed for connection to the public network (first environment). Radio interference suppression is compliant with the EMC product standard for variable-speed drives EN 61800-3, "Second environment" (industrial line supplies). The equipment can cause electromagnetic interference when it is connected to the public network. However, if supplementary measures are taken (e.g. → line filter), it can also be operated in the "first environment".		

<sup>1)</sup> In transport packaging.

<sup>2)</sup> Deviations with respect to the specified class are underlined.

# SINAMICS S150 Converter Cabinet Units

## System overview

### Technical data

Line voltage 380 ... 480 V 3 AC		SINAMICS S150 Converter Cabinet Units					
		6SL3710-7LE32-1AA3	6SL3710-7LE32-6AA3	6SL3710-7LE33-1AA3	6SL3710-7LE33-8AA3	6SL3710-7LE35-0AA3	6SL3710-7LE36-1AA3
<b>Type rating</b>							
• For $I_L$ (50 Hz 400 V) <sup>1)</sup>	kW	<b>110</b>	<b>132</b>	<b>160</b>	<b>200</b>	<b>250</b>	<b>315</b>
• For $I_H$ (50 Hz 400 V) <sup>1)</sup>	kW	90	110	132	160	200	250
• For $I_L$ (60 Hz 460 V) <sup>2)</sup>	hp	150	200	250	300	400	500
• For $I_H$ (60 Hz 460 V) <sup>2)</sup>	hp	150	200	200	250	350	350
<b>Output current</b>							
• Rated current $I_{NA}$	A	210	260	310	380	490	605
• Base load current $I_L$ <sup>3)</sup>	A	205	250	302	370	477	590
• Base load current $I_H$ <sup>4)</sup>	A	178	233	277	340	438	460
• Max. current $I_{max A}$	A	307	375	453	555	715	885
<b>Infeed/regenerative feedback current</b>							
• Rated input current $I_{NE}$	A	197	242	286	349	447	549
• Max. input current $I_{max E}$	A	315	390	570	570	735	907
<b>Current demand, max.</b> <sup>5)</sup>							
• 24 V DC auxiliary power supply	A	Internal	Internal	Internal	Internal	Internal	Internal
<b>Pulse frequency</b> <sup>6)</sup>							
• Rated frequency	kHz	2	2	2	2	2	1.25
• Pulse frequency, max.							
- Without current derating	kHz	2	2	2	2	2	1.25
- With current derating	kHz	8	8	8	8	8	7.5
<b>Power loss, max.</b> <sup>7)</sup>							
• At 50 Hz 400 V	kW	6.31	7.55	10.01	10.72	13.13	17.69
• At 60 Hz 460 V	kW	6.49	7.85	10.45	11.15	13.65	18.55
<b>Cooling air requirement</b>	m <sup>3</sup> /s	0.58	0.7	1.19	1.19	1.19	1.96
<b>Sound pressure level <math>L_{pA}</math></b> (1 m) at 50/60 Hz	dB	71/73	71/73	72/74	72/74	72/74	77/79
<b>Cable length, max.</b>							
• Shielded	m	300	300	300	300	300	300
• Unshielded	m	450	450	450	450	450	450
<b>Degree of protection</b>		IP20	IP20	IP20	IP20	IP20	IP20
<b>Dimensions</b>							
• Width	mm	1400	1400	1600	1800	1800	2200
• Height	mm	2000	2000	2000	2000	2000	2000
• Depth	mm	600	600	600	600	600	600
<b>Weight, approx.</b>	kg	708	708	892	980	980	1716
<b>Frame size</b>		F	F	G	G	G	H

Note: The power data in hp units are based on the NEC/CEC standards for the North American market.

Information about line supply connections, motor connections and cabinet grounding can be found under [Cable cross-sections and connections](#).

- 1) Rated power of a typ. 6-pole standard induction motor based on  $I_L$  or  $I_H$  with 400 V 3 AC 50 Hz.
- 2) Rated power of a typ. 6-pole standard induction motor based on  $I_L$  or  $I_H$  with 460 V 3 AC 60 Hz.
- 3) The base load current  $I_L$  is the basis for a duty cycle of 110 % for 60 s or 150 % for 10 s with a duty cycle duration of 300 s.
- 4) The base load current  $I_H$  is the basis for a duty cycle of 150 % for 60 s or 160 % for 10 s with a duty cycle duration of 300 s.

- 5) If the drive closed-loop control is still to remain active when the line supply fails, then the equipment must be provided with an external 24 V DC supply.
- 6) [Information regarding the correlation between the pulse frequency and max. output current/output frequency is provided in the SINAMICS Low Voltage Engineering Manual.](#)
- 7) The specified power losses are the maximum values at 100 % utilization. The values are lower under normal operating conditions.

## Technical data

Line voltage 380 ... 480 V 3 AC		SINAMICS S150 Converter Cabinet Units				
		6SL3710-7LE37-5AA3	6SL3710-7LE38-4AA3	6SL3710-7LE41-0AA3	6SL3710-7LE41-2AA3	6SL3710-7LE41-4AA3
<b>Type rating</b>						
• For $I_L$ (50 Hz 400 V) <sup>1)</sup>	kW	<b>400</b>	<b>450</b>	<b>560</b>	<b>710</b>	<b>800</b>
• For $I_H$ (50 Hz 400 V) <sup>1)</sup>	kW	315	400	450	560	710
• For $I_L$ (60 Hz 460 V) <sup>2)</sup>	hp	600	700	800	900	1150
• For $I_H$ (60 Hz 460 V) <sup>2)</sup>	hp	450	600	700	900	1000
<b>Output current</b>						
• Rated current $I_{NA}$	A	745	840	985	1260	1405
• Base load current $I_L$ <sup>3)</sup>	A	725	820	960	1230	1370
• Base load current $I_H$ <sup>4)</sup>	A	570	700	860	1127	1257
• Max. current $I_{max A}$	A	1087	1230	1440	1845	2055
<b>Infeed/regenerative feedback current</b>						
• Rated input current $I_{NE}$	A	674	759	888	1133	1262
• Max. input current $I_{max E}$	A	1118	1260	1477	1891	2107
<b>Current demand, max.</b> <sup>5)</sup>						
• 24 V DC auxiliary power supply	A	Internal	Internal	Internal	Internal	Internal
<b>Pulse frequency</b> <sup>6)</sup>						
• Rated frequency	kHz	1.25	1.25	1.25	1.25	1.25
• Pulse frequency, max.						
- Without current derating	kHz	1.25	1.25	1.25	1.25	1.25
- With current derating	kHz	7.5	7.5	7.5	7.5	7.5
<b>Power loss, max.</b> <sup>7)</sup>						
• At 50 Hz 400 V	kW	20.63	21.1	27.25	33.05	33.95
• At 60 Hz 460 V	kW	21.75	22.25	28.65	34.85	35.85
<b>Cooling air requirement</b>		m <sup>3</sup> /s	1.96	1.96	2.6	2.6
<b>Sound pressure level <math>L_{pA}</math></b> (1 m) at 50/60 Hz		dB	77/79	77/79	77/79	78/80
<b>Cable length, max.</b>						
• Shielded	m	300	300	300	300	300
• Unshielded	m	450	450	450	450	450
<b>Degree of protection</b>			IP20	IP20	IP20	IP20
<b>Dimensions</b>						
• Width	mm	2200	2200	2800	2800	2800
• Height	mm	2000	2000	2000	2000	2000
• Depth	mm	600	600	600	600	600
<b>Weight, approx.</b>		kg	1731	1778	2408	2408
<b>Frame size</b>			H	H	J	J

Note: The power data in hp units are based on the NEC/CEC standards for the North American market.

Information about line supply connections, motor connections and cabinet grounding can be found under [Cable cross-sections and connections](#).

<sup>1)</sup> Rated power of a typ. 6-pole standard induction motor based on  $I_L$  or  $I_H$  with 400 V 3 AC 50 Hz.

<sup>2)</sup> Rated power of a typ. 6-pole standard induction motor based on  $I_L$  or  $I_H$  with 460 V 3 AC 60 Hz.

<sup>3)</sup> The base load current  $I_L$  is the basis for a duty cycle of 110 % for 60 s or 150 % for 10 s with a duty cycle duration of 300 s.

<sup>4)</sup> The base load current  $I_H$  is the basis for a duty cycle of 150 % for 60 s or 160 % for 10 s with a duty cycle duration of 300 s.

<sup>5)</sup> If the drive closed-loop control is still to remain active when the line supply fails, then the equipment must be provided with an external 24 V DC supply.

<sup>6)</sup> Information regarding the correlation between the pulse frequency and max. output current/output frequency is provided in the [SINAMICS Low Voltage Engineering Manual](#).

<sup>7)</sup> The specified power losses are the maximum values at 100 % utilization. The values are lower under normal operating conditions.



# SINAMICS S150 Converter Cabinet Units

## System overview

### Technical data

Line voltage 500 ... 690 V 3 AC 50 Hz		SINAMICS S150 Converter Cabinet Units					
		6SL3710-7LG28-5AA3	6SL3710-7LG31-0AA3	6SL3710-7LG31-2AA3	6SL3710-7LG31-5AA3	6SL3710-7LG31-8AA3	6SL3710-7LG32-2AA3
<b>Type rating</b>							
• For $I_L$ (50 Hz 690 V) <sup>1)</sup>	kW	<b>75</b>	<b>90</b>	<b>110</b>	<b>132</b>	<b>160</b>	<b>200</b>
• For $I_H$ (50 Hz 690 V) <sup>1)</sup>	kW	55	75	90	110	132	160
• For $I_L$ (50 Hz 500 V) <sup>1)</sup>	kW	55	55	75	90	110	132
• For $I_H$ (50 Hz 500 V) <sup>1)</sup>	kW	45	55	75	90	90	110
• For $I_L$ (60 Hz 575 V) <sup>2)</sup>	hp	75	75	100	150	150	200
• For $I_H$ (60 Hz 575 V) <sup>2)</sup>	hp	75	75	100	125	150	200
<b>Output current</b>							
• Rated current $I_{NA}$	A	85	100	120	150	175	215
• Base load current $I_L$ <sup>3)</sup>	A	80	95	115	142	170	208
• Base load current $I_H$ <sup>4)</sup>	A	76	89	107	134	157	192
• Max. current $I_{max A}$	A	120	142	172	213	255	312
<b>Infeed/regenerative feedback current</b>							
• Rated current $I_{NE}$	A	86	99	117	144	166	202
• Max. current $I_{max E}$	A	125	144	170	210	253	308
<b>Current demand, max.</b> <sup>5)</sup>							
• 24 V DC aux. power supply	A	Internal	Internal	Internal	Internal	Internal	Internal
<b>Pulse frequency</b> <sup>6)</sup>							
• Rated frequency	kHz	1.25	1.25	1.25	1.25	1.25	1.25
• Pulse frequency, max.							
- Without current derating	kHz	1.25	1.25	1.25	1.25	1.25	1.25
- With current derating	kHz	7.5	7.5	7.5	7.5	7.5	7.5
<b>Power loss, max.</b> <sup>7)</sup>							
• At 50 Hz 690 V	kW	5.2	5.38	5.84	5.75	11.02	11.44
• At 60 Hz 575 V	kW	4.45	4.65	5.2	4.97	11.15	11.56
<b>Cooling air requirement</b>		m <sup>3</sup> /s	0.58	0.58	0.58	1.19	1.19
<b>Sound pressure level <math>L_{pA}</math></b> (1 m) at 50/60 Hz		dB	71/73	71/73	71/73	75/77	75/77
<b>Cable length, max.</b>							
• Shielded	m	300	300	300	300	300	300
• Unshielded	m	450	450	450	450	450	450
<b>Degree of protection</b>			IP20	IP20	IP20	IP20	IP20
<b>Dimensions</b>							
• Width	mm	1400	1400	1400	1400	1600	1600
• Height	mm	2000	2000	2000	2000	2000	2000
• Depth	mm	600	600	600	600	600	600
<b>Weight, approx.</b>		kg	708	708	708	892	892
<b>Frame size</b>			F	F	F	G	G

Note: The power data in hp units are based on the NEC/CEC standards for the North American market.

Information about line supply connections, motor connections and cabinet grounding can be found under [Cable cross-sections and connections](#).

<sup>1)</sup> Rated power of a typ. 6-pole standard induction motor based on  $I_L$  or  $I_H$  at 500 V or 690 V 3 AC 50 Hz.

<sup>2)</sup> Rated power of a typ. 6-pole standard induction motor based on  $I_L$  or  $I_H$  at 575 V 3 AC 60 Hz.

<sup>3)</sup> The base load current  $I_L$  is the basis for a duty cycle of 110 % for 60 s or 150 % for 10 s with a duty cycle duration of 300 s.

<sup>4)</sup> The base load current  $I_H$  is the basis for a duty cycle of 150 % for 60 s or 160 % for 10 s with a duty cycle duration of 300 s.

<sup>5)</sup> If the drive closed-loop control is still to remain active when the line supply fails, then the equipment must be provided with an external 24 V DC supply.

<sup>6)</sup> Information regarding the correlation between the pulse frequency and max. output current/output frequency is provided in the SINAMICS Low Voltage Engineering Manual.

<sup>7)</sup> The specified power loss represents the maximum value at 100 % utilization. The value is lower under normal operating conditions.

## Technical data

Line voltage 500 ... 690 V 3 AC 50 Hz		SINAMICS S150 Converter Cabinet Units					
		6SL3710-7LG32-6AA3	6SL3710-7LG33-3AA3	6SL3710-7LG34-1AA3	6SL3710-7LG34-7AA3	6SL3710-7LG35-8AA3	6SL3710-7LG37-4AA3
<b>Type rating</b>							
• For $I_L$ (50 Hz 690 V) <sup>1)</sup>	kW	<b>250</b>	<b>315</b>	<b>400</b>	<b>450</b>	<b>560</b>	<b>710</b>
• For $I_H$ (50 Hz 690 V) <sup>1)</sup>	kW	200	250	315	400	450	630
• For $I_L$ (50 Hz 500 V) <sup>1)</sup>	kW	160	200	250	315	400	500
• For $I_H$ (50 Hz 500 V) <sup>1)</sup>	kW	132	160	200	250	315	450
• For $I_L$ (60 Hz 575 V) <sup>2)</sup>	hp	250	300	400	450	600	700
• For $I_H$ (60 Hz 575 V) <sup>2)</sup>	hp	200	250	350	450	500	700
<b>Output current</b>							
• Rated current $I_{NA}$	A	260	330	410	465	575	735
• Base load current $I_L$ <sup>3)</sup>	A	250	320	400	452	560	710
• Base load current $I_H$ <sup>4)</sup>	A	233	280	367	416	514	657
• Max. current $I_{max A}$	A	375	480	600	678	840	1065
<b>Infeed/regenerative feedback current</b>							
• Rated current $I_{NE}$	A	242	304	375	424	522	665
• Max. current $I_{max E}$	A	370	465	619	700	862	1102
<b>Current demand, max.</b> <sup>5)</sup>							
• 24 V DC aux. power supply	A	Internal	Internal	Internal	Internal	Internal	Internal
<b>Pulse frequency</b> <sup>6)</sup>							
• Rated frequency	kHz	1.25	1.25	1.25	1.25	1.25	1.25
• Pulse frequency, max.							
- Without current derating	kHz	1.25	1.25	1.25	1.25	1.25	1.25
- With current derating	kHz	7.5	7.5	7.5	7.5	7.5	7.5
<b>Power loss, max.</b> <sup>7)</sup>							
• At 50 Hz 690 V	kW	11.97	12.69	19.98	20.55	24.05	30.25
• At 60 Hz 575 V	kW	12.03	12.63	18.86	19.47	22.85	28.75
<b>Cooling air requirement</b>		m <sup>3</sup> /s	1.19	1.19	1.96	1.96	2.6
<b>Sound pressure level <math>L_{pA}</math></b> (1 m) at 50/60 Hz		dB	75/77	75/77	77/79	77/79	77/79
<b>Cable length, max.</b>							
• Shielded	m	300	300	300	300	300	300
• Unshielded	m	450	450	450	450	450	450
<b>Degree of protection</b>			IP20	IP20	IP20	IP20	IP20
<b>Dimensions</b>							
• Width	mm	1600	1600	2200	2200	2200	2800
• Height	mm	2000	2000	2000	2000	2000	2000
• Depth	mm	600	600	600	600	600	600
<b>Weight, approx.</b>		kg	892	892	1716	1716	2300
<b>Frame size</b>			G	G	H	H	J

Note: The power data in hp units are based on the NEC/CEC standards for the North American market.

Information about line supply connections, motor connections and cabinet grounding can be found under [Cable cross-sections and connections](#).

<sup>1)</sup> Rated power of a typ. 6-pole standard induction motor based on  $I_L$  or  $I_H$  at 500 V or 690 V 3 AC 50 Hz.

<sup>2)</sup> Rated power of a typ. 6-pole standard induction motor based on  $I_L$  or  $I_H$  at 575 V 3 AC 60 Hz.

<sup>3)</sup> The base load current  $I_L$  is the basis for a duty cycle of 110 % for 60 s or 150 % for 10 s with a duty cycle duration of 300 s.

<sup>4)</sup> The base load current  $I_H$  is the basis for a duty cycle of 150 % for 60 s or 160 % for 10 s with a duty cycle duration of 300 s.

<sup>5)</sup> If the drive closed-loop control is still to remain active when the line supply fails, then the equipment must be provided with an external 24 V DC supply.

<sup>6)</sup> Information regarding the correlation between the pulse frequency and max. output current/output frequency is provided in the SINAMICS Low Voltage Engineering Manual.

<sup>7)</sup> The specified power loss represents the maximum value at 100 % utilization. The value is lower under normal operating conditions.

# SINAMICS S150 Converter Cabinet Units

## System overview

### Technical data

Line voltage 500 ... 690 V 3 AC 50 Hz		SINAMICS S150 Converter Cabinet Units			
		6SL3710-7LG38-1AA3	6SL3710-7LG38-8AA3	6SL3710-7LG41-0AA3	6SL3710-7LG41-3AA3
<b>Type rating</b>					
• For $I_L$ (50 Hz 690 V) <sup>1)</sup>	kW	<b>800</b>	<b>900</b>	<b>1000</b>	<b>1200</b>
• For $I_H$ (50 Hz 690 V) <sup>1)</sup>	kW	710	800	900	1000
• For $I_L$ (50 Hz 500 V) <sup>1)</sup>	kW	560	630	710	900
• For $I_H$ (50 Hz 500 V) <sup>1)</sup>	kW	500	560	630	800
• For $I_L$ (60 Hz 575 V) <sup>2)</sup>	hp	800	900	1000	1250
• For $I_H$ (60 Hz 575 V) <sup>2)</sup>	hp	700	800	900	1000
<b>Output current</b>					
• Rated current $I_{NA}$	A	810	910	1025	1270
• Base load current $I_L$ <sup>3)</sup>	A	790	880	1000	1230
• Base load current $I_H$ <sup>4)</sup>	A	724	814	917	1136
• Max. current $I_{max A}$	A	1185	1320	1500	1845
<b>Infeed/regenerative feedback current</b>					
• Rated current $I_{NE}$	A	732	821	923	1142
• Max. current $I_{max E}$	A	1218	1367	1537	1905
<b>Current demand, max.</b> <sup>5)</sup>					
• 24 V DC aux. power supply	A	Internal	Internal	Internal	Internal
<b>Pulse frequency</b> <sup>6)</sup>					
• Rated frequency	kHz	1.25	1.25	1.25	1.25
• Pulse frequency, max.					
- Without current derating	kHz	1.25	1.25	1.25	1.25
- With current derating	kHz	7.5	7.5	7.5	7.5
<b>Power loss, max.</b> <sup>7)</sup>					
• at 50 Hz 690 V	kW	34.45	34.65	36.15	42.25
• at 60 Hz 575 V	kW	32.75	32.85	34.25	39.25
<b>Cooling air requirement</b>		m <sup>3</sup> /s	2.6	2.6	2.6
<b>Sound pressure level <math>L_{pA}</math></b> (1 m) at 50/60 Hz		dB	77/79	77/79	77/79
<b>Cable length, max.</b>					
• Shielded	m	300	300	300	300
• Unshielded	m	450	450	450	450
<b>Degree of protection</b>		IP20	IP20	IP20	IP20
<b>Dimensions</b>					
• Width	mm	2800	2800	2800	2800
• Height	mm	2000	2000	2000	2000
• Depth	mm	600	600	600	600
<b>Weight, approx.</b>		kg	2408	2408	2408
<b>Frame size</b>		J	J	J	J

Note: The power data in hp units are based on the NEC/CEC standards for the North American market.

Information about line supply connections, motor connections and cabinet grounding can be found under [Cable cross-sections and connections](#).

- 1) Rated power of a typ. 6-pole standard induction motor based on  $I_L$  or  $I_H$  at 500 V or 690 V 3 AC 50 Hz.
- 2) Rated power of a typ. 6-pole standard induction motor based on  $I_L$  or  $I_H$  at 575 V 3 AC 60 Hz.
- 3) The base load current  $I_L$  is the basis for a duty cycle of 110 % for 60 s or 150 % for 10 s with a duty cycle duration of 300 s.
- 4) The base load current  $I_H$  is the basis for a duty cycle of 150 % for 60 s or 160 % for 10 s with a duty cycle duration of 300 s.

- 5) If the drive closed-loop control is still to remain active when the line supply fails, then the equipment must be provided with an external 24 V DC supply.
- 6) [Information regarding the correlation between the pulse frequency and max. output current/output frequency is provided in the SINAMICS Low Voltage Engineering Manual.](#)
- 7) The specified power loss represents the maximum value at 100 % utilization. The value is lower under normal operating conditions.

## Characteristic curves

### Derating data

SINAMICS S150 Converter Cabinet Units and the associated system components are rated for an ambient temperature of 40 °C and installation altitudes up to 2000 m above sea level.

For ambient temperatures > 40 °C the output current must be reduced. Ambient temperatures above 50 °C are not permissible.

At installation altitudes > 2000 m above sea level, it must be taken into consideration that with increasing height, the air pressure decreases and therefore the air density. As a consequence, the cooling efficiency and the insulation capacity of the air also decrease.

Due to the reduced cooling efficiency, it is necessary, on one hand, to reduce the ambient temperature and on the other hand, to lower heat loss in the converter cabinet unit by reducing the output current, whereby ambient temperatures lower than 40 °C may be offset to compensate.

The following table lists the permissible output currents as a function of the installation altitude and ambient temperature for the various degrees of protection. The specified values already include a permitted compensation in respect of installation altitude and ambient temperatures < 40 °C temperature at the air intake of the converter cabinet unit.

The values apply under the precondition that it is a guaranteed that the cooling air, as specified in the technical data, flows through the units as a result of the cabinet arrangement.

As additional measure for installation altitudes from 2000 m up to 5000 m, an isolating transformer is required in order to reduce transient overvoltages according to EN 60664-1. [For additional information, please refer to the SINAMICS Low Voltage Engineering Manual.](#)

Degree of protection	Installation altitude above sea level m	Current derating factor (as a % of the rated current) for an ambient/air intake temperature of						
		20 °C	25 °C	30 °C	35 °C	40 °C	45 °C	50 °C
IP20, IP21, IP23, IP43	0 ... 2000	100 %	100 %	100 %	100 %	100 %	<b>93.3 %</b>	<b>86.7 %</b>
	2001 ... 2500	100 %	100 %	100 %	100 %	<b>96.3 %</b>		
	2501 ... 3000	100 %	100 %	100 %	<b>98.7 %</b>			
	3001 ... 3500	100 %	100 %	100 %				
	3501 ... 4000	100 %	100 %	<b>96.3 %</b>				
	4001 ... 4500	100 %	<b>97.5 %</b>					
	4501 ... 5000	<b>98.2 %</b>						
IP54	0 ... 2000	100 %	100 %	100 %	100 %	<b>93.3 %</b>	<b>86.7 %</b>	<b>80.0 %</b>
	2001 ... 2500	100 %	100 %	100 %	<b>96.3 %</b>	<b>89.8 %</b>		
	2501 ... 3000	100 %	100 %	<b>98.7 %</b>	<b>92.5 %</b>			
	3001 ... 3500	100 %	100 %	<b>94.7 %</b>				
	3501 ... 4000	100 %	<b>96.3 %</b>	<b>90.7 %</b>				
	4001 ... 4500	<b>97.5 %</b>	<b>92.1 %</b>					
	4501 ... 5000	<b>93.0 %</b>						

Current-derating factors for SINAMICS S150 as a function of the ambient/air intake temperature, the installation altitude and the degree of protection.

# SINAMICS S150 Converter Cabinet Units

## System overview

### Characteristic curves

#### Current derating as a function of pulse frequency

To reduce motor noise or to increase output frequency, the pulse frequency can be increased relative to the factory setting. When the pulse frequency is increased, the derating factor of the output current must be taken into account. This derating factor must be applied to the currents specified in the technical data.

For additional information, please refer to the SINAMICS Low Voltage Engineering Manual.

SINAMICS S150 Converter Cabinet Unit 6SL3710-...	Type rating at 400 V kW	Output current at 2 kHz A	Derating factor at the pulse frequency				
			2.5 kHz	4 kHz	5 kHz	7.5 kHz	8 kHz
<b>380 ... 480 V 3 AC</b>							
7LE32-1AA3	110	210	95 %	82 %	74 %	54 %	50 %
7LE32-6AA3	132	260	95 %	83 %	74 %	54 %	50 %
7LE33-1AA3	160	310	97 %	88 %	78 %	54 %	50 %
7LE33-8AA3	200	380	96 %	87 %	77 %	54 %	50 %
7LE35-0AA3	250	490	94 %	78 %	71 %	53 %	50 %

Derating factor of the output current as a function of the pulse frequency for units with a rated pulse frequency of 2 kHz

SINAMICS S150 Converter Cabinet Unit 6SL3710-...	Type rating at 400 V or 690 V kW	Output current at 1.25 kHz A	Derating factor at the pulse frequency				
			2.0 kHz	2.5 kHz	4 kHz	5 kHz	7.5 kHz
<b>380 ... 480 V 3 AC</b>							
7LE36-1AA3	315	605	83 %	72 %	64 %	60 %	40 %
7LE37-5AA3	400	745	83 %	72 %	64 %	60 %	40 %
7LE38-4AA3	450	840	87 %	79 %	64 %	55 %	40 %
7LE41-0AA3	560	985	92 %	87 %	70 %	60 %	50 %
7LE41-2AA3	710	1260	92 %	87 %	70 %	60 %	50 %
7LE41-4AA3	800	1405	97 %	95 %	74 %	60 %	50 %
<b>500 ... 690 V 3 AC</b>							
7LG28-5AA3	75	85	93 %	89 %	71 %	60 %	40 %
7LG31-0AA3	90	100	92 %	88 %	71 %	60 %	40 %
7LG31-2AA3	110	120	92 %	88 %	71 %	60 %	40 %
7LG31-5AA3	132	150	90 %	84 %	66 %	55 %	35 %
7LG31-8AA3	160	175	92 %	87 %	70 %	60 %	40 %
7LG32-2AA3	200	215	92 %	87 %	70 %	60 %	40 %
7LG32-6AA3	250	260	92 %	88 %	71 %	60 %	40 %
7LG33-3AA3	315	330	89 %	82 %	65 %	55 %	40 %
7LG34-1AA3	400	410	89 %	82 %	65 %	55 %	35 %
7LG34-7AA3	450	465	92 %	87 %	67 %	55 %	35 %
7LG35-8AA3	560	575	91 %	85 %	64 %	50 %	35 %
7LG37-4AA3	710	735	87 %	79 %	64 %	55 %	35 %
7LG38-1AA3	800	810	97 %	95 %	71 %	55 %	35 %
7LG38-8AA3	900	910	92 %	87 %	67 %	55 %	33 %
7LG41-0AA3	1000	1025	91 %	86 %	64 %	50 %	30 %
7LG41-3AA3	1200	1270	87 %	79 %	55 %	40 %	25 %

Derating factor of the output current as a function of the pulse frequency for units with a rated pulse frequency of 1.25 kHz

The following table lists the maximum achievable output frequency as a function of the pulse frequency:

Pulse frequency	Max. achievable output frequency
1.25 kHz	100 Hz
2.00 kHz	160 Hz
2.50 kHz	200 Hz
≥ 4.00 kHz	300 Hz

## Characteristic curves

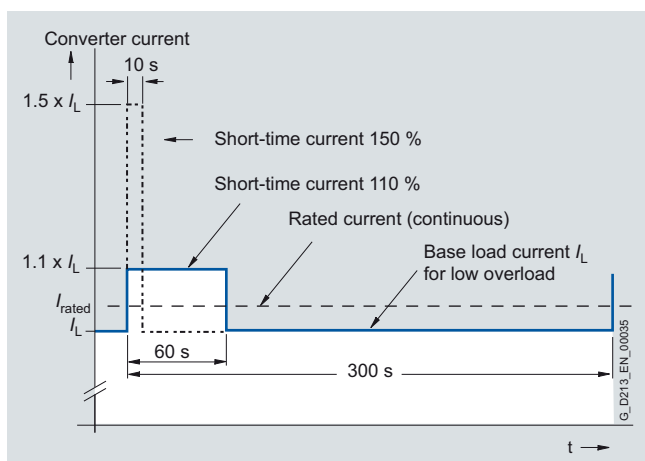
### Overload capability

The SINAMICS S150 Converter Cabinet Units are equipped with an overload reserve to deal with breakaway torques, for example. If larger surge loads occur, this must be taken into account when configuring. In drives with overload requirements, the appropriate base load current must, therefore, be used as a basis for the required load.

The criterion for overload is that the drive is operated with its base load current before and after the overload occurs on the basis of a duty cycle duration of 300 s.

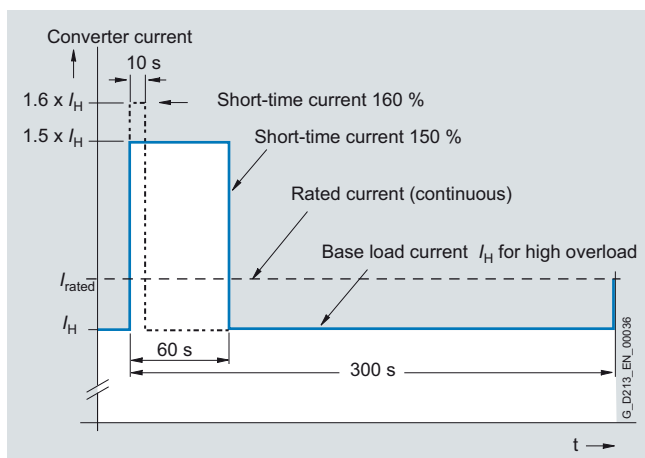
For short, repeating load cycles with significant load fluctuations within the load cycle, the appropriate sections in the SINAMICS Low Voltage Engineering Manual must be observed ([as PDF file on the CD-ROM provided with the catalog](#)).

The base load current for a low overload  $I_L$  is the basis for a duty cycle of 110 % for 60 s or 150 % for 10 s.



Low overload

The base load current for a high overload  $I_H$  is the basis for a duty cycle of 150 % for 60 s or 160 % for 10 s.



High overload

## Selection and ordering data

Type rating at 400 V or 690 V	Rated output current $I_N$	SINAMICS S150 Converter Cabinet Unit
kW	A	Order No.
<b>Line voltage 380 ... 480 V 3 AC</b>		
110	210	<b>6SL3710-7LE32-1AA3</b>
132	260	<b>6SL3710-7LE32-6AA3</b>
160	310	<b>6SL3710-7LE33-1AA3</b>
200	380	<b>6SL3710-7LE33-8AA3</b>
250	490	<b>6SL3710-7LE35-0AA3</b>
315	605	<b>6SL3710-7LE36-1AA3</b>
400	745	<b>6SL3710-7LE37-5AA3</b>
450	840	<b>6SL3710-7LE38-4AA3</b>
560	985	<b>6SL3710-7LE41-0AA3</b>
710	1260	<b>6SL3710-7LE41-2AA3</b>
800	1405	<b>6SL3710-7LE41-4AA3</b>
<b>Line voltage 500 ... 690 V 3 AC</b>		
75	85	<b>6SL3710-7LG28-5AA3</b>
90	100	<b>6SL3710-7LG31-0AA3</b>
110	120	<b>6SL3710-7LG31-2AA3</b>
132	150	<b>6SL3710-7LG31-5AA3</b>
160	175	<b>6SL3710-7LG31-8AA3</b>
200	215	<b>6SL3710-7LG32-2AA3</b>
250	260	<b>6SL3710-7LG32-6AA3</b>
315	330	<b>6SL3710-7LG33-3AA3</b>
400	410	<b>6SL3710-7LG34-1AA3</b>
450	465	<b>6SL3710-7LG34-7AA3</b>
560	575	<b>6SL3710-7LG35-8AA3</b>
710	735	<b>6SL3710-7LG37-4AA3</b>
800	810	<b>6SL3710-7LG38-1AA3</b>
900	910	<b>6SL3710-7LG38-8AA3</b>
1000	1025	<b>6SL3710-7LG41-0AA3</b>
1200	1270	<b>6SL3710-7LG41-3AA3</b>

# SINAMICS S150 Converter Cabinet Units

## System overview

### Options

When ordering a drive converter with options, add the suffix "-Z" to the order number and then state the order code(s) for the desired option(s) after the suffix.

Example:

**6SL3710-7LE32-1AA3-Z  
M07+D60+...**

See also ordering examples.

Available options	Order code
<b>Input side</b>	
Use in the first environment according to EN 61800-3, Category C2 (TN-TT line supplies with grounded neutral point)	<b>L00</b>
Infeed module one level lower	<b>L04</b>
Main control switch incl. fuses/circuit breakers	<b>L26</b>
EMC shield bus (cable connection from below) <sup>1)</sup>	<b>M70</b>
<b>Output side</b>	
dv/dt filter compact plus Voltage Peak Limiter	<b>L07</b>
Motor reactor	<b>L08</b>
dv/dt filter plus Voltage Peak Limiter	<b>L10</b>
Sine-wave filter (only for the voltage range 380 to 480 V, up to 200 kW)	<b>L15</b>
EMC shield bus (cable connection from below) <sup>1)</sup>	<b>M70</b>
<b>Motor protection and safety functions</b>	
EMERGENCY OFF pushbutton installed in the cabinet door	<b>L45</b>
EMERGENCY OFF Stop Category 0, 230 V AC or 24 V DC	<b>L57</b>
EMERGENCY STOP Stop Category 1, 230 V AC	<b>L59</b>
EMERGENCY STOP Stop Category 1, 24 V DC	<b>L60</b>
Thermistor motor protection unit (alarm)	<b>L83</b>
Thermistor motor protection unit (trip)	<b>L84</b>
Pt100 evaluation unit	<b>L86</b>
Insulation monitoring	<b>L87</b>
Additional touch protection	<b>M60</b>
<b>Enhanced degree of protection</b>	
IP21 degree of protection	<b>M21</b>
IP23 degree of protection	<b>M23</b>
IP43 degree of protection	<b>M43</b>
IP54 degree of protection	<b>M54</b>
<b>Mechanical options</b>	
Base 100 mm high, RAL 7022	<b>M06</b>
Cable-marshalling space 200 mm high, RAL 7035	<b>M07</b>
Line connection from above	<b>M13</b>
Motor connection from above	<b>M78</b>
Crane transport assembly for cabinets (top-mounted)	<b>M90</b>
<b>Other options</b>	
CBC10 Communication Board	<b>G20</b>
CBE20 Communication Board	<b>G33</b>
Customer terminal block TM31	<b>G60</b>
Additional customer terminal block TM31	<b>G61</b>
Safety license for 1 axis	<b>K01</b>
SMC10 Sensor Module Cabinet-Mounted	<b>K46</b>
SMC20 Sensor Module Cabinet-Mounted	<b>K48</b>
SMC30 Sensor Module Cabinet-Mounted	<b>K50</b>
VSM10 Voltage Sensing Module	<b>K51</b>
Terminal module for controlling the Safe Torque Off and Safe Stop 1 safety functions	<b>K82</b>

Available options	Order code
TM54F Terminal Module	<b>K87</b>
Safe Brake Adapter SBA, 230 V AC	<b>K88</b>
Safe Brake Adapter SBA, 24 V DC	<b>K89</b>
CU320-2 PN Control Unit	<b>K95</b>
Connection for external auxiliary equipment	<b>L19</b>
Cabinet illumination with service socket	<b>L50</b>
Cabinet anti-condensation heating	<b>L55</b>
25/125 kW braking unit for line voltages of 380 ... 480 V (110 ... 132 kW) and 660 ... 690 V (75 ... 132 kW)	<b>L61</b>
50/250 kW braking unit for line voltages of 380 ... 480 V (160 ... 800 kW) and 660 ... 690 V (160 ... 1200 kW)	<b>L62</b>
25/125 kW braking unit for line voltages of 500 ... 600 V (75 ... 132 kW)	<b>L64</b>
50/250 kW braking unit for line voltages of 500 ... 600 V (160 ... 1200 kW)	<b>L65</b>
Special cabinet paint finish <sup>2)</sup>	<b>Y09</b>
<b>Documentation (standard: English/German)</b>	
Customer documentation (circuit diagram, terminal diagram, layout diagram) in DXF format	<b>D02</b>
Customer documentation as hard copy	<b>D04</b>
Preliminary version of customer documentation	<b>D14</b>
Documentation language: English/French	<b>D58</b>
Documentation language: English/Spanish	<b>D60</b>
Documentation language: English/Italian	<b>D80</b>
<b>Rating plate data (standard: English/German)</b>	
Rating plate data in English/French	<b>T58</b>
Rating plate data in English/Spanish	<b>T60</b>
Rating plate data in English/Italian	<b>T80</b>
<b>Options specific to the chemical industry</b>	
NAMUR terminal block	<b>B00</b>
Protective separation for 24 V supply (PELV)	<b>B02</b>
Outgoing feeder for external auxiliaries (uncontrolled)	<b>B03</b>
<b>Converter acceptance inspection in presence of customer</b>	
Visual acceptance	<b>F03</b>
Function test without connected motor	<b>F71</b>
Function test with test bay motor (no load)	<b>F75</b>
Insulation test	<b>F77</b>
Customer-specific acceptance inspections (on request)	<b>F97</b>
<b>Options specific to the shipbuilding industry</b>	
Marine version	<b>M66</b>
Individual certificate from Germanischer Lloyd (GL)	<b>E11</b>
Individual certificate from Lloyds Register (LR)	<b>E21</b>
Individual certificate from Bureau Veritas (BV)	<b>E31</b>
Individual certificate from Det Norske Veritas (DNV)	<b>E51</b>
Individual certificate from American Bureau of Shipping (ABS)	<b>E61</b>
Individual certificate from Chinese Certification Society (CCS)	<b>E71</b>

<sup>1)</sup> This option is listed for the input- and output-side options, but is only required once.

<sup>2)</sup> The order code **Y..** requires data in plain text.

## Options

## Option selection matrix

Certain options can mutually exclude one another (options that are not involved are not shown).

✓	Possible combination
–	Combination not possible

## Electrical options

	L07	L08	L10	L15	L57	L59	L60	L61/ L64	L62/ L65	L87	K82	M78
L07		–	–	–	✓	✓	✓	✓	✓	✓	✓	–
L08	–		–	–	✓	✓	✓	✓	✓	✓	✓	–
L10	–	–		–	✓	✓	✓	✓	✓	✓	✓	–
L15	–	–	–		✓	✓	✓	✓	✓	✓	✓	–
L57	✓	✓	✓	✓		–	–	✓	✓	✓	✓	✓
L59	✓	✓	✓	✓	–		–	✓	✓	✓	✓	✓
L60	✓	✓	✓	✓	–	–		✓	✓	✓	✓	✓
L61/L64	✓	✓	✓	✓	✓	✓	✓		–	✓	✓	✓
L62/L65	✓	✓	✓	✓	✓	✓	✓	–		✓	✓	✓
L87	✓	✓	✓	✓	✓	✓	✓	✓	✓		– <sup>1)</sup>	✓
K82	✓	✓	✓	✓	✓	✓	✓	✓	✓	– <sup>1)</sup>		✓
M78	–	–	–	–	✓	✓	✓	✓	✓	✓	✓	

## Mechanical/electrical options

	M06	M07	M13	M21	M23	M43	M54	M60	M66	M70	M78
M06		–	✓	✓	✓	✓	✓	✓	✓	✓	✓
M07	–		✓	✓	✓	✓	✓	✓	✓	✓	✓
M13	✓	✓		–	✓	✓	✓	–	✓	– <sup>2)</sup>	✓
M21	✓	✓	–		–	–	–	– <sup>3)</sup>	–	✓	–
M23	✓	✓	✓	–		–	–	–	–	✓	✓
M43	✓	✓	✓	–	–		–	–	–	✓	✓
M54	✓	✓	✓	–	–	–		–	✓	✓	✓
M60	✓	✓	–	– <sup>3)</sup>	–	–	–		✓	✓	–
M66	✓	✓	✓	–	–	–	✓	✓		✓	–
M70	✓	✓	– <sup>2)</sup>	✓	✓	✓	✓	✓	✓		– <sup>2)</sup>
M78	✓	✓	✓	–	✓	✓	✓	–	–	– <sup>2)</sup>	

## Other options

	G20	G33	K46	K48	K50	K51
G20		–	✓	✓	✓	✓
G33	–		✓	✓	✓	✓
K46	✓	✓		–	–	–
K48	✓	✓	–		–	–
K50	✓	✓	–	–		–
K51	✓	✓	–	–	–	

## Rating plate data

	T58	T60	T80
T58		–	–
T60	–		–
T80	–	–	

<sup>1)</sup> A combination of **L87** and **K82** is available on request.

<sup>2)</sup> If the line connection (option **M13**) and the motor connection (option **M78**) are from above, the EMC shield bus is not required in the lower cabinet area.

<sup>3)</sup> Can only be selected for converters in the voltage range 400 V to 250 kW and 690 V to 315 kW. The **M60** option is fitted as standard for higher outputs.



## System overview

## Options

## Ordering examples

## Example 1

*Task:*

A drive system is required for a vehicle test stand to perform exhaust gas analysis which can simulate driving profiles and cycles as encountered in everyday traffic situations. This means for the drive system that the dynamometer must be operated both in the motoring as well as regenerating modes.

A drive with regenerative feedback into the line supply is required as regenerative operation is the predominant operating mode and dynamic switching operations are required.

The max. regenerative power is 200 kW. The drive converter must have degree of protection IP54 as a result of the environmental conditions. An installation altitude of < 1000 m and 45 °C as the maximum ambient temperature can be assumed. The windings must be equipped with Pt100 resistance thermometers and monitored by the drive converter for alarm and trip. A switch disconnecter must be provided to disconnect the converter from the 400 V power supply. In addition, the cabinet is to have a special paint finish in RAL 3002.

*Solution:*

Taking into account the derating factors for degree of protection IP54 and the increased ambient temperature of 45 °C, a converter with a minimum power rating of 223 kW must be configured.

A converter with a power rating of at least 250 kW and options **M54** (degree of protection IP54), **L26** (main control switch including fuses), **L86** (Pt100 evaluation unit) and **Y09** (special paint finish) is selected.

The ordering data are as follows:

**6SL3710-7LE35-0AA3-Z**

**M54 +L26+L86+Y09**

Cabinet color RAL 3002

## Example 2

*Task:*

A drive system is required for a conveyor belt in a brown-coal open-cast mine which is capable of both motor and generator operation. Since the conveyor belt must be capable of starting after a fault when loaded with bulk material, and it is possible for peak loads to occur where 1.5 times the power is required for up to 60 s, the drive system must be designed according to the overload requirements of such a case. The drive converter is installed in a climate-controlled container as a result of the environmental conditions typical of an open-cast mine. The installation altitude is 320 m above sea level and the maximum ambient temperature in the container is 35 °C. The drive is supplied through a converter transformer from the medium-voltage network. The drive is operated from an ungrounded line supply and must have insulation monitoring. A motor with separately-driven fan is selected here as the motor is subject to a high load torque when starting and in the lower range. The fan supply voltage is 690 V and must be drawn from the drive converter.

The required motor power is 420 kW.

*Solution:*

Since the converter is installed in an air-conditioned container, it can be designed with IP20 degree of protection. The 35 °C ambient temperature does not necessitate any additional derating. However, due to the specified overload conditions, the base load current  $I_H$  (for high overload) must be applied. This results in a power of approx. 520 kW for the drive converter. The converter with Order No. 6SL3710-7LG35-8AA3 must be selected.

Option **L87** (insulation monitoring) must be selected for insulation monitoring.

Option **L19** (connection for external auxiliaries) must be selected for the controlled outgoing feeder to supply the separately-driven fan.

The ordering data are as follows:

**6SL3710-7LG35-8AA3-Z**

**L19+L87**

## Options

**B00, B02, B03****Options compliant with NAMUR requirements**List of impermissible combinations with other options:

The following restrictions and exclusions applicable to the NAMUR terminal block **B00** in relation to other available options must be taken into account.

Not permissible with options	Reason
<b>L45, L57, L59, L60</b>	An EMERGENCY OFF Stop Category 0 is already provided in the NAMUR version. The forced line supply disconnection is connected at terminal -X2: 17, 18.
<b>L83, L84</b>	The <b>B00</b> option already provides a PTC thermistor evaluation unit as standard (trip).
<b>L19</b>	Alternatively, option <b>B03</b> can be selected. This means that a reduced scope is available for external auxiliaries.
<b>L87</b>	The insulation monitor monitors the complete electrically coupled network. An insulation monitor must therefore be provided on site.

For options **L50, L55, L86**, the connection is made as described in the standard. These options are not wired to the NAMUR terminal block.

**B00****NAMUR terminal block**

The terminal block has been configured in accordance with the requirements and guidelines of the Standards Working Group for Instrumentation and Control in the Chemicals Industry (NAMUR Recommendation NE37), i.e. certain functions of the device are assigned to specified terminals. The inputs and outputs connected to the terminals fulfill PELV requirements (protective extra-low voltage) with protective separation.

The terminal block and associated functions have been reduced to the necessary minimum. Unlike the NAMUR recommendation, optional terminals are not available.

Terminal -X2:	Meaning	Default	Remarks
<b>10</b>	DI	ON (dynamic)/ ON/OFF (static)	The effective mode can be encoded using a wire jumper at terminal -400: 9; 10
<b>11</b>	DI	OFF (dynamic)	
<b>12</b>	DI	Faster	
<b>13</b>	DI	Slower	
<b>14</b>	DI	RESET	
<b>15</b>	DI	Interlock	
<b>16</b>	DI	Counterclockwise	0 signal for CW rotating field 1 signal for CCW rotating field
<b>17, 18</b>		Supply disconnection	EMERGENCY OFF circuit
<b>30, 31</b>		Ready for operation	Relay output (NO contact)
<b>32, 33</b>		Motor is turning	Relay output (NO contact)
<b>34</b>	DO (NO)	Fault	Relay output (changeover contact)
<b>35</b>	DO (COM)		
<b>36</b>	DO (NC)		
<b>50, 51</b>	AI 0/4 ... 20 mA	Speed setpoint	
<b>60, 61</b>	AO 0/4 ... 20 mA	Motor frequency	
<b>62, 63</b>	AO 0/4 ... 20 mA	Motor current	Motor current is default setting; can be reparameterized for other variables

The 24 V supply is provided on the plant side via terminals -X2:1-3 (fused in the converter with 1 A). It must be ensured that the PELV safety requirements are fulfilled (protective extra-low voltage with protective separation).

Terminal -X2:	Meaning	
<b>1</b>	M	Reference conductor
<b>2</b>	P24	24 V DC supply
<b>3</b>	P24	24 V DC outgoing feeder

For temperature monitoring of explosion-proof motors, option **B00** includes a PTC thermistor.

Exceeding the limit value leads to shutdown. The associated PTC sensor is connected to terminal -X3: 90, 91.

Terminal -X3:	Meaning	
<b>90, 91</b>	AI	Connection of PTC sensor

## Description of the options

## Options

**B02****Protective separation for 24 V supply (PELV)**

If no protective separation for 24 V supply (PELV) is available at the customer site, this option is used to provide a second power supply to guarantee compliance with PELV. (Terminal assignments as for option **B00**, 24 V supply at terminals -X1:1, 2, 3 is not required)

**Notice:** The option **B02** must always be combined with **B00**.

**B03****Outgoing feeder for external auxiliaries (uncontrolled)**

If a motor fan is to be supplied with power from the plant, option **B03** provides an uncontrolled external outgoing feeder with a 10 A fuse. As soon as the supply voltage is present at the converter input, a voltage equaling the converter input voltage ( $U=U_{line}$ ) is also applied at these terminals. This must be taken into consideration when separately driven fans are configured.

Terminal	Meaning
<b>-X1:</b>	
<b>1, 2, 3, PE</b>	Outgoing feeder for external auxiliary equipment

**Notice:** Option **B03** must always be combined with **B00**.

**D02****Customer documentation (circuit diagram, terminal diagram, layout diagram) in DXF format**

Option **D02** can be used to order documents such as circuit diagrams, terminal diagrams, layout diagrams, and dimension drawings in DXF format, e.g. for further processing in AutoCAD systems.

**D04****Customer documentation as hard copy**

Equipment documentation is supplied electronically on CD-ROM as standard. If the customer also requires a hard copy of the documentation and selects option **D04**, the following documents will be shipped in a folder with the drive converter:

- Operating instructions
- Circuit diagram
- Terminal diagram
- Layout diagram
- Dimension drawing
- Spare parts list
- Test certificate

Regardless of whether option **D04** is selected, a hard copy of the safety and transportation guidelines, a check list and a registration form is always supplied.

**D14****Preliminary version of customer documentation**

If documents such as circuit diagrams, terminal diagrams, layout diagrams and dimension drawings are required in advance for the purpose of system engineering (integration of drive into higher-level systems, interface definition, installation, building planning, etc.), it is possible to order a draft copy of the documentation when ordering the converter cabinet units. These documents are then supplied electronically a few working days following receipt of the order. If the order includes options that fall outside the scope of standard delivery, these will not be covered by the documentation due to the obvious time constraints.

Documentation relating to the order is sent to the buyer by e-mail. The recipient's e-mail address must be specified with the order for this purpose. In the e-mail, the recipient will also receive a link (Internet address) for downloading general, non-order-specific documentation such as the Operating Instructions, Equipment Manual and Commissioning Instructions.

**D58, D60, D80****Documentation language**

Option	Language
<b>D58</b>	English/French
<b>D60</b>	English/Spanish
<b>D80</b>	English/Italian

**E11 to E71****Individual certification**

The individual certification of the converter by the relevant certification body contains the expansions described in option **M66**.

- **E11** Individual certificate from Germanischer Lloyd (GL)
- **E21** Individual certificate from Lloyds Register (LR)
- **E31** Individual certificate from Bureau Veritas (BV)
- **E51** Individual certificate from Det Norske Veritas (DNV)
- **E61** Individual certificate from American Bureau of Shipping (ABS)
- **E71** Individual certificate from Chinese Classification Society (CCS)

**Note:** Several individual certificates can be combined.

## Options

**F03, F71, F75, F77, F97****Converter acceptance inspections in the presence of the customer**

Option	Description
<b>F03</b>	<p><b>Visual acceptance</b></p> <p>The inspection includes the following:</p> <ul style="list-style-type: none"> <li>• Check of degree of protection</li> <li>• Check of equipment (components)</li> <li>• Check of equipment identifiers</li> <li>• Check of clearance and creepage distances</li> <li>• Check of cables</li> <li>• Check of customer documentation</li> <li>• Submission of the acceptance report</li> </ul> <p>All the above checks are performed with the converter isolated from the power supply.</p>
<b>F71</b>	<p><b>Function test without connected motor</b></p> <p>The inspection includes the following:</p> <ul style="list-style-type: none"> <li>• Visual inspection as described for option <b>F03</b></li> <li>• Check of power supply</li> <li>• Check of protective and monitoring devices (simulation)</li> <li>• Check of fans</li> <li>• Pre-charging test</li> <li>• Function test without connected motor</li> <li>• Submission of the acceptance report</li> </ul> <p>After the visual inspection with the converter switched off, the converter is connected to rated voltage. No current at the converter output end.</p>
<b>F75</b>	<p><b>Function test with test bay motor (no load)</b></p> <p>The inspection includes the following:</p> <ul style="list-style-type: none"> <li>• Visual inspection as described for option <b>F03</b></li> <li>• Check of power supply</li> <li>• Check of protective and monitoring devices (simulation)</li> <li>• Check of fans</li> <li>• Pre-charging test</li> <li>• Function test with test bay motor (no load)</li> <li>• Submission of the acceptance report</li> </ul> <p>After the visual inspection with the converter switched off, the converter is connected to rated voltage.</p> <p>A small current flows at the converter's output in order to operate the test bay motor (no load).</p>
<b>F77</b>	<p><b>Insulation test</b></p> <p>The inspection includes the following:</p> <ul style="list-style-type: none"> <li>• High-voltage test</li> <li>• Measurement of insulation resistance</li> </ul>
<b>F97</b>	<p><b>Customer-specific acceptance inspections (on request)</b></p> <p>If acceptance inspections that are not covered by the options <b>F03</b>, <b>F71</b>, <b>F75</b> or <b>F77</b> are required, then customer-specific acceptance inspections/supplementary tests can be ordered using order code <b>F97</b> on request and following technical clarification.</p>

**G20****CBC10 Communication Board**

The CBC10 Communication Board is used to interface the CU320-2 Control Unit and thus the SINAMICS S150 to the CAN (Controller Area Network) protocol. The board's driver software fulfills the standards of the following CANopen specification of the CiA organization (CAN in Automation):

Communication profiles in accordance with DS 301:

- Drive profile in accordance with DSP 402 (in this case Profile Velocity Mode)
- EDS (Electronic Data Sheet) in accordance with DSP 306
- Operational status signaling in accordance with DSP 305

The CBC10 Communication Board plugs into the option slot on the CU320-2 Control Unit. The CAN interface on the CBC10 has 2 SUB-D connections for input and output.

[Description of the CBC10 Communication Board → Chapter 2.](#)

**G33****CBE20 Communication Board**

The CBE20 Communication Board can be used to connect the SINAMICS S150 to a PROFINET IO network via a CU320-2 Control Unit. The CBE Communication Board plugs into the option slot on the CU320-2 Control Unit.

[Description of the CBE20 Communication Board → Chapter 2.](#)

**G60****Customer terminal block TM31**

The TM31 Terminal Module is used to expand the customer terminal.

The following additional interfaces are available for this:

- 8 digital inputs
- 4 bidirectional digital inputs/outputs
- 2 relay outputs with changeover contact
- 2 analog inputs
- 2 analog outputs
- 1 temperature sensor input (KTY84-130/PTC)
- 2 DRIVE-CLiQ sockets
- 1 connection for the electronics power supply via the 24 V DC supply connector
- 1 PE/protective conductor connection

To simplify configuration and commissioning of the drive, the optional TM31 Terminal Module is already preset with various factory settings, which can then be selected when commissioning the system.

[For additional information, please refer to the SINAMICS Low Voltage Engineering Manual.](#)

**G61****Additional customer terminal block TM31**

With option **G61**, the number of digital inputs/outputs, as well as the number of analog inputs/outputs in the drive system can be expanded using a second TM31 Terminal Module (in addition to the TM31 Terminal Module that can be selected using option **G60**).

Note: Option **G61** requires option **G60**!

## Description of the options

## Options

**K01****Safety license for 1 axis**

The Safety Integrated Basic Functions do not require a license. However, on the other hand, for Safety Integrated Extended Functions, a license is required for each axis equipped with safety functions. It is irrelevant which safety functions are used and how many. Option **K01** contains the license for 1 axis.

Subsequent licensing is possible in the Internet via the WEB License Manager by generating a license key:  
[www.siemens.com/automation/license](http://www.siemens.com/automation/license)

**K46****SMC10 Sensor Module Cabinet-Mounted**

The SMC10 Sensor Module Cabinet-Mounted can be used to simultaneously sense the speed and the rotor position angle. The signals emitted by the resolver are converted here and made available to the closed-loop control for evaluation via the DRIVE-CLiQ interface.

The following encoder signals can be evaluated:

- 2-pole resolver
- Multipole resolver

The motor temperature can also be detected using KTY84-130 or PTC thermistors.

[Description of the SMC10 Sensor Module Cabinet-Mounted → Chapter 2.](#)

**K48****SMC20 Sensor Module Cabinet-Mounted**

The SMC20 Sensor Module Cabinet-Mounted can be used to simultaneously sense the speed and position. The signals emitted by the incremental encoder are converted here and made available to the closed-loop control for evaluation via the DRIVE-CLiQ interface.

The following encoder signals can be evaluated:

- Incremental encoder  $\sin/\cos 1 V_{pp}$
- EnDat absolute encoder
- SSI encoder with incremental signals  $\sin/\cos 1 V_{pp}$  (firmware version 2.4 and later)

The motor temperature can also be detected using KTY84-130 or PTC/Pt100 thermistors.

[Description of the SMC20 Sensor Module Cabinet-Mounted → Chapter 2.](#)

**K50****SMC30 Sensor Module Cabinet-Mounted**

The SMC30 Sensor Module Cabinet-Mounted can be used to evaluate the encoders of motors without a DRIVE-CLiQ interface. External encoders can also be connected via the SMC30.

The following encoder signals can be evaluated:

- Incremental encoders TTL/HTL with/without open-circuit detection (open-circuit detection is only available with bipolar signals)
- SSI encoder with TTL/HTL incremental signals
- SSI encoder without incremental signals

The motor temperature can also be detected using KTY84-130 or PTC thermistors.

[Description of the SMC30 Sensor Module Cabinet-Mounted → Chapter 2.](#)

**K51****VSM10 Voltage Sensing Module**

The VSM10 Voltage Sensing Module is used to sense the voltage characteristic on the motor side, so that the following function can be implemented:

- Operation of a permanent-magnet synchronous motor without encoder with the requirement to be able to connect to a motor that is already running (flying restart function)

[Description of the VSM10 Voltage Sensing Module → Chapter 2.](#)

**K82****Terminal module for controlling the Safe Torque Off and Safe Stop 1 safety functions**

The terminal module controls the Basic Safety Functions Safe Torque Off (STO) and Safe Stop 1 (SS1) (time-controlled) over a wide voltage range from 24 V to 240 V DC/AC (terminology as defined in draft IEC 61800-5-2).

The integrated safety functions, starting from the Safety Integrated (SI) input terminals of the components (Control Unit and Power Module), satisfy the requirements of EN 61800-5-2, EN 60204-1, DIN EN ISO 13849-1 Category 3 (previously EN 954-1) for Performance Level (PL) d and IEC 61508 SIL 2.

With option **K82**, the requirements specified in EN 61800-5-2, EN 60204-1, DIN EN ISO 13849-1 Category 3 (previously EN 954-1) for Performance Level (PL) d and IEC 61508 SIL 2 are fulfilled.

The Safety Integrated functions using option **K82** are only available in conjunction with certified components and software versions.

The Safety Integrated functions of SINAMICS are generally certified by independent institutes. An up-to-date list of certified components is available on request from your local Siemens office.

**K87****TM54F Terminal Module**

The TM54F Terminal Module is a terminal expansion module with safe digital inputs and outputs to control the Safety Integrated functions.

The TM54F must be connected directly to a Control Unit via DRIVE-CLiQ. Each Control Unit can be precisely assigned to one TM54F.

The TM54F has 4 fail-safe digital outputs and 10 fail-safe digital inputs. A fail-safe digital output consists of one 24 V DC switching output, an output switching to ground and one digital input to check the switching state. A fail-safe digital input consists of two digital inputs.

**K88****Safe Brake Adapter SBA, 230 V AC**

The Safe Brake Control (SBC) is a safety function, which is used in safety-relevant applications, for example in presses or rolling mills. In the no-current state, the brake acts on the drive motor using spring force. The brake is released when current flows in it (low active).

The Safe Brake Adapter, 230 V AC is factory installed in the cabinet unit. A source of power is connected to terminal -X12 on the Safe Brake Adapter. For control, a connection is established between the Safe Brake Adapter and the Control Interface Module in the factory using a cable harness.

On the plant side, to control the brake, a connection must be established between terminal -X14 on the Safe Brake Adapter and the brake.

## Options

**K89****Safe Brake Adapter SBA, 24 V DC**

The Safe Brake Control (SBC) is a safety function, which is used in safety-relevant applications, for example in presses or rolling mills. In the no-current state, the brake acts on the drive motor using spring force. The brake is released when current flows in it (low active).

The Safe Brake Adapter, 24 V DC is factory installed in the cabinet unit. A source of power is connected to terminal -X13 on the Safe Brake Adapter. For control, a connection is established between the Safe Brake Adapter and the Control Interface Module in the factory using a cable harness.

On the plant side, to control the brake, a connection must be established between terminal -X14 on the Safe Brake Adapter and the brake.

**K95****CU320-2 PN (PROFINET) Control Unit**

The converter is supplied with a CU320-2 PN Control Unit (PROFINET) instead of the CU320-2 DP Control Unit (PROFIBUS) included as standard. Detailed information on this can be found for SINAMICS S120 Chassis Format Units, Control Units.

**L00****Use in the first environment according to EN 61800-3, Category C2 (TN/TT supply systems with grounded neutral point)**

In order to limit interference emission, the converter includes as standard a radio interference suppression filter according to the EMC product standard EN 61800-3, Category C3 (use in the industrial environment or in the second environment).

By using the optionally available line filter (option **L00**), up to a motor cable length of 300 m on grounded line supplies, the converters are suitable for use according to Category C2 (residential area or first environment).

However, complying with the limit values in the standard means that all of the relevant installation specifications regarding grounding and shielding must be strictly observed.

Notes on this are provided in the SINAMICS Low Voltage Engineering Manual as well as in the appropriate operating instructions.

**L04****Infeed module one level lower**

With this option, an infeed (Active Line Module/Active Interface Module) rated one power level lower than the Motor Module (inverter) is used.

The option is suitable for the following applications, for example:

- If the Motor Module is operated with pulse frequencies greater than the rated pulse frequency, thereby reducing the output power (current derating as a function of the pulse frequency).
- If the rated power is required in regenerative mode and the system losses are covered by the Motor Module.
- With motors that have a higher efficiency and/or a lower power factor compared to typical standard induction motors.
- The maximum current of the Motor Module is requested below the maximum power of the unit, e.g. drives with a high break-away torque.

When using option **L04**, the following restrictions must always be taken into consideration:

- The rated output current of the Motor Module is only available as long as the infeed (Active Line Module) is not loaded with the rated power.
- For line undervoltage conditions, the output power is reduced linearly with the line voltage.
- The unit should be operated with a line power factor  $\cos \varphi = 1$  (this corresponds to the factory setting) and should only provide the active power. It does not make sense to additionally compensate the reactive power at the line supply.

Option **L04** is available for the following cabinet units:

SINAMICS S150 Converter Cabinet Unit	Type rating at 400 V	Permissible currents		
		Output	Input Standard	With option <b>L04</b>
6SL3710-...	kW	A	A	A
<b>Line voltage 380 ... 480 V 3 AC</b>				
7LE33-1AA3	160	310	310	260
7LE35-0AA3	250	490	490	380
7LE36-1AA3	315	605	605	490
7LE37-5AA3	400	745	745	605
7LE41-0AA3	560	985	985	840



## Description of the options

## Options

**L07****dv/dt filter compact plus Voltage Peak Limiter**

dv/dt filter compact plus VPL (**V**oltage **P**eak **L**imiter) limits the voltage rate-of-rise dv/dt to values < 1600 V/μs, and the typical voltage peaks to the following values according to the limit value curve A according to IEC 60034-25: 2007:

- < 1150 V at  $U_{line} < 575$  V
- < 1400 V at  $660$  V <  $U_{line} < 690$  V

The dv/dt filter compact plus VPL functionally comprises two components, which are mechanically supplied as a compact unit, the dv/dt reactor and the voltage limiting network VPL, which cuts off voltage peaks and feeds back the energy into the DC link.

It is so compact that it can be completely integrated into the cabinet, even for high power ratings. An additional cabinet is not required.

By using a dv/dt filter compact plus VPL, standard motors with standard insulation and without insulated bearings can be used with supply voltages up to 690 V in converter operation.

dv/dt filter compact plus VPL are designed for the following maximum motor cable lengths:

- Shielded cables: 100 m (e.g. Protodur NYCWY)
- Unshielded cables 150 m (e.g. Protodur NYY)

For longer cable lengths (> 100 m shielded, > 150 m unshielded) use the dv/dt filter plus VPL (option **L10**).

**Notice:**

- The max. permissible cable length between the dv/dt filter and converter is 5 m.
- Operation with output frequencies < 10 Hz is permissible for max. 5 min.

Also observe the appropriate notes in the SINAMICS Low Voltage Engineering Manual ([as PDF on the CD-ROM provided with the catalog](#)).

**Note:**

Option **L07** cannot be combined with the following options:

- **L08** (motor reactor)
- **L10** (dv/dt filter plus VPL)
- **L15** (sine-wave filter)
- **M78** (motor connection from above)

**L08****Motor reactor**

Motor reactors reduce the voltage load on the motor windings by reducing the voltage gradients on the motor terminals generated when the converter is used. At the same time, the capacitive charge/discharge currents that place an additional load on the converter output when long motor cables are used are reduced.

The maximum permissible output frequency when a motor reactor is used is 150 Hz.

For converter cabinet units with power units connected in parallel, a motor reactor is available on request.

Option **L08** cannot be combined with option **M78** (motor connection from above).

**L10****dv/dt filter plus Voltage Peak Limiter**

dv/dt filter plus VPL (**V**oltage **P**eak **L**imiter) limits the voltage rate-of-rise dv/dt to values < 500 V/μs, and the typical voltage peaks to the following values according to the limit value curve to IEC/TS 60034-17: 2006:

- < 1000 V at  $U_{line} < 575$  V
- < 1250 V at  $660$  V <  $U_{line} < 690$  V

The dv/dt filter plus VPL functionally comprises two components, the dv/dt reactor and the voltage limiting network VPL, which cuts off voltage peaks and feeds back the energy into the DC link.

Depending on the converter power, option **L10** can be accommodated in the converter cabinet unit or an additional cabinet is required with a width of 400 mm or 600 mm.

Voltage range	Installation of the dv/dt filter plus VPL		
	in the converter (without supplementary cabinet)	in the supplementary cabinet	
		400 mm wide	600 mm wide
380 ... 480 V	110 ... 250 kW	315 ... 450 kW	560 ... 800 kW
500 ... 690 V	75 ... 315 kW	400 ... 560 kW	710 ... 1200 kW

By using a dv/dt filter plus VPL, standard motors with standard insulation and without insulated bearings can be used with supply voltages up to 690 V in converter operation.

dv/dt filter plus VPL are designed for the following maximum motor cable lengths:

- Shielded cables: 300 m (e.g. Protodur NYCWY)
- Unshielded cables 450 m (e.g. Protodur NYY)

For cable lengths < 100 m shielded or < 150 m unshielded, the dv/dt filter compact plus VPL (option **L07**) can be advantageously used.

When using dv/dt filters, restrictions regarding permissible pulse and output frequencies must be observed.

The corresponding notes are provided in the SINAMICS Low Voltage Engineering Manual ([as PDF on the CD-ROM provided with the catalog](#)).

**Note:**

Parts of option **L10** do not have nickel-plated copper busbars.

Option **L10** cannot be combined with the following options:

- **L07** (dv/dt filter compact plus VPL)
- **L08** (motor reactor)
- **L15** (sine-wave filter)
- **L08** (motor connection from above)

## Options

**L15**  
*Sine-wave filter*

Sine-wave filters are available up to a converter power rating of 250 kW (380 V to 480 V) or up to 132 kW (500 V to 600 V). The sine-wave filter at the converter output supplies almost perfect sinusoidal voltages at the motor so that standard motors can be used without special cables or power derating. Standard cables can be used. The max. permissible motor cable length is limited to 300 m.

**Note:** In conjunction with the option **L15**, the pulse frequency of the converter must be increased. This reduces the power available at the drive converter output (derating factor 0.88). The modulation depth of the output voltage decreases to approx. 85 % (380 V to 480 V) or approx. 81 % (500 V to 600 V). The maximum output frequency is 150 Hz. It must be noted that the reduced voltage at the motor terminals compared to the rated motor voltage means that the motor goes into field weakening operation earlier.

**L19**  
*Connection for external auxiliary equipment*

An outgoing feeder fused with max. 10 A for external auxiliary equipment (for example, separately driven motor fan).

The voltage is tapped at the drive converter input upstream of the main contactor/circuit breaker and, therefore, has the same level as the supply voltage.

The outgoing feeder can be switched inside the drive converter or externally.

Terminal -X155:	Meaning	Range
1	L1	380 ... 690 V AC
2	L2	380 ... 690 V AC
3	L3	380 ... 690 V AC
11	Contactor control	230 V AC
12	Contactor control	230 V AC
13	Feedback signal, circuit breaker	230 V AC/0.5 A; 24 V DC/2 A
14	Feedback signal, circuit breaker	230 V AC/0.5 A; 24 V DC/2 A
15	Feedback signal, contactor	230 V AC/6 A
16	Feedback signal, contactor	230 V AC/6 A
PE	PE	–

**L26**  
*Main control switch incl. fuses or circuit breakers*

Up to 800 A a switch disconnecter with fuses is available as main switch. For currents greater than 800 A, a circuit breaker provided as standard is used to isolate the drive system from the line supply. The circuit breaker is controlled and supplied within the converter.

Terminal -X50:	Meaning
1	Checkback contact (NO contact) main control switch/circuit breaker closed
2	Checkback contact (NC contact) main control switch/circuit breaker closed
3	Common potential

**L45**  
*EMERGENCY OFF pushbutton, installed in the cabinet door*

The option **L45** only includes the EMERGENCY OFF pushbutton which is fitted with a protective collar in the cabinet door of the converter. The contacts of the pushbutton are brought out and connected to a terminal block.

The EMERGENCY OFF functions and/or EMERGENCY STOP functions of Category 0 or 1 can be activated in conjunction with options **L57**, **L59** and **L60**.

Terminal -X120:	Meaning
1	Checkback contact of the EMERGENCY OFF pushbutton in the cabinet door
2	Checkback contact of the EMERGENCY OFF pushbutton in the cabinet door
3	Checkback contact of the EMERGENCY OFF pushbutton in the cabinet door <sup>1)</sup>
4	Checkback contact of the EMERGENCY OFF pushbutton in the cabinet door <sup>1)</sup>

**Notice:** By pressing the EMERGENCY OFF pushbutton, the motor is stopped either uncontrolled or controlled depending on the selected Stop Category 0 or 1, and the main voltage disconnected from the motor, in compliance with IEC 60204-1 (VDE 0113). Auxiliary voltages such as the supply for a separately driven fan or anti-condensation heating may still be present. Certain areas within the converter also remain live (under voltage), such as the control or auxiliaries. If complete disconnection of all voltages is required, the EMERGENCY OFF pushbutton must be incorporated into a protective system to be implemented by the customer. For this purpose, an NC contact is provided at terminal -X120.

**L50**  
*Cabinet illumination with service socket*

One handheld light with an integrated service socket is installed in each cabinet panel.

The power supply (at terminal block -X390) for the cabinet lighting and socket must be provided externally and fused with max. 10 A. The cabinet lighting is manually switched on.

Terminal -X390:	Meaning
1	L1 (230 V AC)
2	N
3	PE

**L55**  
*Cabinet anti-condensation heating*

The anti-condensation heating is recommended at low ambient temperatures and high levels of humidity to prevent condensation. A 100 W electrical cabinet heater is installed for each cabinet element (two heating units are installed for each element for cabinet element widths from 800 mm to 1200 mm).

The power supply for the anti-condensation heating (110 V to 230 V AC, at terminal block -X240) must be provided externally and fused with max. 16 A.

Terminal -X240:	Meaning
1	L1 (110 ... 230 V AC)
2	N
3	PE

<sup>1)</sup> For option **L57** to **L60** preassigned in the converter.



## Description of the options

## Options

**L57**  
**EMERGENCY OFF Stop Category 0, 230 V AC or 24 V DC**

EMERGENCY OFF Stop Category 0 for an uncontrolled stop in accordance with EN 60204-1.

The function includes disconnecting the voltage at the converter using the line contactor and bypassing the microprocessor controller using a safety combination according to EN 60204-1. The motor then coasts down. When shipped, the pushbutton circuit is preset to 230 V AC. Jumpers must be appropriately set when using 24 V DC.

Terminal -X120:	Meaning
7	Loop in the EMERGENCY OFF pushbutton from the plant side; remove jumper 7-8!
8	Loop in the EMERGENCY OFF pushbutton from the plant side; remove jumper 7-8!
15	"ON" for monitored start; remove jumper 15-16!
16	"ON" for monitored start; remove jumper 15-16!
17	Checkback signal, "safety combination has tripped"
18	Checkback signal, "safety combination has tripped"

**L59**  
**EMERGENCY STOP Stop Category 1, 230 V AC**

EMERGENCY STOP Stop Category 1 for a controlled stop in accordance with EN 60204-1.

The function stops the drive using a fast Stop along a down ramp that is parameterized by the user. The voltage is then disconnected as described for EMERGENCY OFF Stop Category 0 (option **L57**). The pushbutton circuit is operated at 230 V AC.

In order to maintain the specified stopping times, it may be necessary to use a braking unit.

Terminal -X120:	Meaning
7	Loop in the EMERGENCY OFF pushbutton from the plant side; remove jumper 7-8!
8	Loop in the EMERGENCY OFF pushbutton from the plant side; remove jumper 7-8!
15	"ON" for manual start; remove jumper 15-16!
16	"ON" for manual start; remove jumper 15-16!
17	Checkback signal, "safety combination has tripped"
18	Checkback signal, "safety combination has tripped"

**L60**  
**EMERGENCY STOP Stop Category 1, 24 V DC**

EMERGENCY STOP Stop Category 1 for a controlled stop in accordance with EN 60204-1.

The function stops the drive using a fast stop along a down ramp that is parameterized by the user. The voltage is then disconnected as described for EMERGENCY OFF Stop Category 0 (option **L57**). The pushbutton circuit is operated at 24 V DC.

In order to maintain the specified stopping times, it may be necessary to use a braking unit.

Terminal -X120:	Meaning
7	Loop in the EMERGENCY OFF pushbutton from the plant side; remove jumper 7-8!
8	Loop in the EMERGENCY OFF pushbutton from the plant side; remove jumper 7-8!
15	"ON" for manual start; remove jumper 15-16!
16	"ON" for manual start; remove jumper 15-16!
17	Checkback signal, "safety combination has tripped"
18	Checkback signal, "safety combination has tripped"

## Options

**L61, L62, L64, L65**  
Braking units

Braking units may be required for drives in which motors might operate in generator mode but have no other facility for feeding energy back into the supply system.

The braking unit comprises two components:

- A Braking Module which can be installed in the air discharge of the chassis format power units
- A braking resistor to be mounted externally (IP20 degree of protection).

The braking unit functions as an autonomous unit, and does not require an external power supply. During the braking process, the kinetic energy is converted into heat in the externally mounted braking resistor.

A max. cable length of 100 m is permissible between the Braking Module and the braking resistor. This allows the braking resistor to be mounted externally so that heat losses can be dissipated outside the converter enclosure. The braking resistor is connected directly to the terminal -X5 of the converter.

The following braking units are available for SINAMICS S150 Converter Cabinet Units:

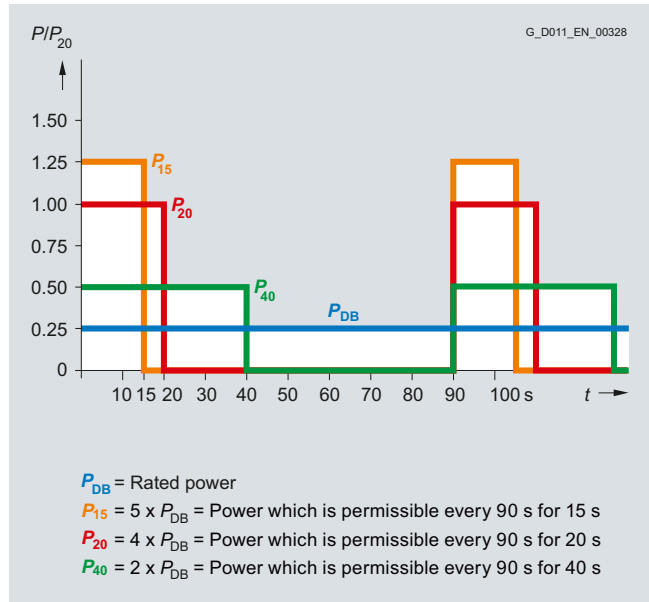
Option	SINAMICS S150 converter	Braking Module		
		Type rating	Rated power $P_{DB}$	Braking power $P_{20}$
	kW	kW	kW	kW
<b>380 ... 480 V 3 AC</b>				
<b>L61</b>	110 ... 132	25	100	125
<b>L62</b>	160 ... 800	50	200	250
<b>500 ... 600 V 3 AC</b>				
<b>L64</b>	75 ... 132	25	100	125
<b>L65</b>	160 ... 1200	50	200	250
<b>660 ... 690 V 3 AC</b>				
<b>L61</b>	75 ... 132	25	100	125
<b>L62</b>	160 ... 1200	50	200	250

$P_{DB}$  = rated power (continuous braking power)

$P_{20} = 4 \times P_{DB}$ : 20 s power referred to a braking interval of 90 s

$P_{15} = 5 \times P_{DB}$ : 15 s power referred to a braking interval of 90 s

If more braking power is required than provided by the braking units listed here, then braking units may be connected in parallel for higher converter outputs (on request). In this case, one Braking Module is assigned to each braking resistor.



Load diagram for Braking Modules and braking resistors

Additional notes about possible duty cycles of the braking resistors and other engineering notes are included in the SINAMICS Low Voltage Engineering Manual.

## Description of the options

## Options

**L83****Thermistor motor protection unit (alarm)**

Thermistor motor protection device for PTC temperature thermistors (PTC resistors, type A) for alarm. The thermistor motor protection unit is supplied with power and evaluated internally in the converter.

Terminal	Meaning
<b>-B127:</b>	
<b>T1</b>	Sensor loop connection
<b>T2</b>	Sensor loop connection

**L84****Thermistor motor protection unit (trip)**

Thermistor motor protection device for PTC temperature thermistors (PTC resistors, type A) for trip. The thermistor motor protection unit is supplied with power and evaluated internally in the converter.

Terminal	Meaning
<b>-B125:</b>	
<b>T1</b>	Sensor loop connection
<b>T2</b>	Sensor loop connection

**L86****Pt100 evaluation unit**

The Pt100 evaluation unit can monitor up to 6 sensors. The sensors can be connected with two or three conductors to the evaluation unit. The limit values can be freely programmed for each channel.

In the factory setting, the measuring channels are subdivided into two groups, each with 3 channels. With motors, for example, this means that three Pt100s in the stator windings and two Pt100s in the motor bearings can be monitored. Unused channels can be suppressed via parameters.

The output relays are integrated into the internal fault and shutdown sequence of the converter.

**L87****Insulation monitoring**

An insulation monitor must be used if the converter is connected to an ungrounded line supply. The device monitors the entire galvanically coupled circuit for insulation faults.

An alarm is output in the event of a fault.

**Notice:** Only **one** insulation monitor can be used in each galvanically coupled network.

As there are different response strategies when a ground fault occurs in an ungrounded system, output relays of the insulation monitor are provided for integration in a plant-side control. The customer can also choose to integrate the outputs into the converter monitoring system.

Terminal	Meaning
<b>-A101:</b>	
<b>11</b>	Signaling relay ALARM 1 base
<b>12</b>	Signaling relay ALARM 1 NC contacts
<b>14</b>	Signaling relay ALARM 1 NO contacts
<b>21</b>	Signaling relay ALARM 2 base
<b>22</b>	Signaling relay ALARM 2 NC contacts
<b>24</b>	Signaling relay ALARM 2 NO contacts
<b>M+</b>	External kΩ display 0 μA to 400 μA
<b>M-</b>	External kΩ display 0 μA to 400 μA
<b>R1</b>	External reset button (NC contact or wire jumper otherwise the fault code is not stored)
<b>R2</b>	External reset button (NC contact or wire jumper)
<b>T1</b>	External test button
<b>T2</b>	External test button

**M06****Base 100 mm high, RAL 7022**

The additional cabinet base allows larger bending radii for cables (cable inlet from below) and enables them to be routed within the cabinet base.

The cabinet base is supplied in RAL 7022 in all cases. A special paint finish is not available for the base. It is delivered completely assembled with the cabinet. The mounting height of the operator panel changes accordingly.

**M07****Cable-marshalling space 200 mm high, RAL 7035**

The cable-marshalling space is made of strong sheet steel and allows cables to be connected more flexibly (entry from below). It also allows routing of cables within the marshalling compartment. It is delivered completely assembled with the cabinet. The mounting height of the operator panel changes accordingly.

**Notice:** The cable-marshalling space is painted as standard with RAL 7035. If a special color is requested for the cabinet (option **Y09**), the cable-marshalling space is also painted in this color.

## Options

**M13****Line connection from above**

The control cabinet is provided with an additional roof section to allow a line connection from above. The connecting lugs for the power cables, the clamping bar for mechanically securing the cables, an EMC shield bus, and a PE busbar are located inside the roof section.

This increases the cabinet height by 405 mm. The busbars for connection from above are fully mounted when the cabinet is delivered. For transport reasons, the roof sections are delivered separately and must be fitted on site. Crane transport assemblies (option **M90**) can still be used. However, they must be removed on site before the roof sections can be installed. Use of rope spreaders should be considered in the case of small crane hook heights.

An undrilled aluminum mounting plate (5 mm thick) is provided in the roof section for feeding in the cables. Depending on the number of cables and the cross-sections used, holes for attaching cable glands for feeding in the cables must be drilled in this mounting plate on site.

**Note:** The control cables are still connected from below. Option **M13** eliminates the lugs, provided as standard, to connect the line supply from below.

The degree of protection of the roof sections is IP21. In combination with options **M23**, **M43** and **M54**, additional plastic ventilation grilles and filter elements are provided.

**Notice:** The roof sections are colored RAL 7035 as standard. If a special color is requested for the cabinet (option **Y09**), the roof section is also painted in this color. Ventilation grilles used with IP23 and IP54 degrees of protection have an RAL 7035 color and cannot be painted.

The covers provided with option **M60** are also included in the scope of supply.

**M21****IP21 degree of protection**

Cabinet version in IP20, but with additional top or drip protection cover. This increases the cabinet height by 250 mm.

For transport reasons, the top or drip protection covers are delivered separately and must be fitted on site.

**Notice:** The top or drip protection covers are painted in RAL 7035 as standard. If a special color is requested for the cabinet (option **Y09**), the roof sections or drip protection panel are also painted in this color.

**M23****IP23 degree of protection**

Converter cabinet units with IP23 degree of protection are supplied with additional roof sections and plastic ventilation grilles in the air inlet and outlet. This increases the cabinet height by 400 mm. The covers provided with option **M60** are also included in the scope of supply. For transport reasons, the roof sections are delivered separately and must be fitted on site.

**Notice:** The roof sections are colored RAL 7035 as standard. If a special color is requested for the cabinet (option **Y09**), the roof section is also painted in this color. The molded plastic parts (e.g. ventilation grilles) are colored RAL 7035 and cannot be painted.

**M43****IP43 degree of protection**

Converter cabinet units with IP43 degree of protection are supplied with additional roof sections as well as plastic ventilation grilles and a wire mesh in the air inlet and outlet. This increases the cabinet height by 400 mm. The covers provided with option **M60** are also included in the scope of supply. They are an integral component of the internal cabinet air guidance system and are adapted accordingly.

For transport reasons, the roof sections are delivered separately and must be fitted on site.

**Notice:** The roof sections are colored RAL 7035 as standard. If a special color is requested for the cabinet (order code **Y09**), the roof sections are also painted in this color. The molded plastic parts (e.g. ventilation grilles) are colored RAL 7035 and cannot be painted.

**M54****IP54 degree of protection**

Converter cabinet units with IP54 degree of protection are supplied with additional roof sections as well as plastic ventilation grilles and a filter medium in the air inlet and outlet. This increases the cabinet height by 400 mm. The covers provided with option **M60** are also included in the scope of supply. They are an integral component of the internal cabinet air guidance system and are adapted accordingly. The filters must be maintained according to the local environmental conditions.

**Notice:**

- The roof sections are colored RAL 7035 as standard. If a special color is requested for the cabinet (option **Y09**), the roof section is also painted in this color. The molded plastic parts (e.g. ventilation grilles) are colored RAL 7035 and cannot be painted.
- For units with IP54 degree of protection, it is important to observe the derating factor for output currents in relation to ambient temperature and installation altitude.

**M60****Additional touch protection**

The converter cabinet units are designed as standard according to BGV A3. Option **M60** provides additional covers (outside arm's reach) in the vicinity of the AC busbars and above the power unit (can only be selected as an option with converters up to 250 kW in the 400 V range and with converters up to 315 kW in the 690 V range with degrees of protection IP20 and IP21; otherwise supplied as standard).

## Description of the options

## Options

**M66****Marine version**

For compliance with the requirements of the classification institutes:

- Lloyds Register
- American Bureau of Shipping
- Germanischer Lloyd
- Bureau Veritas
- Det Norske Veritas
- Chinese Classification Society

This option includes a strengthened mechanical version of the cabinet, handles (handrail) below the operator panel and mechanical locking of the cabinet doors. The cabinet has degree of protection IP23 (option **M23**) and includes cabinet anti-condensation heating (option **L55**). To attach the drive converter to the ship's deck, a welding frame (5 mm high) is supplied separately.

**Note:** A combination with options **M21**, **M23** and **L55** is not possible. Individual certification is additionally required if the converter is used for a safety-relevant drive on the ship (see options **E11** to **E71**).

**M70****EMC shield bus (cable connection from below)**

The EMC shield bus is used to connect shielded power cables for the line supply and motor feeder cables. With the options **M13** and **M78**, the EMC shield bus is already included as standard for the connection busbars underneath the roof section.

**M78****Motor connection from above**

The control cabinet is provided with an additional roof section for a motor connection from above. The connecting lugs for the power cables, the clamping bar for mechanically securing the cables, an EMC shield bus, and a PE busbar are located inside the roof section.

This increases the cabinet height by 405 mm. The busbars for connection from above are fully mounted when the cabinet is delivered. For transport reasons, the roof sections are delivered separately and must be fitted on site. Crane transport assemblies (option **M90**) can still be used. However, they must be removed on site before the roof sections can be installed. Use of rope spreaders should be considered in the case of small crane hook heights.

An undrilled aluminum mounting plate (5 mm thick) is provided in the roof section for feeding in the cables. Depending on the number of cables and the cross-sections used, holes for attaching cable glands for feeding in the cables must be drilled in this mounting plate on site.

**Note:** The control cables are still connected from below. Option **M78** eliminates the lugs, provided as standard, to connect the motor from below.

The degree of protection of the roof sections is IP21. In combination with options **M23**, **M43** and **M54**, additional plastic ventilation grilles and filter elements are provided.

**Notice:** The roof sections are colored RAL 7035 as standard. If a special color is requested for the cabinet (option **Y09**), the roof sections are also painted in this color. Ventilation grilles used with IP23, IP43 and IP54 degrees of protection have an RAL 7035 color and cannot be painted.

The covers provided with option **M60** are also included in the scope of supply.

**M90****Crane transport assembly (top-mounted)**

In the case of single cabinets up to a width of 600 mm, transport eyebolts are provided to transport the unit by crane. For cabinet widths of 800 mm and wider, transport rails are used.

**T58, T60, T80****Rating plate data**

The rating plate is provided in English/German as standard. A rating plate in another language can be selected by specifying the following option order codes.

Option	Rating plate language
<b>T58</b>	English/French
<b>T60</b>	English/Spanish
<b>T80</b>	English/Italian

**Y09****Special cabinet paint finish**

The converter cabinet units are painted with RAL 7035 as standard. The special paint finish must be stated in plain text in the order. All RAL colors which are available as powder coatings can be selected.

**Notice:** If options such as cable-marshalling space (option **M07**), top or drip protection covers (option **M21**), roof sections (options **M23/M43/M54**) or cable connection from above (options **M13/M78**) are ordered for the converter cabinet units, they will also be supplied in the paint finish stated in the order. The molded plastic parts (e.g. ventilation grilles) are colored RAL 7035 and cannot be painted.

## Overview

The fuses specified below are the recommended types for protecting the unit on the low-voltage distribution panel. If option **L26** was selected for SINAMICS S150 with rated input currents < 800 A, then the semiconductor protection is already integrated in the unit. For units > 800 A, this function is realized by the circuit breaker provided as standard. In this case, a 3NA fuse can

be used in the distribution system. If option **L26** has not been selected for units < 800 A, then we strongly advise that 3NE fuses are used. <sup>1)</sup>

Catalog LV 10.1 contains additional information on the fuses that have been listed.

Type rating at 400 V or 690 V		SINAMICS S150 converter	Cable protection fuse in systems with fuse switch disconnector			Cable protection fuse (incl. semiconductor protection) in systems without fuse switch disconnector		
For $I_L$ , 50 Hz 400 V, 500 V or 690 V	For $I_L$ , 60 Hz 460 V or 575 V		Rated current	Frame size acc. to IEC 60269-2	Rated current	Frame size acc. to IEC 60269-2		
kW	hp	6SL3710-...	Order No.	A	Order No.	A		
<b>Line voltage 380 ... 480 V 3 AC</b>								
110	150	7LE32-1AA3	<b>3NA3252</b>	315	2	<b>3NE1230-2</b>	315	1
132	200	7LE32-6AA3	<b>3NA3254</b>	355	2	<b>3NE1331-2</b>	350	2
160	250	7LE33-1AA3	<b>3NA3365</b>	500	3	<b>3NE1334-2</b>	500	2
200	300	7LE33-8AA3	<b>3NA3365</b>	500	3	<b>3NE1334-2</b>	500	2
250	400	7LE35-0AA3	<b>3NA3372</b>	630	3	<b>3NE1436-2</b>	630	3
315	500	7LE36-1AA3	<b>3NA3475</b>	800	4	<b>3NE1438-2</b>	800	3
400	600	7LE37-5AA3	<b>3NA3475</b>	800	4	<b>3NE1448-2</b>	850	3
450	700	7LE38-4AA3	–	–	–	Circuit breaker included as standard		
560	800	7LE41-0AA3	–	–	–	Circuit breaker included as standard		
710	1000	7LE41-2AA3	–	–	–	Circuit breaker included as standard		
800	1000	7LE41-4AA3	–	–	–	Circuit breaker included as standard		
<b>Line voltage 500 ... 690 V 3 AC</b>								
75	75	7LG28-5AA3	<b>3NA3132-6</b>	125	1	<b>3NE1022-2</b>	125	00
90	75	7LG31-0AA3	<b>3NA3132-6</b>	125	1	<b>3NE1022-2</b>	125	00
110	100	7LG31-2AA3	<b>3NA3136-6</b>	160	1	<b>3NE1224-2</b>	160	1
132	150	7LG31-5AA3	<b>3NA3240-6</b>	200	2	<b>3NE1225-2</b>	200	1
160	150	7LG31-8AA3	<b>3NA3244-6</b>	250	2	<b>3NE1227-2</b>	250	1
200	200	7LG32-2AA3	<b>3NA3252-6</b>	315	2	<b>3NE1230-2</b>	315	1
250	250	7LG32-6AA3	<b>3NA3354-6</b>	355	3	<b>3NE1331-2</b>	350	2
315	300	7LG33-3AA3	<b>3NA3365-6</b>	500	3	<b>3NE1334-2</b>	500	2
400	400	7LG34-1AA3	<b>3NA3365-6</b>	500	3	<b>3NE1334-2</b>	500	2
450	450	7LG34-7AA3	<b>3NA3352-6</b>	2 × 315	2	<b>3NE1435-2</b>	560	3
560	600	7LG35-8AA3	<b>3NA3354-6</b>	2 × 355	3	<b>3NE1447-2</b>	670	3
710	700	7LG37-4AA3	<b>3NA3365-6</b>	2 × 500	3	<b>3NE1448-2</b>	850	3
800	800	7LG38-1AA3	–	–	–	Circuit breaker included as standard		
900	900	7LG38-8AA3	–	–	–	Circuit breaker included as standard		
1000	1000	7LG41-0AA3	–	–	–	Circuit breaker included as standard		
1200	1250	7LG41-3AA3	–	–	–	Circuit breaker included as standard		

<sup>1)</sup> The double function fuses (3NE1.) with duty class gS for cable and semiconductor protection are recommended to protect the converter. These fuses are specially adapted to the requirements of the semiconductors in the input rectifier.

- super flink
- coordinated to the I2t integral of the semiconductor
- lower arc voltage
- better current limiting (lower let-through I2t values)

# SINAMICS S150 Converter Cabinet Units

## Cable cross-sections and connections

### Overview

The following tables list the recommended and maximum connectable line and motor-side cable cross sections and connections for a single connection.

The recommended cross-sections are based on the specified fuses. They are valid for a three-conductor copper cable routed horizontally in air with PVC insulation and a permissible conductor temperature of 70 °C (e.g. Protodur NYY or NYCWY) at an ambient temperature of 40 °C and individual routing.

For deviating conditions (cable routing, cable accumulation, ambient temperature), the appropriate correction factors according to IEC 60364-5-52 must be taken into account.

For additional information, please refer to the [SINAMICS Low Voltage Engineering Manual](#).

Type rating at 400 V or 690 V	SINAMICS S150 Converter Cabinet Unit	Line supply connection			Motor connection			Cabinet grounding	
		Recommended cross-section <sup>1)</sup>	Max. cable cross-section	Fixing screw M12	Recommended cross-section <sup>1)</sup>	Max. cable cross-section	Fixing screw M12	Fixing screw M12	Remarks
kW	6SL3710-...	IEC	IEC	(Number of holes)	IEC	IEC	(Number of holes)	(Number of holes)	
		mm <sup>2</sup>	mm <sup>2</sup>		mm <sup>2</sup>	mm <sup>2</sup>			
<b>380 ... 480 V 3 AC</b>									
110	7LE32-1AA3	2 × 70	4 × 240	(2)	2 × 50	2 × 150	(2)	(2)	
132	7LE32-6AA3	2 × 95	4 × 240	(2)	2 × 70	2 × 150	(2)	(2)	
160	7LE33-1AA3	2 × 120	4 × 240	(2)	2 × 95	2 × 150	(2)	(2)	
200	7LE33-8AA3	2 × 120	4 × 240	(2)	2 × 95	2 × 150	(2)	(2)	
250	7LE35-0AA3	2 × 185	4 × 240	(2)	2 × 150	2 × 240	(2)	(2)	
315	7LE36-1AA3	2 × 240	4 × 240	(2)	2 × 185	4 × 240	(2)	(2)	
400	7LE37-5AA3	3 × 185	4 × 240	(2)	2 × 240	4 × 240	(2)	(10)	Cu bar
450	7LE38-4AA3	4 × 150	8 × 240	(4)	3 × 185	4 × 240	(2)	(16)	Cu bar
560	7LE41-0AA3	4 × 185	8 × 240	(4)	4 × 185	6 × 240	(3)	(18)	Cu bar
710	7LE41-2AA3	4 × 240	8 × 240	(4)	4 × 240	6 × 240	(3)	(18)	Cu bar
800	7LE41-4AA3	6 × 185	8 × 240	(4)	6 × 185	6 × 240	(3)	(18)	Cu bar
<b>500 ... 690 V 3 AC</b>									
75	7LG28-5AA3	50	4 × 240	(2)	35	2 × 70	(2)	(2)	
90	7LG31-0AA3	50	4 × 240	(2)	50	2 × 150	(2)	(2)	
110	7LG31-2AA3	70	4 × 240	(2)	70	2 × 150	(2)	(2)	
132	7LG31-5AA3	95	4 × 240	(2)	70	2 × 150	(2)	(2)	
160	7LG31-8AA3	120	4 × 240	(2)	95	2 × 150	(2)	(2)	
200	7LG32-2AA3	2 × 70	4 × 240	(2)	120	2 × 150	(2)	(2)	
250	7LG32-6AA3	2 × 95	4 × 240	(2)	2 × 70	2 × 185	(2)	(2)	
315	7LG33-3AA3	2 × 120	4 × 240	(2)	2 × 95	2 × 240	(2)	(2)	
400	7LG34-1AA3	2 × 185	4 × 240	(2)	2 × 120	4 × 240	(2)	(2)	
450	7LG34-7AA3	2 × 185	4 × 240	(2)	2 × 150	4 × 240	(2)	(2)	
560	7LG35-8AA3	2 × 240	4 × 240	(2)	2 × 185	4 × 240	(2)	(2)	
710	7LG37-4AA3	3 × 185	8 × 240	(4)	3 × 150	6 × 240	(3)	(18)	Cu bar
800	7LG38-1AA3	4 × 150	8 × 240	(4)	3 × 185	6 × 240	(3)	(18)	Cu bar
900	7LG38-8AA3	4 × 150	8 × 240	(4)	4 × 150	6 × 240	(3)	(18)	Cu bar
1000	7LG41-0AA3	4 × 185	8 × 240	(4)	4 × 185	6 × 240	(3)	(18)	Cu bar
1200	7LG41-3AA3	4 × 240	8 × 240	(4)	4 × 240	6 × 240	(3)	(18)	Cu bar

<sup>1)</sup> The recommendations for the North American market in AWG or MCM must be taken from the corresponding standards NEC (National Electrical Code) or CEC (Canadian Electrical Code).



## Overview

### Cable cross-sections required for connecting to the line supply and to motors

It is generally recommended to use shielded 3-conductor three-phase cables between the converter and motor – and for higher power ratings, symmetrical cables where possible. If required, several of these cables can be connected in parallel. There are two main reasons for this:

- Only then can the high IP55 degree of protection at the motor terminal box be easily achieved. The reason for this is that cables are routed into the terminal box through glands, and the number of possible glands is restricted by the terminal box geometry. Individual cables are less suitable in achieving this.
- For symmetrical 3-conductor three-phase cables, the summed ampere turns over the outer cable diameter are zero. This means that they can be routed in metallic, conductive cable ducts or cable trays without any problems and without any noticeable currents being induced in the conductive connections (ground and leakage currents). The risk of induced leakage currents and therefore increased cable sheath losses is significantly higher for single-conductor cables.

The cable cross-section required depends on the current being conducted in the cable. The permissible current load capability of cables is defined, for example in IEC 60364-5-52. On one hand this is dependent on the ambient conditions, such as temperature, and on the other hand, the type of routing. It must be taken into account whether cables are individually routed with relatively good cooling, or whether several cables are routed together; in this case, cable ventilation is significantly poorer, which can therefore result in higher cable temperatures. Regarding this topic, reference is made to the corresponding correction factors for these secondary conditions in IEC 60364-5-52.

For 3-conductor copper and aluminum cables with PVC insulation and a permissible conductor temperature of 70 °C (e.g. Protodur NYY or NYCWY), as well as an ambient temperature of 40 °C, the cross-sections can be determined from the information provided in the following table, which is based on IEC 60364-5-52.

Cross-section of 3-conductor cable mm <sup>2</sup>	Copper cable		Aluminum cable	
	Individual routing	Several cables lying next to one another <sup>1)</sup>	Individual routing	Several cables lying next to one another <sup>1)</sup>
3 × 2.5	22	17	17	13
3 × 4.0	30	23	23	18
3 × 6.0	37	29	29	22
3 × 10	52	41	40	31
3 × 16	70	54	53	41
3 × 25	88	69	68	53
3 × 35	110	86	84	65
3 × 50	133	104	102	79
3 × 70	171	133	131	102
3 × 95	207	162	159	124
3 × 120	240	187	184	144
3 × 150	278	216	213	166
3 × 185	317	247	244	190
3 × 240	374	292	287	224

Current-carrying capacity according to IEC 60364-5-52 at 40 °C

Cables must be connected in parallel for higher currents.

<sup>1)</sup> A maximum of 9 cables may be routed directly next to one another horizontally on a cable tray.

Note: The recommendations for the North American market in AWG or MCM must be taken from the corresponding standards NEC (National Electrical Code) or CEC (Canadian Electrical Code).

### Grounding and protective conductor cross-section

The protective conductor must be dimensioned taking into account the following data:

- In the case of a ground fault, it is not permissible that inadmissibly high contact voltages occur as a result of voltage drops along the protective conductor caused by the ground fault current (< 50 V AC or < 120 V DC, IEC 61800-5-1, IEC 60364, IEC 60543).
- The protective conductor must not be excessively loaded by any ground fault current it carries.
- If it is possible for continuous currents to flow through the protective conductor when a fault occurs, then the protective conductor cross-section must be dimensioned for this continuous current.
- The protective conductor cross-section must be selected according to EN 60204-1, EN 60439-1, IEC 60364.

Cross-section, line conductor mm <sup>2</sup>	Minimum cross-section, external protective conductor mm <sup>2</sup>
up to 16	Minimum cross-section of external conductor
16 ... 35	16
from 35	At least half the cross-section of external conductor

Note: The recommendations for the North American market in AWG or MCM must be taken from the corresponding standards NEC (National Electrical Code) or CEC (Canadian Electrical Code).

- Switchgear and motors are usually grounded separately via a local ground electrode. With this constellation, the ground fault current flows via the parallel ground connections and is divided. In spite of the relatively low protective conductor cross-sections used in accordance with the table above, no inadmissible touch voltages occur with this grounding system. However, from experience gained with different grounding constellations, we recommend that the ground cable from the motor returns directly to the drive converter. For EMC reasons and in order to avoid bearing currents, for large power ratings, it is preferable to use symmetrical 3-conductor, three-phase cables instead of four-conductor cables. For 3-conductor cables, the protective or PE conductor must be routed separately or arranged symmetrically in the motor cable. The symmetry of the PE conductor is achieved using a conductor surrounding all phase conductors or using a cable with a symmetrical arrangement of the three phase conductors and three ground conductors.

For additional information, please refer to the [SINAMICS Low Voltage Engineering Manual](#).

- Through their high-speed control, the converters limit the load current (motor and ground fault currents) to an rms value corresponding to the rated current. As a result of this fact, we recommend that the cross-section of the protective conductor to ground the cabinets is the same as for the outer (main) conductor.



# SINAMICS S150 Converter Cabinet Units

## Supplementary system components

### Overview

#### Mounting device for power blocks



Power block mounting device for installing and removing the power blocks for the Basic Line Modules, Smart Line Modules, Active Line Modules and Motor Modules in chassis format.

The mounting device is a mounting aid. It is placed in front of the module and attached to the module. The telescopic rails allow the device to be adjusted to the installation height of the power blocks.

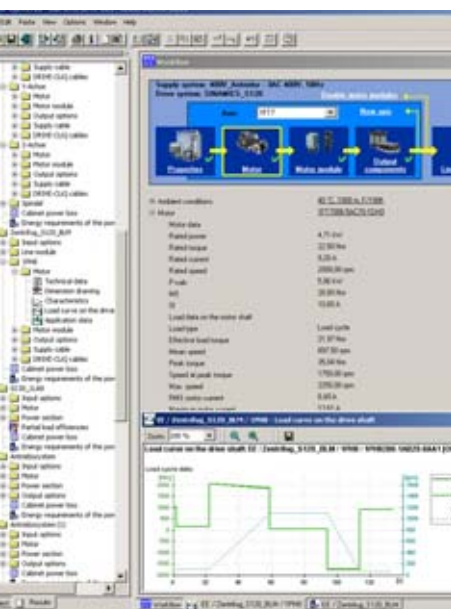
Once the mechanical and electrical connections have been released, the Power block can be removed from the module.

The power block is guided and supported by the guide rails on the handling device.

### Selection and ordering data

Description	Order No.
<b>Mounting device</b> for installing and removing power blocks	<b>6SL3766-1FA00-0AA0</b>

## Tools and engineering



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**Engineering Software**SIZER for Siemens Drives  
engineering tool

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STARTER commissioning tool

Drive Control Chart

Drive ES Engineering Software

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**Engineering**

Engineering Manual

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**Communication**

Overview

PROFIBUS

PROFINET

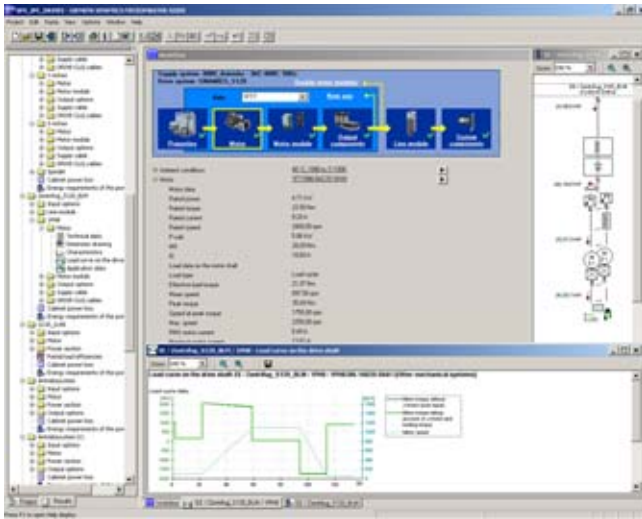
PROFIdrive

# Tools and engineering

## Engineering Software

### SIZER for Siemens Drives engineering tool

#### Overview



The following drives and controls can be engineered in a user-friendly way using the SIZER for Siemens Drives engineering tool:

- SINAMICS Low Voltage, MICROMASTER 4, DYNAVERT T, SIMATIC ET 200S FC and SIMATIC ET 200pro FC drive systems
- Motor starters
- SINUMERIK CNC control
- SIMOTION Motion Control System
- SIMATIC Technology

It provides support when setting up the technologies involved in the hardware and firmware components required for a drive task. SIZER for Siemens Drives covers the full range of operations required to configure a complete drive system, from simple single drives to complex multi-axis applications.

SIZER for Siemens Drives supports all of the configuring steps in a workflow:

- Configuring the power supply
- Designing the motor and gearbox, including calculation of mechanical transmission elements
- Configuring the drive components
- Compiling the required accessories
- Selecting the line-side and motor-side power options, e.g. cables, filters, and reactors

When SIZER for Siemens Drives was being designed, particular importance was placed on a high degree of usability and a universal, function-based approach to the drive application. The extensive user guidance makes using the tool easy. Status information keeps you continually informed about the progress of the configuration process.

The SIZER for Siemens Drives user interface is available in German, English, French and Italian.

The drive configuration is saved in a project. In the project, the components and functions used are displayed in a hierarchical tree structure.

The project view permits the configuration of drive systems and the copying/inserting/modifying of drives already configured.

The configuration process produces the following results:

- A parts list of the required components (export to Excel, use of the Excel data sheet for import to SAP)
- Technical specifications of the system
- Characteristic curves
- Comments on system reactions
- Mounting arrangement of drive and control components and dimension drawings of motors
- Energy requirements of the configured application

These results are displayed in a results tree and can be reused for documentation purposes.

Technological online help is available:

- Detailed technical specifications
- Information about the drive systems and their components
- Decision-making criteria for the selection of components
- Online help in German, English, French, Italian, Chinese and Japanese

#### System requirements

- PG or PC with Pentium III min. 800 MHz (recommended > 1 GHz)
- 512 MB RAM (1 GB RAM recommended)
- At least 4.1 GB of free hard disk space
- An additional 100 MB of free hard disk space on the Windows system drive
- Screen resolution 1024 x 768 pixels (recommended 1280 x 1024 pixels)
- Operating system
  - Windows XP Home Edition SP2
  - Windows XP Professional 32 bit SP2
  - Windows XP Professional 64 bit SP2
  - Windows Vista Business
  - Windows 7 Ultimate 32 bit
  - Windows 7 Professional 32 bit
- Microsoft Internet Explorer 5.5 SP2

#### Selection and ordering data

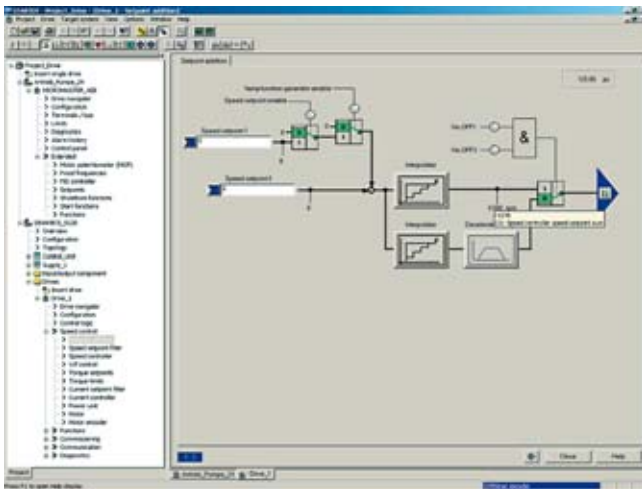
	Order No.
<b>SIZER for Siemens Drives engineering tool</b> DVD-ROM German, English, French, Italian	<b>6SL3070-0AA00-0AG0</b>

#### More information

The SIZER for Siemens Drives engineering tool is available free on the Internet at:

[www.siemens.com/sizer](http://www.siemens.com/sizer)

### Overview



The user-friendly STARTER commissioning tool can be used for

- Commissioning
- Optimization
- 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.

Configuring can be realized both offline as well as online. If several drives are connected to the selected communication bus, then an online connection can be established to several drives simultaneously.

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 travel commands can be simply entered via the control panel from the PC.

The individual settings can be made using the graphic parameterizing screen forms, which precisely visualize the drive mode of operation.

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 the drive unit)
- Trace to precisely record the signals (this depends on the drive unit, is not supported for
  - MICROMASTER 4
  - SINAMICS G110
  - SINAMICS G120 < FW V4.4
  - SINAMICS G110D
  - SINAMICS G120D
  - SIMATIC ET 200S FC
  - SIMATIC ET 200pro FC)
- Numerous measuring functions such as step functions and frequency response analysis

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 optimization work.

#### System requirements V4.2 and higher

- PG or PC Pentium III min. 1 GHz (recommended > 1 GHz)
- 1 GB RAM (recommended 2 GB RAM)
- Screen resolution 1024 x768 pixels, 16 bit color depth
- Free hard disk memory min. 3 GB
- Operating system
  - Windows 2000 SP4
  - Windows 2003 Server SP2
  - Windows 2008 Server
  - Windows XP Professional SP3
  - Windows 7 Professional 32 bit
  - Windows 7 Ultimate 32 bit
- Microsoft Internet Explorer V6.0

# Tools and engineering Engineering Software

## STARTER commissioning tool

### Integration

The fieldbus communication between the Control Units from SINAMICS S120, SINAMICS S150, SINAMICS G130 and SINAMICS G150 can, depending on the CU version (DP or PN), be realized via PROFIBUS or PROFINET/Ethernet, alternatively, also via the serial RS232 interface.

Further, there is the option of coupling SINAMICS S120, SINAMICS S150, SINAMICS G130, SINAMICS G150 and SINAMICS DC MASTER via SINAMICS Link, e.g. to establish a setpoint cascade.

For commissioning and service, a PG/PC can be connected to the CU320-2 Control Unit via PROFIBUS. A PROFIBUS connection must be available with a connecting cable at the PG/PC.

Further, communication between a CU320-2 Control Unit and PG/PC can also be established via Ethernet, either via an (optional) CBE20 Communication Board or the Ethernet interface -X127 on the CU320-2 Control Unit.

#### Note on -X127:

This terminal block is only intended for communication between a PG/PC for service and commissioning.

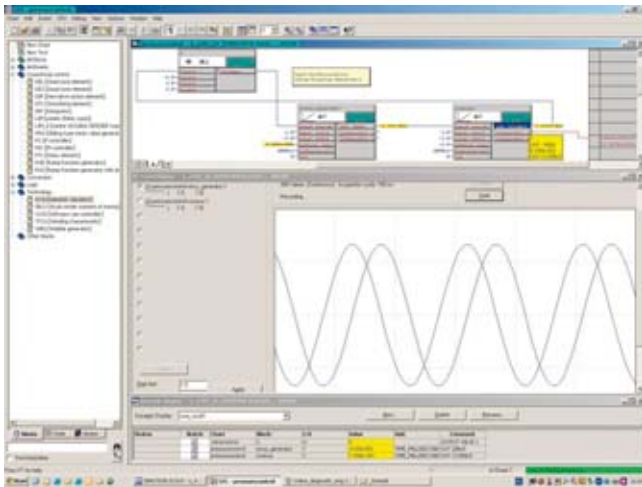
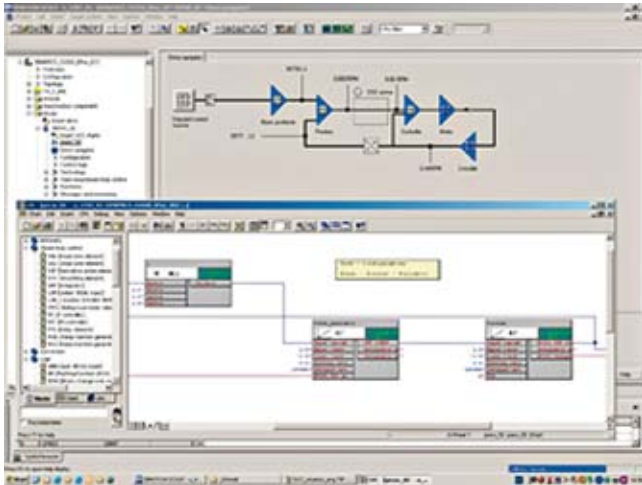
### Selection and ordering data

	Order No.
<b>STARTER commissioning tool</b> For SINAMICS and MICROMASTER on DVD-ROM German, English, French, Italian, Spanish	<b>6SL3072-0AA00-0AG0</b>
<b>Accessories</b>	
<b>SIMATIC S7 connecting cable</b> RS232 zero modem cable, 6 m	<b>6ES7901-1BF00-0XA0</b>
<b>PROFIBUS communication module CP 5512</b> PCMCIA type 2 card + adapter with 9-pin SUB-D socket, for Windows 2000/Windows XP Professional and PCMCIA 32	<b>6GK1551-2AA00</b>
<b>SIMATIC DP plug-in cable</b> 12 Mbit/s, for PG connection, pre-assembled with 2 × 9-pin SUB-D connector, 3 m PROFINET/Ethernet Standard-CAT5 Ethernet cable or PROFINET cable	<b>6ES7901-4BD00-0XA0</b>

### Options

#### Drive Control Chart (DCC)

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 an additional application to the STARTER commissioning tool.



Drive Control Chart expands the possibility for very simply configuring 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 blocks, 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.

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 [STARTER engineering software](#), since DCC is installed in addition to this.

#### Selection and ordering data (options)

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

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

The engineering license required for each PC (floating) for DCC is purchased 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.

	Order No.
<b>DCC-SIMOTION/SINAMICS V2.0 SP5</b> for SCOUT/STARTER V4.1 SP5 (single Engineering License, with DCC data carrier) DCC Editor + DCB libraries for use on SIMOTION V4.1 SP5 and SINAMICS S120 V2.6 SP2/V4.3 SP1 German, English, French, Italian (SIMOTION) German, English, French, Italian, Spanish (SINAMICS)	<b>6AU1810-1JA20-5XA0</b>
<b>DCC-SINAMICS V2.0 SP5</b> for STARTER V4.1 SP5 (single Engineering License, with DCC data carrier) DCC Editor + DCB library for use on SINAMICS S120 V2.6 SP2/V4.3 SP1 German, English, French, Italian, Spanish	<b>6AU1810-1HA20-5XA0</b>

#### More information

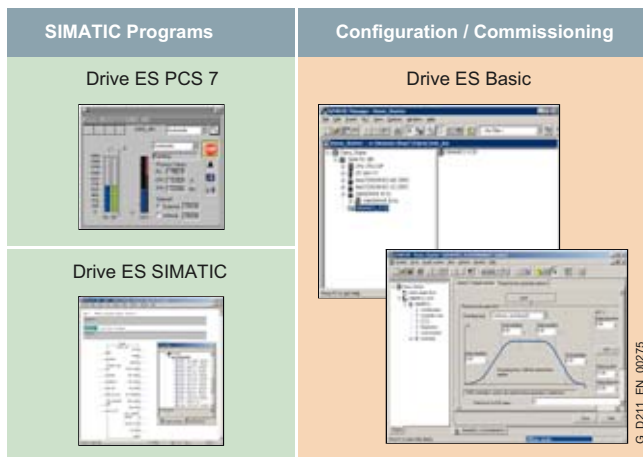
The STARTER commissioning tool is also available for update purposes on the Internet at [www.siemens.com/starter](http://www.siemens.com/starter)



# Tools and engineering Engineering Software

## 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.

### Design

Various software packages are available for selection:

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

#### 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 software. 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 and isochronous operation 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 includes a SIMATIC block library and therefore allows the PROFIBUS and/or PROFINET-IO interface to be simply and reliably programmed in the SIMATIC CPU for the drives.

The autonomous programming of data exchange between the SIMATIC CPU and the drive is eliminated – and otherwise time-consuming procedure.

For Drive ES users, the motto is:

**Copy – Adapt – Load – ready.**

Coordinated, well proven function blocks are taken from the library and transferred into your project.

Frequency required functions are completely programmed:

- 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 convenient configuration of drives and 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 convenient configuration of drives and non-cyclic PROFIBUS DP communication with the drives
- **SETUP program** for installing the software in the PCS 7 environment

## Selection and ordering data

	Order No.
<b>Drive ES Basic V5.5 SPx <sup>*)</sup></b> Configuration software for the integration of drives into TIA (Totally Integrated Automation) Precondition: STEP 7 from V5.3, SP3 and higher Supplied as: DVD Languages: Ger, Eng, Fr, It, Sp with electronic documentation <ul style="list-style-type: none"> <li>Floating license, 1 user</li> <li>Floating license (copy license), 60 users</li> <li>Update service for single-user license</li> <li>Update service for copy license, 60 users</li> <li>Upgrade from V5.x to V5.5 SPx <sup>*)</sup></li> </ul>	<b>6SW1700-5JA00-5AA0</b> <b>6SW1700-5JA00-5AA1</b> <b>6SW1700-0JA00-0AB2</b> <b>6SW1700-0JA00-1AB2</b> <b>6SW1700-5JA00-5AA4</b>
<b>Drive ES SIMATIC V5.5 SPx <sup>*)</sup></b> Function block library for SIMATIC for the parameterization of communication with the drives Precondition: STEP 7 from V5.3, SP3 and higher Supplied as: CD-ROM Languages: Ger, Eng, Fr, It, Sp with electronic documentation <ul style="list-style-type: none"> <li>Single-user license incl. 1 runtime license</li> <li>Runtime license (without data carrier)</li> <li>Upgrade from V5.x to V5.5 SPx <sup>*)</sup></li> </ul>	<b>6SW1700-5JC00-5AA0</b> <b>6SW1700-5JC00-1AC0</b> <b>6SW1700-5JC00-5AA4</b>
<b>Drive ES PCS 7 V6.1 SPx <sup>*)</sup></b> Function block library for PCS 7 for the integration of drives Precondition: PCS 7 V6.1 and higher Supplied as: CD-ROM Languages: Ger, Eng, Fr, It, Sp with electronic documentation <ul style="list-style-type: none"> <li>Single-user license incl. 1 runtime license</li> <li>Runtime license (without data carrier)</li> <li>Update service for single-user license</li> </ul>	<b>6SW1700-6JD00-1AA0</b> <b>6SW1700-5JD00-1AC0</b> <b>6SW1700-0JD00-0AB2</b>
<b>Drive ES PCS 7 V7.0 SPx <sup>*)</sup></b> Function block library for PCS 7 for the integration of drives Precondition: PCS 7 V7.0 and higher Supplied as: CD-ROM Languages: Ger, Eng, Fr, It, Sp with electronic documentation <ul style="list-style-type: none"> <li>Single-user license incl. 1 runtime license</li> <li>Runtime license (without data carrier)</li> <li>Update service for single-user license</li> <li>Upgrade from V5.x to V7.0 SPx <sup>*)</sup></li> </ul>	<b>6SW1700-7JD00-0AA0</b> <b>6SW1700-5JD00-1AC0</b> <b>6SW1700-0JD00-0AB2</b> <b>6SW1700-7JD00-0AA4</b>
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More information is available on the Internet at:  
[www.siemens.com/drivesolutions](http://www.siemens.com/drivesolutions)

## Options

*Drive ES software update service*

A software update service can also be purchased for the Drive ES software. The user will automatically receive the latest software, service packs and full versions for one year after ordering.

The update service can only be ordered in addition to an existing (i.e. previously ordered) full version.

- Period of update service: 1 year

The update service is automatically extended by 1 further year unless canceled up to 6 weeks prior to expiration.

	Order No.
<b>Drive ES Basic</b> <ul style="list-style-type: none"> <li>Update service for single-user license</li> <li>Update service for copy license</li> </ul>	<b>6SW1700-0JA00-0AB2</b> <b>6SW1700-0JA00-1AB2</b>
<b>Drive ES PCS 7</b> <ul style="list-style-type: none"> <li>Update service for single-user license</li> </ul>	<b>6SW1700-0JD00-0AB2</b>

<sup>\*)</sup> Orders are always automatically supplied with the latest SP.



#### Overview



The SINAMICS Low Voltage Engineering Manual is available for correctly selecting and engineering the devices specified in this catalog. This is a supplement to Catalogs D 11 and D 21.3, and simplifies handling the SINAMICS series of devices.

The Engineering Manual is only available electronically in German and English and is provided as PDF on the CD-ROM supplied with the catalogs.

The Engineering Manual contains general information on the basics of variable-speed electric drives, as well as detailed system descriptions and data on the following devices in the SINAMICS series:

- SINAMICS G130 Converter Cabinet Units (Catalog D 11)
- SINAMICS G150 Converter Cabinet Units (Catalog D 11)
- SINAMICS S120 Chassis Format Units (Catalogs D 21.3 and PM 21)
- SINAMICS S120 Cabinet Modules (Catalog D 21.3)
- SINAMICS S150 Converter Cabinet Units (Catalog D 21.3)

The Engineering Manual is subdivided into the following chapters.

The first chapter – Basics and the system description – predominantly discusses the physical basics of variable-speed electric drives and includes generally applicable system descriptions for the SINAMICS series of devices.

The second chapter – EMC design guideline – discusses the topic of electromagnetic compatibility (EMC) and supplies all of the necessary information required to engineer and install drives with the specified SINAMICS devices in compliance with EMC guidelines.

The additional chapters – Engineering the devices SINAMICS G130, SINAMICS G150, SINAMICS S120 Chassis Units, SINAMICS S120 Cabinet Modules and SINAMICS S150 – discuss device-specific topics, which go beyond the generally applicable system descriptions.

They contain information that addresses technically qualified specialists. It is the responsibility of the application engineer to evaluate the completeness of the information provided for the respective application. This person also has the final system responsibility for the complete drive and/or the system.

**Overview**

Digital bus systems are commonly used in production automation today. These handle communication between the control level, the machine control and the sensors and actuators as final controlling element. Corresponding to the data to be exchanged, a distinction is made between process communication and data communication.

**Process communication**

With process communication, control data, setpoints and actual values are cyclically exchanged between the higher-level control and the devices at the field level. The data quantity involved is comparatively low. For instance, a drive needs between 4 and 32 bytes for its process data. Generally, the number of connected sensors and actuators is defined by the configuration, which means that the process communication is very constant regarding the bus cycle.

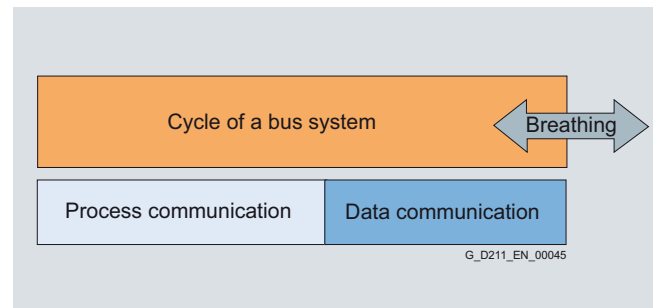
**Data communication**

Data communication is frequently required for the engineering and is not directly involved in executing the production process. Data is sporadically (acyclically) exchanged with the devices involved. The scope of this communication can be very extensive with > 100 byte for each device and communication task.

**Cycle time of a bus system**

The cycle time of a bus system comprises the time components for process communication and data communication. As a consequence, for conventional bus systems the total cycle time is not constant, but varies depending on the percentage of data communication. Without data communication, the cycle time is far shorter than with.

It can be said: The bus cycle fluctuates. For basic drive applications or drives that operate as stand-alone drive, a fluctuating bus cycle time can be tolerated, and therefore poses no problem for the quality of the application. However, for high-precision drive applications, it must be ensured that the bus cycle is constant, independent of the data communication volume.

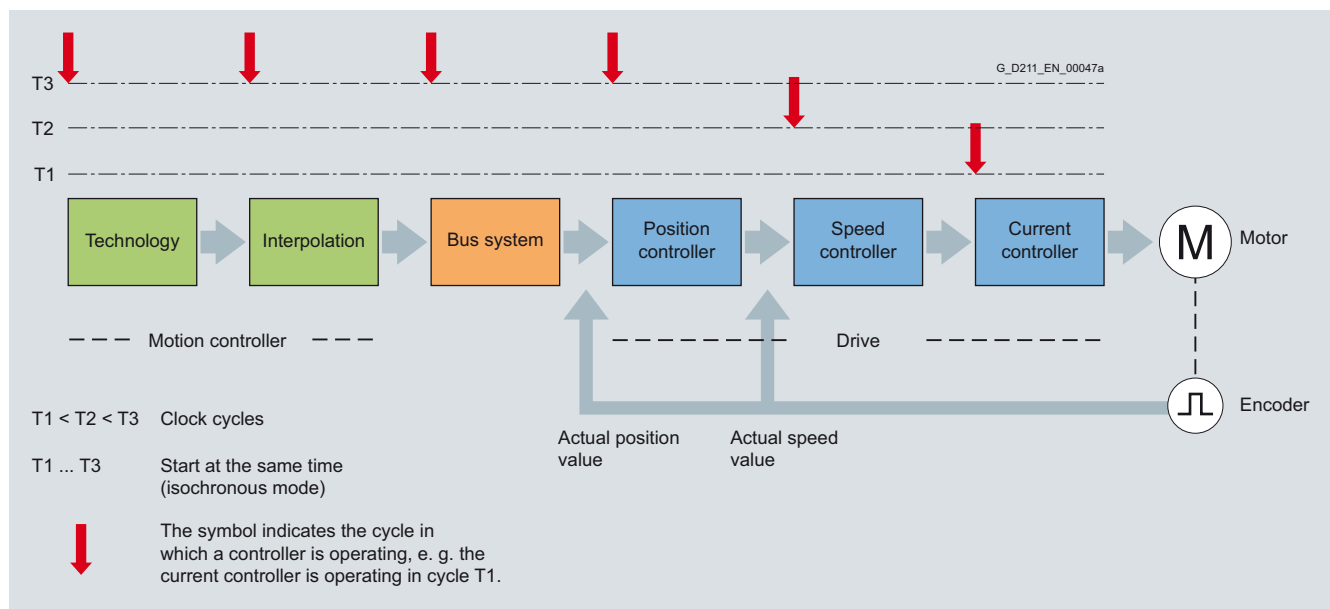


Bus cycle fluctuations

**Requirements of digital drive controls on the fieldbus**

Today, drives predominantly have a digital closed-loop control. This closed-loop control ensures that the manipulated quantity of the drive, for instance the speed or position is reached and held. Such a digital closed-loop control comprises several controls that are intermeshed with one another (position, speed, current etc.). These must operate with one another in a coordinated and synchronized form. This synchronization is important in order to keep the closed-loop control stable and to quickly control the system to reach the setpoint and precisely maintain this.

If parts of the closed-loop control are located outside a drive, then a bus system must be used in order to handle the communication between these various elements. In this case, the bus system must operate synchronously just like the closed-loop controls themselves.



Digital closed-loop drive control: synchronous operation of all participants

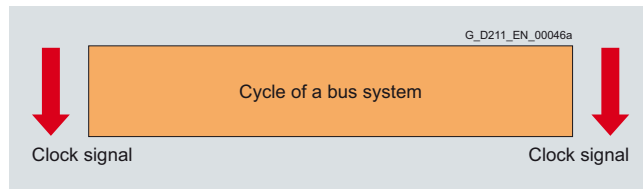
# Tools and engineering Communication

## Communication

### Overview

#### *The solution to the requirements: Isochronous mode*

In order that all of the connected devices communicate in synchronism via the bus system, generally an additional clock signal is used to synchronize the cycle time of the bus system. This is known as clock synchronization or isochronous mode.



Constant bus cycle using the isochronous mode

For drives in the motion control system sector, this clock synchronization must be extremely fast and very precise. This ensures that the bus cycle length only varies slightly.

The bus cycle then no longer fluctuates (large deviations), but only manifests slight deviations called jitter. Permissible values are  $< 1 \mu\text{s}$ .

#### *Bus systems for motion control applications*

In order that a bus system can be used for motion control applications, the bus cycle must be equidistant and deterministic. Only slight deviations of less than  $1 \mu\text{s}$  (jitter) from bus cycle to bus cycle can be tolerated.

In order to fulfill these requirements with conventional bus systems, for extensive data communication – that is not critical from a time perspective – frequently an additional bus system is used, for example Industrial Ethernet.

PROFIBUS DP and PROFINET fulfill the requirements regarding process communication and clock synchronization. Further, PROFINET permits simultaneous communication using standard TCP/IP and TCP/UDP data communication to the network.

Industrial Ethernet – the predecessor to PROFINET – is not suitable for real-time communication, but for data communication using standard TCP/IP and UDP/IP.

**Overview****PROFIBUS – the most successful open fieldbus in the automation environment**

The requirements of users for an open, non-proprietary communication system have resulted in the specification and standardization of the PROFIBUS protocol.

PROFIBUS defines the technical and functional features of a serial fieldbus system, with which the distributed field automation devices in the lower area (sensor/actuator level) can be networked up to the mid performance range (cell level).

Standardization according to IEC 61158/EN 50170 secures your investments for the future.

Using the conformity and interoperability test performed by the test laboratories authorized from PROFIBUS & PROFINET International (PI) and the certification of the devices by PI, users have the security that the quality and functionality is guaranteed, even in multi-vendor installations.

**PROFIBUS versions**

Three different PROFIBUS versions have been defined in order to comply with the strongly differing requirements at the field level:

PROFIBUS FMS (Fieldbus Message Specification) – the universal solution for communication tasks at the field and cell levels in the industrial communication hierarchy.

PROFIBUS PA (Process Automation) – the version for applications in process automation. PROFIBUS PA uses intrinsically secure data transfer technology defined in IEC 61158-2.

PROFIBUS DP (Distributed Periphery) – this version, which is optimized for speed, is specifically tailored to the communication of automation systems with distributed I/O stations and drives. PROFIBUS DP sets itself apart as a result of the shortest response times and high noise immunity, and replaces cost-intensive, parallel signal transfer with 24 V and measured value transfer utilizing 0/4 ... 20 mA technology.

**Design****Bus participants for PROFIBUS DP**

PROFIBUS DP makes a distinction between two different master classes and one slave class:

**DP master Class 1**

For PROFIBUS DP, DP master Class 1 is the central component. In a defined message cycle that always repeats itself, the central master station exchanges information with distributed stations (DP slaves).

**DP master Class 2**

When commissioning, to configure the DP system, for diagnostics or to operate the plant or system in operation, devices of this type are used (programming, configuring or operator control devices). A DP master Class 2 can, for example, read input, output, diagnostics and configuration data of the slaves.

**DP slave**

A DP slave is an I/O device, which receives output information or setpoints from the DP master, and as response, returns input information, measured values and actual values to the DP master. A DP slave never sends data automatically, but only when requested by the DP master.

The quantity of input and output information depends on the device, and for each DP slave in each send direction can be a maximum of 244 bytes.

**Function****Functional scope in DP masters and DP slaves**

The functional scope can differ between DP masters and PROFIBUS DP slaves. The functional scope is different for DP-V0, DP-V1 and DP-V2.

**DP-V0 communication functions**

The DP-V0 master functions comprise the functions "Configuration", "Parameter Assignment", "Read Diagnostics Data" as well as cyclic reading of input data/actual values and writing output data/setpoints.

**DP-V1 communication functions**

The DP-V1 function expansions make it possible to perform acyclic read and write functions as well as processing cyclic data communication. This type of slave must be supplied with extensive parameterization data during start-up and during normal operation. These acyclically transferred parameterization data are only rarely changed in comparison to the cyclic setpoints, actual values, and measured values, and are transferred at lower priority in parallel with the cyclic high-speed user data transfer. Detailed diagnostic information can be transferred in the same way.

**DP-V2 communication functions**

The extended DP-V2 master functions mainly comprise functions for isochronous operation and direct data exchange between DP slaves.

- **Isochronous mode:**  
Isochronous mode is implemented by means of an equidistant signal in the bus system. This cyclic, equidistant cycle is sent by the DP master to all bus nodes in the form of a Global Control Telegram. Master and slaves can then synchronize their applications with this signal. The jitter of the clock signal from cycle to cycle is less than 1  $\mu$ s.
- **Slave-to-slave communication:**  
The "publisher/subscriber" model is used to implement slave-to-slave communication. Slaves declared as publishers make their input data/actual values and measured values available to other slaves, the subscribers, for reading. This is performed by sending the response frame to the master as a broadcast. Slave-to-slave communication is therefore a cyclic process.

**PROFIBUS for SINAMICS and SIMOTION**

SINAMICS and SIMOTION use the PROFIBUS protocol PROFIBUS DP.

SINAMICS S120 drives can operate only as DP slaves and support all communication functions, i.e. DP-V0, DP-V1 and DP-V2.

The SIMOTION systems can be used both as DP masters and DP slaves. The DP-V0, DP-V1 and DP-V2 communication functions are supported.

# Tools and engineering Communication

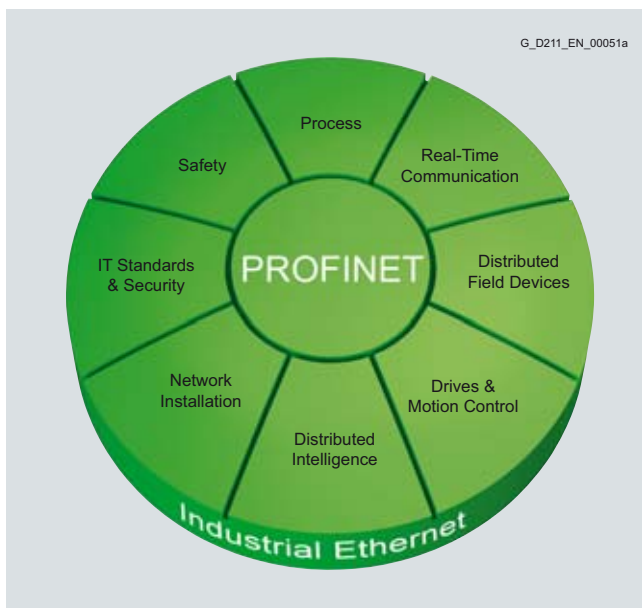
## PROFINET

### Overview



PROFINET is the innovative, open Industrial Ethernet standard (IEC 61158) for the industrial automation environment. PROFINET combines IT communication, data communication and process communication in a single communication medium. PROFINET thus permits uniform communication from the control level down through to the field level, offers plant-wide engineering and uses well-proven standards from the IT environment such as TCP/IP and UDP.

Existing fieldbus systems such as PROFIBUS can also be simply integrated without having to change existing devices.



PROFINET fulfills all of the requirements of industrial automation:

- Industry-standard installation technology
- Real-time capability
- Deterministic behavior
- Integration of distributed field devices
- Simple network administration and diagnostics
- Protection against unauthorized access
- Efficient, cross-vendor engineering, as well as
- Isochronous motion control applications

PROFINET uses switch technology, and has expanded this to include isochronous real-time communication. The network topology can be optimally adapted to the machine requirements by utilizing switch technology. Collisions are avoided and therefore optimum data flow rates achieved.

### Function

#### PROFINET communication

##### Data communication

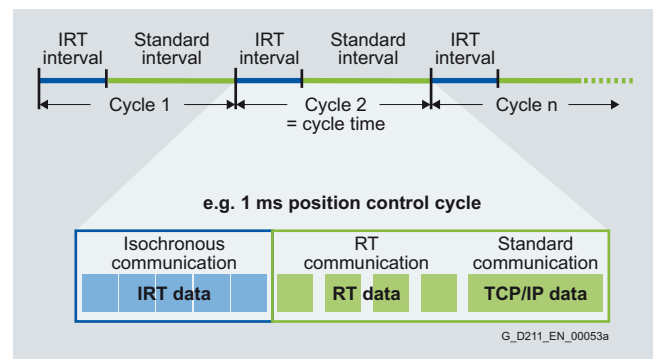
PROFINET uses standard TCP/IP for data communication that is not critical from a time perspective, e.g. for parameter assignment, configuration, commissioning and diagnostics.

##### Process communication/real-time communication

For PROFINET IO, real-time communication to transfer process data and data communication, uncritical from a time perspective, is realized using one single cable. PROFINET IO offers the following performance levels for real-time communication:

- Real Time (RT)
  - RT uses the option of prioritizing the communication stack of the bus participants. This permits high-performance data transmission based on standard network components.
- Isochronous Real-Time (IRT)
  - IRT permits strict deterministic, cyclic data transmission with extremely short response times and minimum jitter for high-performance motion control applications. This property is implemented using a PROFINET ASIC in the corresponding interfaces (switch integrated in the device) or network components (switch).

For PROFINET, the communication cycle is subdivided into different, time intervals. Isochronous Real-Time communication (IRT) is realized in the first interval, followed by Real Time communication (RT) and standard TCP/IP communication. Using a special algorithm, the optimum timing of the individual telegrams for each network section can be determined, taking into account the topology. This means that the switch is in a position to transfer the IRT telegrams from the input port to the defined output port and on to the target device.



**Function****Device classes for PROFINET IO**

PROFINET IO makes a distinction between several device classes within an PROFINET IO system:

**IO Supervisor**

An IO Supervisor is typically an engineering station, which has a limited (time) access to the field devices for parameterization, commissioning and diagnostics. Engineering data is transferred using the standard TCP/IP channel from PROFINET IO.

**IO Controller**

An IO Controller is typically a programmable logic controller (PLC) or a motion control system, for instance SIMATIC S7 or SIMOTION. The IO Controller cyclically sends control signals and setpoints to the IO devices assigned to it, and reads actual values and possibly alarms from the lower-level IO devices. Communication between the IO Controller and the IO devices is realized – depending on the application requirements – via Real-Time (RT) or Isochronous Real-Time (IRT).

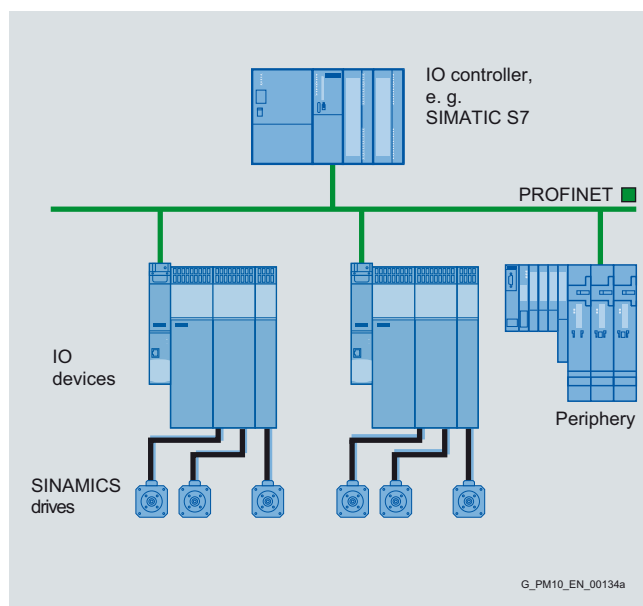
**IO Device**

IO Devices are typically distributed I/O systems and drives, for instance SIMATIC ET 200S and SINAMICS S120. IO Devices receive control signals and setpoints from a higher-level IO Controller and form the direct interface to the process. They send actual values to the higher-level IO Controller so that this can update its internal process image.

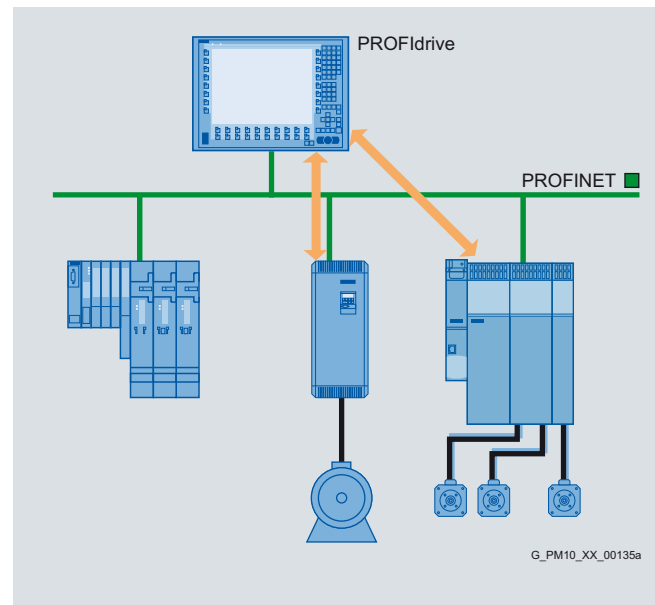
**Device concept of an PROFINET IO system**

In the simplest configuration, a PROFINET IO system comprises an IO Controller and several IO Devices allocated to it. The IO Devices are initialized and parameterized by the IO Controller when powering up. Together with its IO Devices, the IO Controller forms a PROFINET IO System (refer to the master-slave system for PROFIBUS).

The IO Controller updates its internal process image via the cyclic process communication with the allocated IO Devices. Depending on the requirements and device properties, with real-time (RT) or isochronous real-time (IRT). Further, PROFINET permits communication between the controllers and devices of different IO systems.

**PROFIdrive – the standardized drive profile for PROFIBUS and PROFINET**

The functional interface between the control system and the SINAMICS drives for PROFINET and PROFIBUS is defined by the PROFIdrive drive profile of PROFIBUS International. When making a transition from PROFIBUS to PROFINET, the user program does not have to be changed.

**PROFINET IO with RT: the choice for standard drive applications**

PROFINET IO with RT, with cycle times of typically 4 to 10 ms, provides the performance of PROFIBUS regarding cyclic data transfer.

As a consequence, all standard drives applications can be automated, by entering speed, torque or current setpoints – or also target positions – which do not have to be isochronously coupled with one another.

**Note:** For real-time communication (RT), process data can also be wirelessly transferred using wireless LAN devices.

**PROFINET IO with IRT: the choice for demanding motion control applications with clock cycle synchronization**

In this case a motion control system (for instance SIMOTION) controls and/or synchronizes axes via PROFINET. In this case, cyclic, isochronous data exchange with the drives is required, whereby the following criteria must be fulfilled:

- Synchronization of the closed-loop control cycles to the bus cycle
- The control loop must be closed via the bus
- Synchronous, simultaneous acquisition of position actual values
- Synchronous, simultaneous activation of the setpoints

PROFINET IO with IRT fulfills this requirement. By appropriately configuring the application, e.g. a synchronous relationship between axes, IRT telegrams are implicitly determined and the appropriate configuration data generated.

# Tools and engineering Communication

## PROFIdrive

### Overview

#### *PROFIdrive – the standardized drive profile for PROFIBUS and PROFINET*

PROFIdrive defines the device behavior and technique to access internal device data for electric drives connected to PROFIBUS and PROFINET – from basic frequency converters up to high-performance servo controllers.

It describes in detail the practical use of communication functions – slave-to-slave data transfer, equidistance and clock cycle synchronization (isochronous mode) in drive applications. Further, all of the device properties and the influence on the interface to a controller, connected via PROFIBUS or PROFINET, are clearly specified. This also includes the state machine (sequence control), the encoder interface, scaling of values, definition of standard telegrams, access to drive parameters etc.

The PROFIdrive profile supports both central as well as distributed motion control concepts.

#### *What are profiles?*

For devices and systems used in automation technology, profiles define properties and modes of behavior. This allows manufacturers and users to define common standards. Devices and systems that comply with such a cross-manufacturer profile, are interoperable on a fieldbus and, to a certain degree, can be interchanged.

#### *Are there different types of profiles?*

A distinction is made between what are known as application profiles (general or specific) and system profiles:

- Application profiles (also device profiles) predominantly refer to devices (e.g. drives) and include an agreed selection regarding bus communication as well as also specific device applications.
- System profiles describe classes of systems, including master functionality, program interfaces and integration resources.

#### *Is PROFIdrive fit for the future?*

PROFIdrive has been specified by the PROFIBUS and PROFINET International (PI) user organization, and is specified as a standard that is fit for the future through standard IEC 61800-7.

#### *The basic philosophy: Keep it simple*

The basic philosophy of the PROFIdrive profile is to keep the drive interface as simple as possible and keep it free of technological functions. As a result of this philosophy, referencing models as well as the functionality and performance of the PROFIBUS/PROFINET master have either no influence or only a low influence on the drive interface.

#### *One drive profile – different application classes*

The integration of drives into automation solutions depends very strongly on the particular drive application. In order to be able to address the complete, huge bandwidth of drive applications – from basic frequency converters up to synchronized multi-axis systems with a high dynamic performance – using just one profile, PROFIdrive defines six application classes, to which most drive applications can be assigned:

- Class 1 – standard drives (for example pumps, fans, agitators etc.)
- Class 2 – standard drives with technological functions
- Class 3 – positioning drives
- Class 4 – motion control drives with central, higher-level motion control intelligence and patented position control concept "dynamic servo control"
- Class 5 – motion control drives with central, higher-level motion control intelligence and position setpoint interface
- Class 6 – motion control drives with distributed motion control intelligence integrated in the drives themselves



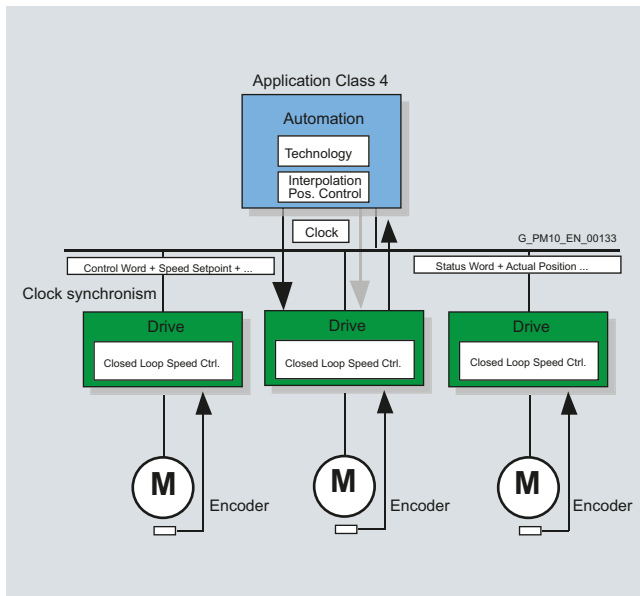
**Design***The PROFdrive device model*

PROFdrive defines a device model comprising function modules, which interoperate inside the device and which reflect the intelligence of the drive system. These modules are assigned objects, which are defined in the profile together with their associated functions. As a consequence, the complete functionality of a drive is defined by the sum of its parameters.

Contrary to other drive profiles, PROFdrive only defines the mechanisms to access parameters as well as a subset of approximately 30 profile parameters, to which the fault buffer, drive control and device identification belong, for example.

All of the other parameters are manufacture-specific. This provides drive manufacturers with a high degree of flexibility when implementing closed-loop control functions. The elements of a parameter are accessed acyclically using data sets.

As communication profile, PROFdrive uses DP-V0, DP-V1 and the DP-V2 extensions for PROFIBUS, which in turn include the functions "slave-to-slave data transfer" and "clock cycle synchronization", or PROFINET IO with the real-time classes RT and IRT.

*PROFdrive for motion control*

Application class 4 is the most important for highly complex motion control tasks with a high dynamic performance. This application class describes in detail the master-slave relationship between the controller and the drives, which are connected to one another via PROFIBUS or PROFINET.

Using the DSC function (Dynamic Servo Control), the dynamic performance and the stiffness of the position control loop is significantly improved. This is achieved by minimizing the dead times that normally occur for speed-setpoint interfaces using an additional, relatively simple feedback network in the drive. The position control loop is closed in the drive, which permits very fast position control cycles (for example 125  $\mu$ s for SINAMICS S120) and thus limiting the dead times exclusively to the control behavior.

*PROFdrive for SIMOTION and SINAMICS*

For SIMOTION and SINAMICS S120, the drive interface is realized according to the PROFdrive profile and application classes 1 to 4 (class 4 with and without DSC), and will be referred to from now on as PROFdrive interface.

When operating SINAMICS S120 with SIMOTION, application class 4 with DSC is used as standard.



# Tools and engineering Communication

Notes

5

# Services and documentation



## 6/2 Training

### 6/3 Range of training courses

### 6/5 SparesOnWeb

## 6/6 Service & Support

6/6 Perfectly setup for global service over the complete lifecycle

6/6 Overview

6/7 Commissioning drive systems

6/7 Customized training courses for drives

6/8 Maintenance and inspection of drives

6/8 Spare parts for drives

6/9 Remote maintenance – expert knowledge close at hand

6/9 Energy saving in drive technology

6/10 Retrofitting drives

6/10 Service portfolio

6/10 Extended liability for defects

6/12 The unmatched complete service for the entire life cycle

6/12 Online Support

6/12 Technical Support

6/12 Technical Consulting

6/12 Training

6/13 Engineering Support

6/13 Field Service

6/13 Spare Parts

6/13 Repairs

6/13 Optimization

6/13 Retrofitting

6/13 Service programs

## 6/14 Documentation

# Services and documentation

## Training

### Overview

#### *Faster and more applicable know-how: Hands-on training from the manufacturer*

SITRAIN® – the Siemens Training for Automation and Industrial Solutions – provides you with comprehensive support in solving your tasks.

Training by the market leader in automation and plant engineering enables you to make independent decisions with confidence. Especially where the optimum and efficient use of products and plants are concerned. You can eliminate deficiencies in existing plants, and exclude expensive faulty planning right from the beginning.



First-class know-how directly pays for itself: In shorter startup times, high-quality end products, faster troubleshooting and reduced downtimes. In other words, increased profits and lower costs.

#### **Achieve more with SITRAIN**

- Shorter times for startup, maintenance and servicing
- Optimized production operations
- Reliable configuration and startup
- Minimization of plant downtimes
- Flexible plant adaptation to market requirements
- Compliance with quality standards in production
- Increased employee satisfaction and motivation
- Shorter familiarization times following changes in technology and staff

#### *SITRAIN highlights*

##### **Top trainers**

Our trainers are skilled teachers with direct practical experience. Course developers have close contact with product development, and directly pass on their knowledge to the trainers.

##### **Practical experience**

The practical experience of our trainers enables them to teach theory effectively. But since theory can be pretty drab, we attach great importance to practical exercises which can comprise up to half of the course time. You can therefore immediately implement your new knowledge in practice. We train you on state-of-the-art methodically/didactically designed training equipment. This training approach will give you all the confidence you need.

##### **Wide variety**

With a total of about 300 local attendance courses, we train the complete range of Siemens Industry products as well as interaction of the products in systems.

#### **Tailor-made training**

We are only a short distance away. You can find us at more than 50 locations in Germany, and in 62 countries worldwide. You wish to have individual training instead of one of our 300 courses? Our solution: We will provide a program tailored exactly to your personal requirements. Training can be carried out in our Training Centers or at your company.

#### **The right mixture: Blended learning**

"Blended learning" means a combination of various training media and sequences. For example, a local attendance course in a Training Center can be optimally supplemented by a teach-yourself program as preparation or follow-up. Additional effect: Reduced traveling costs and periods of absence.



#### **More information**

##### *Contact*

Visit our site on the Internet at:

[www.siemens.com/sitrain](http://www.siemens.com/sitrain)

or let us advise you personally.

##### *SITRAIN Customer Support Germany:*

Phone: +49 (911) 895-7575

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E-Mail: [info@sitrain.com](mailto:info@sitrain.com)

## Applications

### Range of training courses for the SINAMICS S120 and SINAMICS S150 drive systems

This provides an overview of the training courses available for the SINAMICS S120 and SINAMICS S150 drive systems.

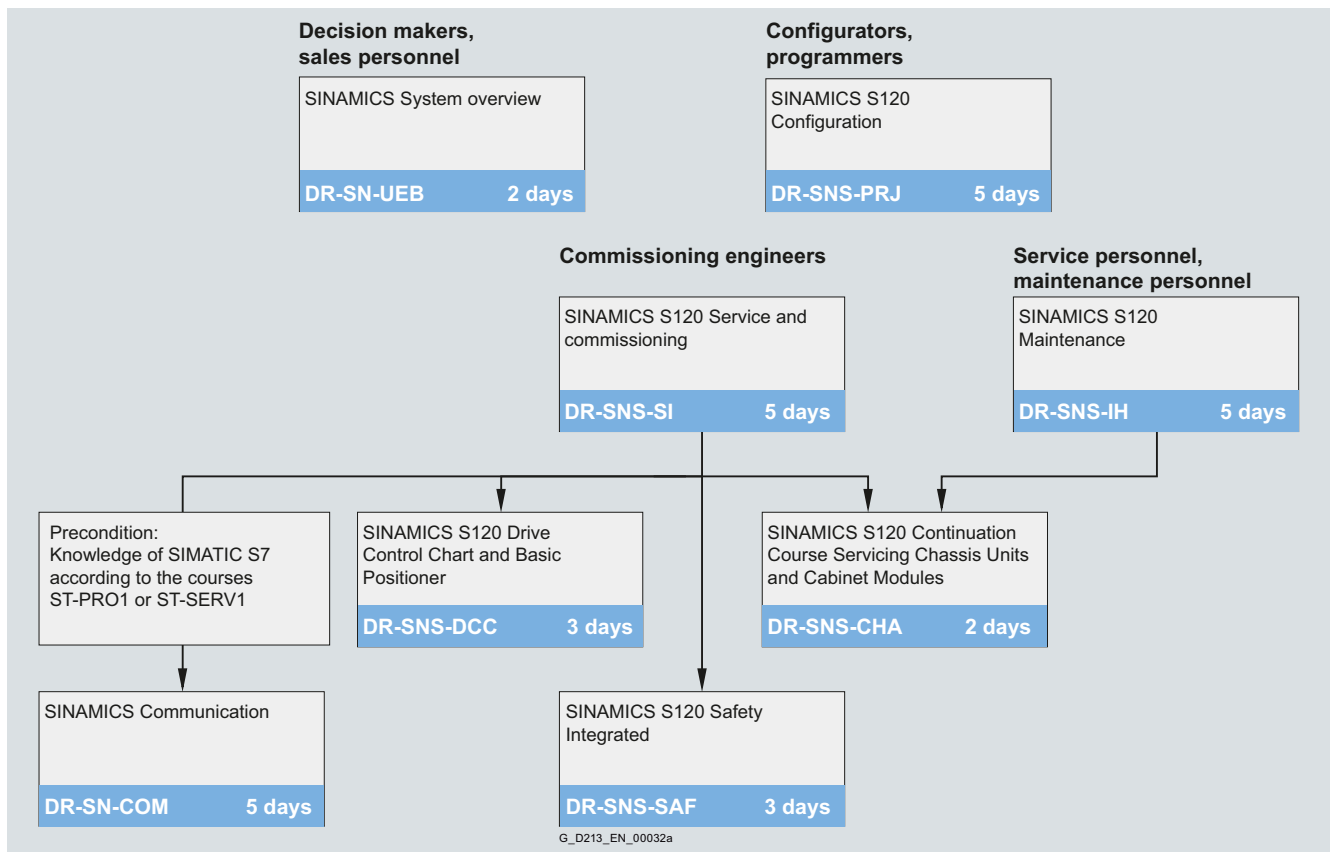
The courses are modular in design and are intended for a variety of target groups as well as individual customer requirements. Intensive training is carried out directly at the drive system in small groups.

You will find further information on the course contents and dates in Catalog ITC and on the Internet at [www.siemens.com/sitrain](http://www.siemens.com/sitrain)

### Training courses SINAMICS S120

Title	Target group						Duration	Course code
	Decision-makers, sales personnel	Project managers, project personnel	Programmers	Commiss. engineers, application engineers	Service engineers	Maintenance personnel		
SINAMICS System overview	✓	✓					2 days	DR-SN-UEB
SINAMICS S120 Configuration	✓	✓		✓			5 days	DR-SNS-PRJ
SINAMICS S120 Service and Commissioning			✓	✓	✓		5 days	DR-SNS-SI
SINAMICS S120 Continuation Course on Chassis Units and Cabinet Modules				✓	✓	✓	2 days	DR-SNS-CHA
SINAMICS S120 Maintenance					✓	✓	5 days	DR-SNS-IH
SINAMICS S120 Drive Control Chart and Basic Positioner			✓	✓	✓		3 days	DR-SNS-DCC
SINAMICS S120 Safety Integrated		✓	✓	✓	✓		3 days	DR-SNS-SAF
SINAMICS Communication			✓	✓	✓		5 days	DR-SN-COM

### Training path for SINAMICS S120



# Services and documentation

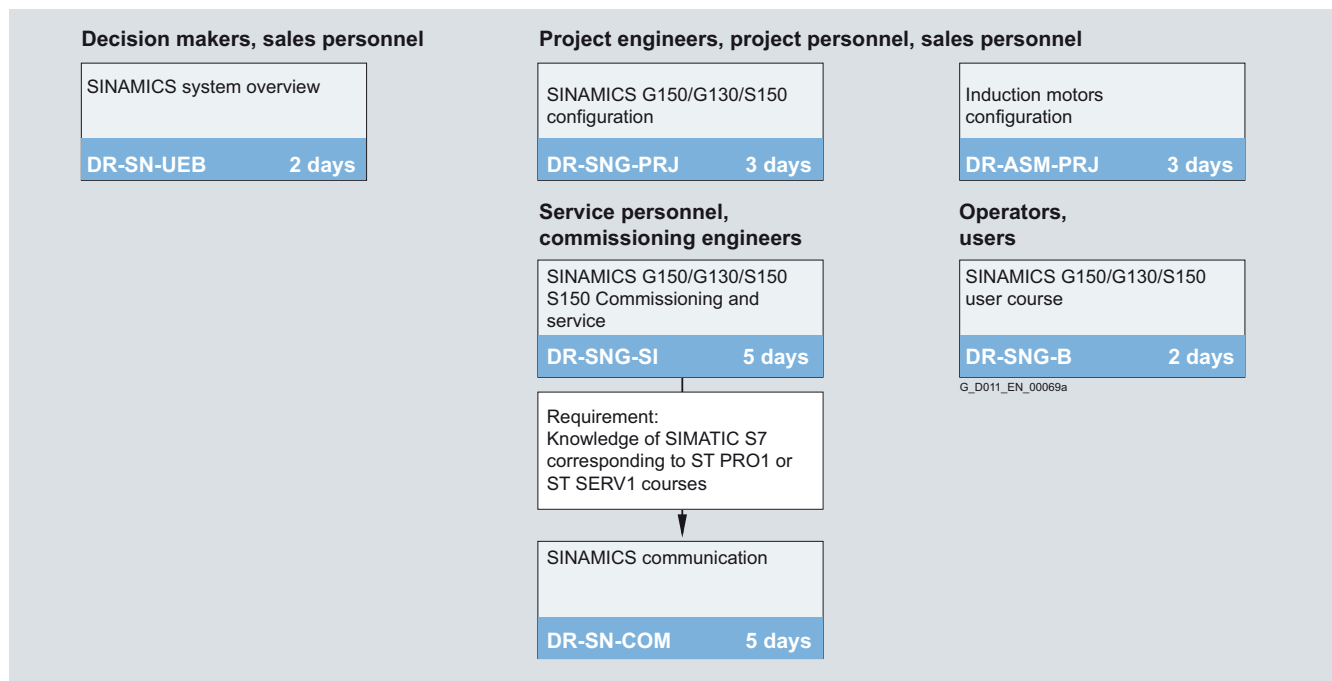
## Range of training courses

### Applications

#### Training courses for SINAMICS G150, SINAMICS G130 and SINAMICS S150

Title	Target group						Duration	Course code
	Decision-makers, sales personnel	Project managers, project personnel	Commissioning engineers, application engineers	Service engineers	Operating personnel, users	Maintenance personnel		
SINAMICS System Overview	✓	✓					2 days	DR-SN-UEB
SINAMICS G150/G130/S150 Configuring	✓	✓	✓				3 days	DR-SNG-PRJ
SINAMICS Induction Motor Configuring	✓	✓					3 days	DR-ASM-PRJ
SINAMICS G150/G130/S150 Commissioning and Service			✓	✓		✓	5 days	DR-SNG-SI
SINAMICS G150/G130/S150 Course for Operating Personnel					✓	✓	2 days	DR-SNG-B
SINAMICS Communication			✓	✓	✓		5 days	DR-SN-COM

#### Training path for SINAMICS G150, SINAMICS G130 and SINAMICS S150



## Overview

### SparesOnWeb – Online spare parts catalog



SparesOnWeb is a web-based tool for selecting the spare parts available for the SINAMICS system. After you have registered and entered the serial number and order number, the spare parts available for the relevant unit are displayed.

The delivery state for specific orders can be displayed for all shipped SINAMICS products.

<http://workplace.automation.siemens.com/sparesonweb>

# Services and documentation

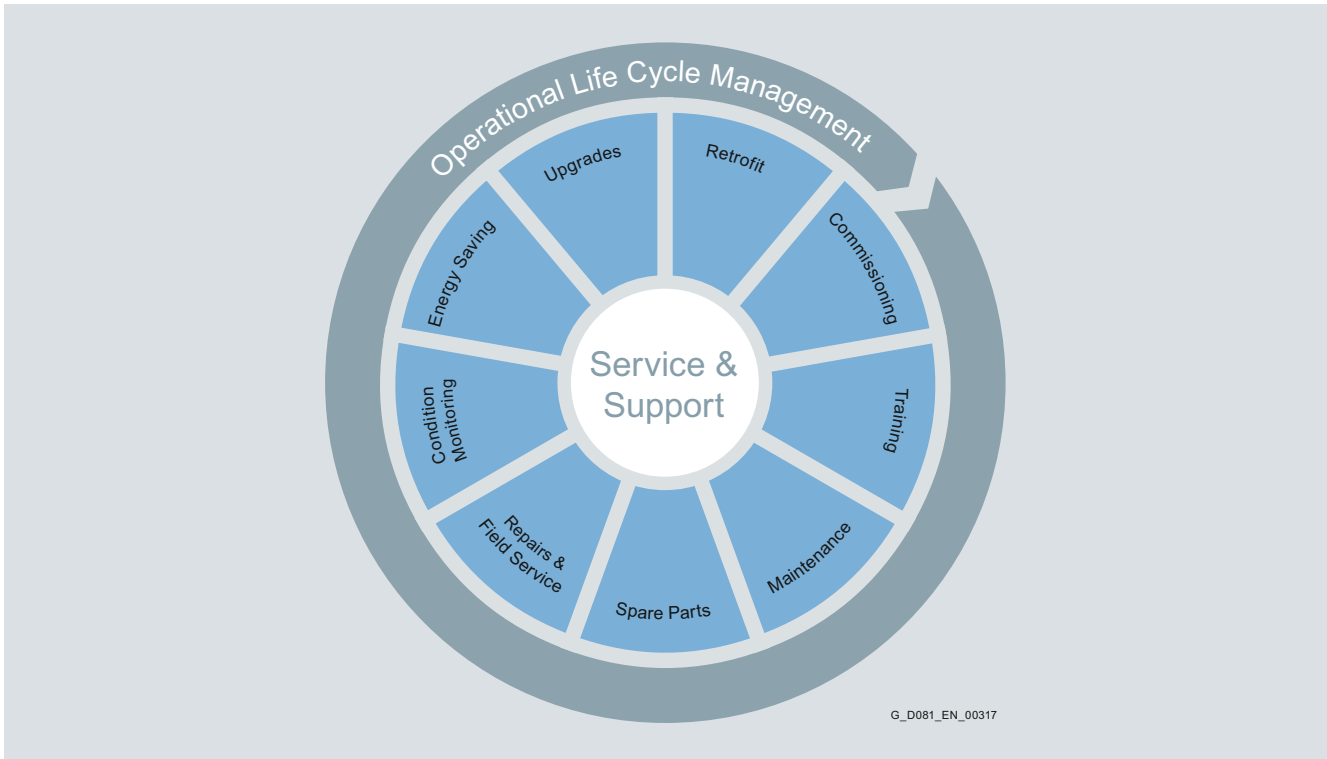
## Service & Support

Perfectly setup for global service over the complete lifecycle

### Overview

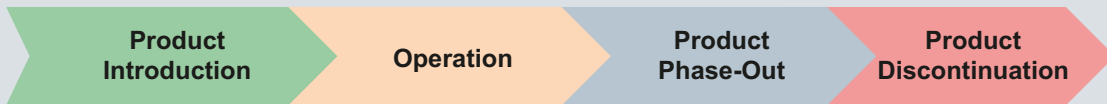
Our service and support is available to you worldwide and supports you over the complete lifecycle of your machines and

plants in all areas of Siemens drive technology – locally in over 100 countries and around the clock.



You can find your regional contact person as well as additional information under:  
[www.siemens.com/automation/partner](http://www.siemens.com/automation/partner)  
[www.siemens.com/id-service](http://www.siemens.com/id-service)

### The correct solution in every phase of the product life cycle



#### Delivery

- Installation & Commissioning
- Training
- Support & Remote Services
- Spare Parts
- Product Support & Maintenance Contracts

#### Support

- Support & Remote Services
- Training
- Spare Parts & Repair Services
- Maintenance & Field Service
- Optimization Services

#### Product Phase-Out

- Support & Remote Services
- Spare Parts & Repair Services
- Maintenance & Field Service
- Retrofit/ Modernization Services
- Energy Optimization of Drive Systems

#### Product Discontinuation

#### Replacement

- Limited Availability of Spare Parts
- Repair Service is limited to Components
- Retrofit/ Modernization Services
- Energy Optimization of Drive Systems

G\_D081\_EN\_00318

### Commissioning drive systems



#### Our services:

In addition to commissioning plants and systems, we also provide the associated local service for motors, converters and auxiliary equipment for low-voltage variable-speed drives.

We focus on the following sectors and segments:

- Oil and gas
- Chemical industry
- Energy
- Steel
- Paper
- Marine engineering
- Mining
- Cement
- Water/wastewater

#### Auxiliaries:

- Water cooling systems
- Higher-level control systems
- Protective equipment

#### Your advantages at a glance:

- High degree of flexibility and cost advantages thanks to a global network of qualified service personnel
- Direct contact between the customer and manufacturer, in close collaboration with local service centers
- Short communication paths across all organizational levels
- "Global resource management" for global service calls taking into account legal stipulations and tax regulations
- Cross-area drive know-how for the complete system
- Highly qualified specialists for variable-speed drives

Ordering information on our extensive range of services  
→ see Page 6/10.

### Customized training courses for drives



#### Our services:

We offer a wide range of individual training courses to expand existing know-how or to provide basic information on specific topics. These training courses can be designed either as

- local training courses at the customer's site in the form of a workshop, or
- training course in a Siemens factory.

The duration of the training course is adapted to the particular training-specific requirements and necessities. It goes without saying that we can support you in implementing individual training requirements and planning.

#### Your advantages at a glance:

- Establishing and expanding the technical knowledge of the customer's own maintenance and operating personnel
- Independently maintaining and professionally implementing drive-specific maintenance work
- Quickly and competently determining and documenting fault causes → real-time troubleshooting
- In case of a fault situation, the customer's own maintenance personnel are in a position to quickly and reliably make the correct decisions
- Contact can be specifically made to the Siemens service organization with a competent description of the fault
- Providing information and know-how to correctly select and stock a range of important spare parts to ensure quick replacement and resumption of operation in the case of a plant failure

Ordering information on our extensive range of services  
→ see Page 6/10.



# Services and documentation

## Service & Support

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### Maintenance and inspection of drives



#### Our services:

In addition to regular inspections, we also provide the option of entering into specific maintenance contracts. These can be individually tailored to your requirements and specifically expanded by the options that you require.

#### Inspection:

- Determining and documenting the actual condition of electric motors and converters
- Comprehensive plant or system assessment based on checklists that have been specifically developed for this purpose
- Definition of additional measures required, including reporting

#### Maintenance contracts:

- Definition of the required maintenance intervals
- Remote support and availability of a technical contact person
- Agreed fixed inspection dates
- Spare parts, service materials and tools
- Training the service and plant operating personnel of the customer

#### Your advantages at a glance:

- Professional plant investigation and assessment of the plant state
- Determination of the required maintenance work
- Recommendation for an optimum range of spare parts to be stocked
- Estimating possible improvements to operating conditions
- Maximizing the drive lifetime
- Minimizing component wear
- Avoiding non-scheduled production failures and the associated costs
- Monitoring the product lifecycle and providing support on alternatives

Ordering information on our extensive range of services  
→ see Page 6/10.

### Spare parts for drives



#### Our services:

For drives, which generally play an essential role in the production process, in addition to the general service requirements, the availability of spare parts is of crucial significance. In addition to ordering individual spare parts, this is the reason that we now also offer the option of requesting complete packages of spare parts. The essential basis for creating these packages is our extensive experience that we have gained over decades regarding maintenance activities in the drive and component area.

Especially for low-voltage equipment, we recommend the following spare part packages:

- "Basic spare package"  
Spare part package with the most important electronic components, for example for commissioning
- "Premium spare package"  
Comprehensive spare part package, that also includes other spare parts to extend the usage period.

When requested we would be more than willing to also check the stock of spare parts of your plant and to provide you with a quotation to appropriately adapt this stock of spare parts. For instance, this can take place as part of an annual maintenance program.

#### Your advantages at a glance:

- Minimization of fault-related downtimes
- In the case of a fault, no additional waiting times for spare parts to be delivered
- Increased availability of the drive unit
- Individual package content corresponding to the customer and plant requirements over the complete lifecycle

By specifying the device-specific Siemens order number as well as the associated serial number, you can view our "SparesOnWeb" database to obtain spare parts information for almost all of our current drive products.

To do this, use the following link

[https://b2b-extern.automation.siemens.com/spares\\_on\\_web](https://b2b-extern.automation.siemens.com/spares_on_web)

It goes without saying that your local Siemens contact person can provide you with individual quotations for inquiries, and is always available to provide ordering information.

### Remote maintenance – expert knowledge close at hand



#### Our services:

Complex drive systems must have a high availability and when required demand competent and fast support. Specialist personnel cannot always be available locally. This is the reason that we offer you the option of remotely monitoring your plants or systems. Remote maintenance activities such as these include, for example, the following services:

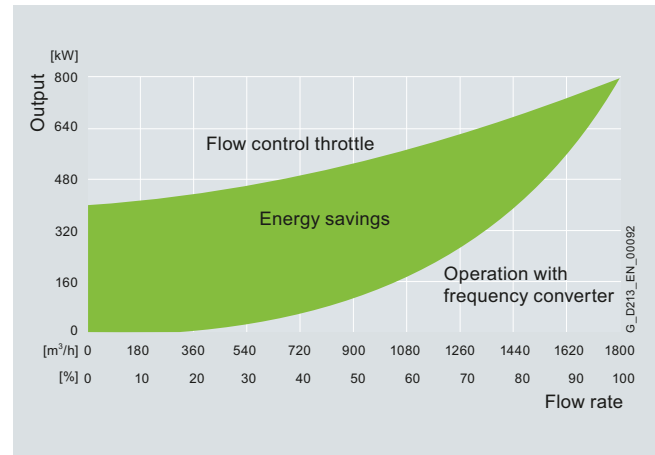
- Online condition monitoring
- Data is stored so that it cannot be lost in the event of a power failure
- Trend analysis, archiving and comparison of the saved data
- When required, expert support from the local service organization
- Video-based support for plant personnel
- Definition of additional measures required, including a report

#### Your advantages at a glance:

- Leading edge technology for highly secure connections with the maximum availability
- High number of supported software applications
- Support service around-the-clock
- Transparency through monitoring and signaling all connections
- Minimizing non-scheduled plant downtimes and avoiding possible subsequent costs
- Increased plant availability
- Basis for condition-oriented maintenance
- Optimization and planning of service and maintenance work
- Careful use of valuable resources by reducing plant visits
- Optimization of the spare part inventory
- Flexibly configured hardware and software concepts, can be appropriately adapted to the corresponding drive system

Ordering information on our extensive range of services  
→ see Page 6/10.

### Energy saving in drive technology



#### Our services:

Drive technology represents about 2/3 of the industrial energy consumed. As a consequence, the efficient use of energy in the drive sector plays a significant role and today represents high cost-saving potential. To optimize the energy usage, we have defined essential measures, which when requested, we can apply in your facility:

- Identification of energy-saving potential  
Determine the actual energy demand and subsequent calculation of the possible energy-saving potential
- Evaluation of the data determined  
By applying various methods, the identified energy-saving potential is evaluated, therefore providing a sound basis for making a decision
- Implementation of measures to optimize energy usage  
Selection of the appropriate products as well as performing specific implementation measures

#### Your advantages at a glance:

- Efficient use of energy by using state-of-the-art, energy-saving drive technology
- Efficient use of energy by changing over to variable-speed drives
- Reduction of the line-side reactive power demand
- Improvement in the starting behavior of motors
- Reduced line harmonics
- Noise reduction by applying state-of-the-art technology
- Optimization of production conditions
- Reduction of wear by adapting the speed

We can offer you a free of charge energy-efficiency software under the following link, which you can use to calculate your own energy-saving potential: where are  
[www.siemens.com/energy-saving](http://www.siemens.com/energy-saving)

# Services and documentation

## Service & Support

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### Retrofitting drives



#### Our services:

Retrofitting drives is one of the most important elements in the product lifecycle. You can only guarantee that your production runs smoothly if your machines, converters and plants operate safely and reliably.

To support you here, we can replace old technology by state-of-the-art converters and motors from our current product portfolio. Generally, it is not necessary to expand functions or plants – or to modify the drive concept.

#### Your advantages at a glance:

- Lower maintenance costs in later phases of the lifecycle
- Increased efficiency
- Process optimization
- Improved energy efficiency and adaptation to prevailing environmental legislation
- Reduced risk as a result of faults

Ordering information on our extensive range of services → see right column.

### Service portfolio

The following services can be directly ordered:

#### Standard inspections

Version	Time	Order No.
SINAMICS low voltage converters, standard version	1 day	<b>9LD1230-0AA11</b>
SINAMICS low voltage converters, connected in parallel	1 day	<b>9LD1230-0AA12</b>
SINAMICS low voltage converters, standard version with water cooling	1 day	<b>9LD1230-0AA14</b>
SINAMICS low voltage converters, connected in parallel with water cooling	2 days	<b>9LD1230-0AA15</b>

#### Service products

Service order type	Order No.
Repair order	<b>9LD1030-0AB00</b>
Product support and maintenance contract	<b>9LD1350-0AB00</b>
Field service call for commissioning and troubleshooting	<b>9LD1130-0AB00</b>
Retrofit order	<b>9LD1550-0AB00</b>

#### Note:

Please contact your local Siemens contact person for questions relating to ordering information and requesting quotations.

For more information, go to:  
[www.siemens.com/ld-service](http://www.siemens.com/ld-service)

## 6

### Extended liability for defects

For our SINAMICS S120 Cabinet Modules and SINAMICS S150 Cabinet units, we also provide the option of extending the liability for defects period beyond the normal period. The standard liability for defects period, as listed in our standard conditions for the supply of services and products, is 12 months.

#### 1) Extended liability for defects when ordering new products

When ordering new products, it is possible to extend the standard liability for defects period for an additional price. Various extension periods can be selected.

Additional ordering data	Additional text
<b>-Z</b> with order code	
<b>Q80</b>	Extension of the liability for defects period by 12 months to a total of 24 months (2 years) after being delivered
<b>Q81</b>	Extension of the liability for defects period by 18 months to a total of 30 months (2½ years) after being delivered
<b>Q82</b>	Extension of the liability for defects period by 24 months to a total of 36 months (3 years) after being delivered
<b>Q83</b>	Extension of the liability for defects period by 30 months to a total of 42 months (3½ years) after being delivered
<b>Q84</b>	Extension of the liability for defects period by 36 months to a total of 48 months (4 years) after being delivered
<b>Q85</b>	Extension of the liability for defects period by 48 months to a total of 60 months (5 years) after being delivered

### Extended liability for defects (continued)

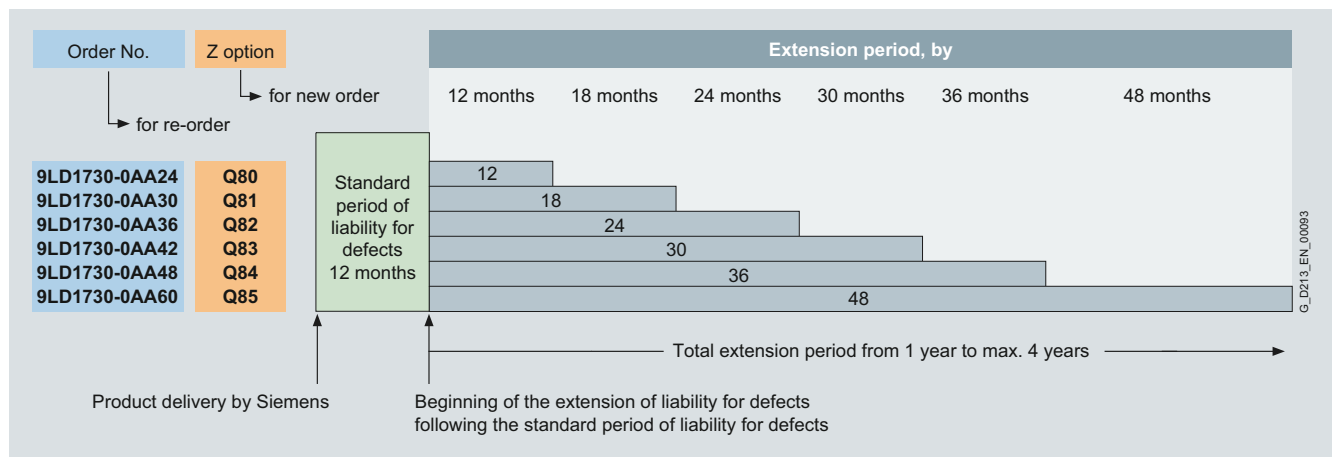
#### 2) Extended liability for defects period after the product has already been delivered

If a product has already been delivered, an extended liability for defects period can be ordered, if the original liability for defects period has still not expired. When ordering, in addition to the order number specified on the type plate, the serial number is also required.

The following order numbers are used:

Extended liability for defects for converters	
Order No.	Text
<b>9LD1730-0AA24</b>	Extension of the liability for defects period by 12 months to a total of 24 months (2 years) after being delivered
<b>9LD1730-0AA30</b>	Extension of the liability for defects period by 18 months to a total of 30 months (2½ years) after being delivered
<b>9LD1730-0AA36</b>	Extension of the liability for defects period by 24 months to a total of 36 months (3 years) after being delivered
<b>9LD1730-0AA42</b>	Extension of the liability for defects period by 30 months to a total of 42 months (3½ years) after being delivered
<b>9LD1730-0AA48</b>	Extension of the liability for defects period by 36 months to a total of 48 months (4 years) after being delivered
<b>9LD1730-0AA60</b>	Extension of the liability for defects period by 48 months to a total of 60 months (5 years) after being delivered

#### Overview of the extended liability for defects



#### Conditions for an extension of the liability for defects:

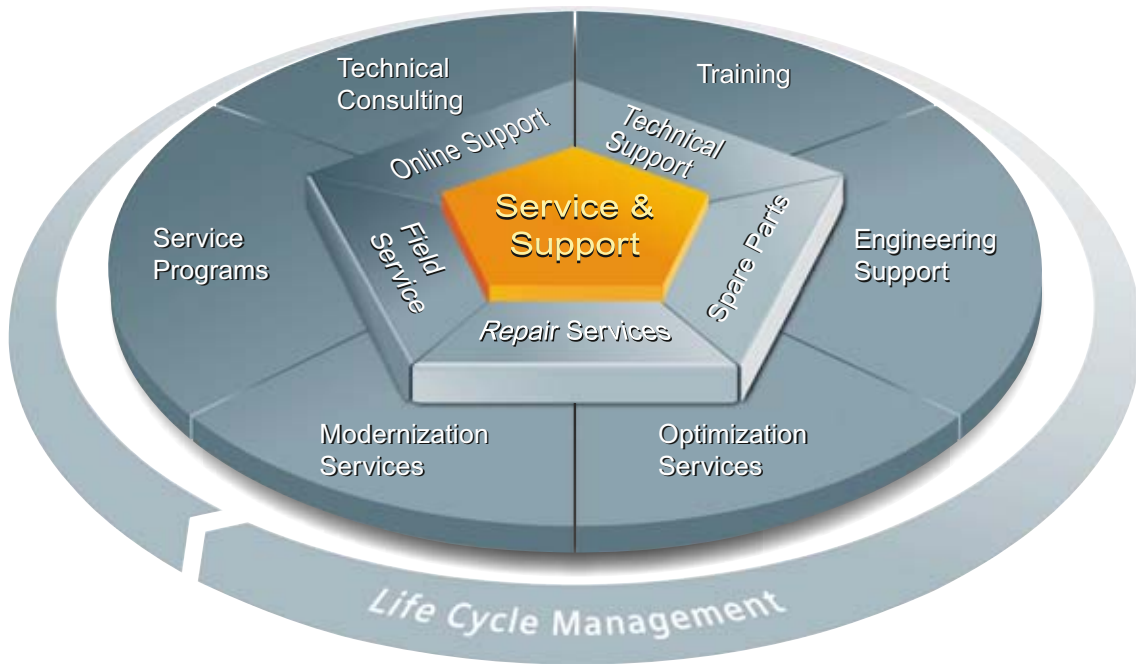
- 1) For all extension periods of liability for defects, for new and subsequent orders, the final destination of the product must be known. The EUNA process is available to obtain this information [www.siemens.com/euna](http://www.siemens.com/euna), which must be performed by your local Siemens contact person.
- 2) For all 4 and 5 year extension periods of the liability for defects (Q84/9LD1730-0AA48, Q85/9LD1730-0AA60), this is only possible in conjunction with a corresponding maintenance contract with regular inspections. This maintenance contract must be signed and concluded with the responsible service department. Feedback on this must be documented using the EUNA procedure under [www.siemens.com/euna](http://www.siemens.com/euna), which must be performed by your local Siemens contact person.
- 3) The generally applicable storage conditions specified in the operating instructions must be carefully observed, especially the specifications regarding long-term storage.
- 4) Commissioning must be carried out by appropriately qualified technical specialists. When making liability for defect claims, under certain circumstances, it may be necessary to submit the commissioning report to the department making the decision.
- 5) The equipment must be regularly maintained, according to the specifications provided in the operating instructions. When making liability for defect claims, under certain circumstances, it may be necessary to submit the corresponding maintenance documentation and history.
- 6) The operating conditions correspond to the specifications and data provided in the operating instructions, in the engineering manual or special conditions specified in the specific contract.
- 7) The extended liability for defects excludes wearing parts such as fans or filters. This does not apply if it can be clearly proven that the failure is a premature one.
- 8) Otherwise, the general conditions regarding liability for defects applies as agreed in the supply agreement.



# Services and documentation

## Service & Support

The unmatched complete service  
for the entire life cycle



For machine constructors, solution providers and plant operators: The service offering from Siemens Industry, Automation and Drive Technologies includes comprehensive services for a wide range of different users in all sectors of the manufacturing and process industry

To accompany our products and systems, we offer integrated and structured services that provide valuable support in every phase of the life cycle of your machine or plant – from planning and implementation through commissioning as far as maintenance and modernization.

Our Service & Support accompanies you worldwide in all matters concerning automation and drives from Siemens. We provide direct on-site support in more than 100 countries through all phases of the life cycle of your machines and plants.

You have an experienced team of specialists at your side to provide active support and bundled know-how. Regular training courses and intensive contact among our employees – even across continents – ensure reliable service in the most diverse areas.

### Online Support



The comprehensive online information platform supports you in all aspects of our Service & Support at any time and from any location in the world.

[www.siemens.com/automation/service&support](http://www.siemens.com/automation/service&support)

### Technical Consulting



Support in planning and designing your project: From detailed actual-state analysis, definition of the goal and consulting on product and system questions right through to the creation of the automation solution.

### Technical Support



Expert advice on technical questions with a wide range of demand-optimized services for all our products and systems.

[www.siemens.com/automation/support-request](http://www.siemens.com/automation/support-request)

### Training



Extend your competitive edge – through practical know-how directly from the manufacturer.

[www.siemens.com/sitrain](http://www.siemens.com/sitrain)

Contact information is available in the Internet at:  
[www.siemens.com/automation/partner](http://www.siemens.com/automation/partner)

# Services and documentation

## Service & Support

The unmatched complete service  
for the entire life cycle

### Engineering Support



Support during project engineering and development with services fine-tuned to your requirements, from configuration through to implementation of an automation project.

### Modernization



You can also rely on our support when it comes to modernization – with comprehensive services from the planning phase all the way to commissioning.

### Field Service



Our Field Service offers you services for commissioning and maintenance – to ensure that your machines and plants are always available.

### Service programs



Our service programs are selected service packages for an automation and drives system or product group. The individual services are coordinated with each other to ensure smooth coverage of the entire life cycle and support optimum use of your products and systems.

The services of a Service Program can be flexibly adapted at any time and used separately.

### Spare parts



In every sector worldwide, plants and systems are required to operate with constantly increasing reliability. We will provide you with the support you need to prevent a standstill from occurring in the first place: with a worldwide network and optimum logistics chains.

Examples of service programs:

- Service contracts
- Plant IT Security Services
- Life Cycle Services for Drive Engineering
- SIMATIC PCS 7 Life Cycle Services
- SINUMERIK Manufacturing Excellence
- SIMATIC Remote Support Services

Advantages at a glance:

- Reduced downtimes for increased productivity
- Optimized maintenance costs due to a tailored scope of services
- Costs that can be calculated and therefore planned
- Service reliability due to guaranteed response times and spare part delivery times
- Customer service personnel will be supported and relieved of additional tasks
- Comprehensive service from a single source, fewer interfaces and greater expertise

### Repairs



Downtimes cause problems in the plant as well as unnecessary costs. We can help you to reduce both to a minimum – with our worldwide repair facilities.

### Optimization



During the service life of machines and plants, there is often a great potential for increasing productivity or reducing costs. To help you achieve this potential, we are offering a complete range of optimization services.

Contact information is available in the Internet at:  
[www.siemens.com/automation/partner](http://www.siemens.com/automation/partner)

## Documentation

### Overview

#### *SINAMICS S120 Cabinet Modules and SINAMICS S150 Converter Cabinet Units*

The documentation is provided as standard in the PDF format on CD-ROM, and comprises the following sections:

- Description
- Installation instructions
- Commissioning guide
- Function description
- Service Manual
- Engineering Manual
- Lists of spare parts

As well as device-specific documentation, such as circuit diagrams, dimension drawings, layout diagrams and terminal diagrams.

The documentation is provided in English/German as standard supplied with the device.

The scope of delivery also includes a CD-ROM with the STARTER commissioning tool.

If one of the languages subsequently listed is required, when ordering this must be specified using the corresponding option order code (→ [Description of the options](#)):

Language	Order code
English/French	<b>D58</b>
English/Spanish	<b>D60</b>
English/Italian	<b>D80</b>

#### *SINAMICS S120 Chassis Format Units*

The documentation must always be ordered separately from the device delivery, in the required language and number of copies.

Information is available in the following formats:

- **Paper version**, printed
- **PDF file** on the SINAMICS Manual Collection

Additional information regarding the availability of documents and languages is available under [www.siemens.com/motioncontrol](http://www.siemens.com/motioncontrol) via → Support → Technical documentation.

## Appendix



7/2	<b>Glossary</b>
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7/10	Software licenses
7/11	Setup texts and software update services
7/12	<b>Partner at Industry Automation and Drive Technologies</b>
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7/13	Product selection with the Offline Mall of Industry
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7/14	<b>Subject index</b>
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7/19	<b>Export regulations</b>
7/20	<b>CD-ROM for Catalog D 21.3 · 2011</b>



## Glossary

**Absolute encoder**

Position encoder, which immediately provides the actual position of the drive as absolute value after its power supply voltage has been switched on. For singleturn encoders the sensing range is one revolution, and for multiturn encoders, many revolutions (for example, 4096 revolutions is typical). When using an absolute encoder as positioning encoder, after switching on, a reference point approach is not required and the reference switch, which is otherwise required for this purpose, can be eliminated (e.g. BERO proximity switch).

There are rotary and linear absolute encoders.

Examples of absolute encoders:

1FK and 1FT motors can be supplied with integrated multiturn absolute encoders with 2048 sine/cosine signals per revolution over 4096 revolutions absolute → EnDat protocol.

**Active Infeed**

Overall functionality of an infeed with → Active Line Module, including the required supplementary components (filter, switch-gear, percentage component of the computational performance of a → Control Unit, voltage sensing, etc.).

**Active Interface Module**

This module includes the line-side components required for an → Active Line Module, for example the pre-charging circuit (pre-charging resistors and bypass contactor).

**Active Line Module**

Controlled, self-commutated infeed/regenerative feedback unit (with IGBTs in the infeed and regenerative feedback directions), which provides a constant DC link voltage for the → Motor Modules. The Active Line Module operates together with the → line reactor as step-up controller.

**Advanced Operator Panel (AOP)**

User-friendly, graphics-capable operator panel, where measured values are displayed in plain text or in a quasi analog form with a bar-type display.

**Automatic restart**

The automatic restart function automatically switches a converter on when the line supply returns after a power failure, without the power failure fault having to be acknowledged. The automatic restart function can, for example, minimize drive downtimes and production failures.

However, a potentially dangerous situation has to be taken into account, which can occur if a drive, after a longer power failure, automatically restarts without operating personnel having intervened. In this type of dangerous situation, when required an external control function can be used (e.g. withdrawing the ON command) to ensure safe operation.

Typical applications for the automatic restart function include pump, fan and compressor drives, which operates as single drives and frequently have no local control. The automatic restart function is not used for coordinated drives for continuous material webs and motion control.

With SINAMICS, the following versions of the automatic restart function can be set by parameter:

- Restart after the power fails, if the 24 V electronics power supply is still available
- Restart after the 24 V electronics power supply fails
- Restart after any fault shutdown

The following actions can be parameterized:

- Only acknowledgment of the power failure signal (e.g. for multi-motor drives, DC drive line-up)
- ON command after a parameterized wait time has expired
- ON command with flying restart

The number of start attempts, which are performed within a parameterizable time, can be set.

In addition to the automatic restart function, the → flying restart function can be activated, so that the converter can be bumplessly connected to a motor that is possibly still rotating.

**Auxiliary Power Supply Module (APSM)**

Auxiliary Power Supply Modules supply the auxiliary power system for the SINAMICS S120 Cabinet Modules.

For instance, the fans of SINAMICS S120 units and electronic modules with an external 24 V DC voltage are connected to this.

**Basic Line Module**

Uncontrolled infeed unit (diode bridge or thyristor bridge, without regenerative feedback) to rectify the line voltage for the → DC link.

**Basic Operator Panel**

Basic, small operator panel that is plugged onto a SINAMICS → Control Unit with a numerical display and a few buttons.

The BOP20 is available in the SINAMICS product range.

**Blocksize**

A drive unit in a block-shaped mechanical design to optimize envelope dimensions. This is generally used to drive one motor.

See → Booksize, → chassis unit.

**Booksize**

A booksize component format is suitable for lining up drives in a group. This format is generally used to operate several → motors.

**Booksize Base Cabinet**

Booksize Base Cabinets are cabinet modules to accommodate devices in the booksize format. They include all of the components that are required in the cabinet to operate the devices. Booksize Base Cabinets are always supplied together with the required devices in the booksize format as preconfigured Booksize Cabinet Kits and as part of the SINAMICS S120 Cabinet Modules.

**Booksize Cabinet Kit**

Motor Modules in the booksize format are factory-installed as Booksize Cabinet Kits in Booksize Base Cabinets and delivered as a complete unit including cabinet-side connection components. A Cabinet Kit contains all the necessary components for operating a SINAMICS S120 Booksize device.

**Brake control**

This is a software function, which defines when a mechanical holding brake or operating brake (if one is being used) should be applied; either within the scope of a load cycle at standstill or in the case of a fault condition.

**Braking Module**

Electronic switches or choppers (braking chopper), which switch → a braking resistor to the DC link voltage with a specific mark-to-space ratio to convert regenerative (braking) energy into thermal energy with the objective of limiting the DC link voltage to permissible values. For SINAMICS, the Braking Module has no integrated braking resistor. This should be mounted outside the Braking Module.

**Braking power**

Regenerative power, which is injected from one or several → Motor Modules into the → DC link, for example when lowering a load or when braking a motor.

See → braking resistor.

**Braking resistor**

Resistor, which is used to dissipate the excess energy in the → DC link. The braking resistor is connected to a → Braking Module.

As a consequence the power loss is dissipated outside the cabinet.

See → braking power.

**CBC10 Communication Board**

Module for interfacing to a bus system according to the CAN protocol (Controller Area Network).

The board's driver software fulfills the standards of the following CANopen specification of the CiA organization (CAN in Automation):

- Communication profiles in accordance with DS 301
- Drive profile in accordance with DSP 402 (in this case Profile Velocity Mode)
- EDS (Electronic Data Sheet) in accordance with DSP 306
- Signals the operating state according to DSP 305

**CBE20 Communication Board**

Module for operation with → PROFINET (open industrial Ethernet Standard of the PROFIBUS User Organization for automation).

This permits PROFINET IO with IRT (Isochronous Real Time) and PROFINET IO with RT (Real Time) to be run. The module is inserted in the option slot of a → Control Unit.

**Central Braking Module (CBM)**

The CBM limits the DC link voltage at a central location in the drive line-up when the motors are operating in the generator mode and energy recovery to the line supply is not possible.

**Chassis unit**

Generally chassis units are used in the upper power range, and these are installed in cabinets. The components are mounted on support plates or in racks.

See → Booksize → Blocksize.

**Cold plate cooling**

Cold plate cooling is a → cooling type for SINAMICS power units, which at the present time is only available for → booksize units. Instead of the standard ribbed heat sink, the Cold plate is mounted at the rear of the units.

**Cold plate**

The Cold plate is a flat aluminum cooling plate, which is used for the SINAMICS power units with the → cooling type → Cold plate cooling as thermal interface.

**Command data set**

Parameter data set, in which binector inputs (e.g. for control commands) and connector inputs (e.g. for setpoints) are combined.

The individual data sets are shown as indexed parameters. Input signals are used to switchover the data sets.

By appropriately parameterizing several command data sets and switching over the data sets, the drive can be optionally operated with different preconfigured signal sources.

**Communication Board**

Module for external communication, e.g. → PROFIBUS, → PROFINET, CAN or Ethernet. The module is inserted in the option slot of a → Control Unit.

**CompactFlash card**

Memory card to save the drive software and the associated parameters in a non-volatile fashion. The memory card can be inserted into the → Control Unit from the outside.

**Control Unit**

Central control module in which the open-loop and closed-control functions for one or several SINAMICS → Line Modules and/or → Motor Modules are realized.

**Cooling**

Dissipating the power loss from the converter and/or motor in order that permissible temperatures are not exceeded.

## Glossary

**DC link**

A part of the converter (or converter system) that connects the input converter (rectifier) with the output converter (one or several inverters).

For a voltage DC link converter such as SINAMICS, the DC link always has a constant DC voltage (rectified line voltage).

**Direct measuring system**

Position encoder, which is directly coupled to the moving machine part, and the associated evaluation electronics. Linear scales can be used for this purpose for linear axes.

In many cases, a direct measuring system must be used. The reason for this is that a → motor encoder is not suitable for sensing the position and closed-loop position control, for example because the elasticities and backlash in the drive train are too high.

**Double Motor Module**

Two motors can be connected and operated at a Double Motor Module.

See → Motor Module, → Single Motor Module.

**Drive system**

A drive system comprises all of the components belonging to a drive of a product family, e.g. SINAMICS. A drive system includes, for example → Line Modules, → Motor Modules, → encoders, → motors, → Terminal Modules and → Sensor Modules – as well as supplementary components such as reactors, filters, cables etc..

**DRIVE-CLiQ**

Abbreviation for "Drive Component Link with IQ".

Communication system to link the various components of a SINAMICS drive system, for example → Control Unit, → Line Modules, → Motor Modules, → motors and speed/position encoders.

From a hardware perspective, DRIVE-CLiQ is based on the standard Industrial Ethernet with twisted-pair cables. In addition to the send and receive signals, the +24 V power supply is also provided via the DRIVE-CLiQ cable.

**Droop**

Using droop, the speed controller is artificially made softer by connecting an adjustable percentage of the speed controller output signal – with a negative sign – to the speed controller input. As a consequence, for a higher load torque, the speed dips slightly. Droop is used to lessen the response to load surges, and for certain versions of the load equalization control of drives, which are coupled with one another through a continuous material web. The  $I$  component or the summed output signal can be used as speed controller output signal. Droop can be activated and deactivated using a control command.

**Dynamic Servo Control**

Dynamic Servo Control (DSC) allows the position actual value to be directly evaluated in the drive in the fast speed control cycle. The position setpoint is entered in the position control cycle from the higher-level control via the isochronous → PROFIBUS with → PROFIdrive telegrams.

With DSC, using a sophisticated signal filtering and pre-control, optimum dynamic performance can be achieved in the position control loop with low associated impact on the bus bandwidth.

DSC permits high controller gains and therefore a high degree of stiffness; this means that load-related path deviations can be quickly corrected.

**Edge modulation**

Modulation mode of a converter gating unit, where the pulses "cutout" from the DC link voltage to not appear in a fixed time grid. The edges of the output voltage generated, are formed by several short pulses (around the zero crossover), while at the center of each half wave, a wide pulse is generated. As a consequence, a high output voltage with the order of magnitude of 100 % of the line supply voltage is possible – and in turn, good motor utilization.

**Electronic type plate**

Every component of the SINAMICS drive system, which is connected via → DRIVE-CLiQ, has an electronic type plate.

The electronic type plate can be read out using the → STARTER commissioning tool and includes the following data: Type, order number, version, manufacturer, serial number and rated data.

**Encoder**

An encoder is a measuring system, that senses the speed, angle or position actual values and provides these for electronic processing. Depending on the mechanical version, encoders can be mounted in the → motor (→ motor encoder) or on the external mechanical system. Depending on the type of motion, a distinction is made between rotary encoders and translatory encoders (e.g. linear scale). A distinction is made between → absolute encoders and → incremental encoders according to how the measured value is provided.

See → incremental encoder, TTL/HTL, → incremental encoder, sin/cos 1 V<sub>pp</sub>, → resolver.

**EnDat protocol**

Serial data transfer protocol to transfer position/angle actual values from an → absolute encoder to the drive control or position control.

It is also possible to parameterize the encoder and perform diagnostics using the EnDat protocol.

**Fault buffer**

The drive enters faults that have occurred into a fault buffer. The fault buffer can be read-out using parameters.

### Field weakening

Field weakening involves reducing the magnetizing current of an electric motor, so that when the rated voltage is reached, the speed can still be increased further.

### Flexible response

For a line voltage dip resulting in a minimum DC link voltage of approximately 50 % of the rated value (or the parameterized line voltage value), using this function, the converter can still be operated. For a voltage dip, the maximum output power of the converter is reduced corresponding to the actual line voltage.

Contrary to → kinetic buffering, a speed dip can be avoided, as long as the remaining power is sufficient to still operate the drive with the demanded torque.

### Flying measurement

If a hardware signal is received, the instantaneous position actual value is saved and is provided for further processing, e.g. via PROFIBUS. The hardware signal can be received, for example from a measuring probe or a print mark acquisition sensor (mechanical switch, BERO or an optical sensor). The active edge of the hardware signal can be parameterized (rising, falling or both).

### Flying restart

After the converter has been switched on, the flying restart function allows it to be automatically connected to a motor that is possibly coasting down. When connecting to a motor that is rotating, for an → induction motor, the motor must first be magnetized. For drives without encoder, the converter also searches for the actual speed. The actual speed setpoint is then set in the ramp-function generator to the speed actual value.

The drive ramps up to the final setpoint from this value. After the converter has been switched on, the flying restart function can help to shorten the ramp-up procedure if the load is still coasting down.

Application example:

Using the flying restart function, after a power failure, a fan drive can be quickly connected to the fan impeller that is still rotating.

See → Automatic restart.

### Hub

Central connecting device in a network with a star-type topology. A hub takes data packages that it receives, and distributes them to all of the connected terminal devices.

### Incremental encoder

Incremental distance and speed encoder, which contrary to an → absolute encoder, does not output a position actual value signal corresponding to the actual distance, but instead, incremental "delta distance or angle signals".

For incremental encoders, a distinction is made between → TTL/HTL incremental encoders, → sin/cos 1  $V_{pp}$  incremental encoders and → resolvers.

### Incremental encoder sin/cos 1 $V_{pp}$

This involves a high-resolution, optical sine-cosine encoder, which is installed as → motor encoder in 1FK motors.

Typically, the following signals are output:

- Two signals, offset through 90 degrees, each with 2048 sinusoidal signal periods for each revolution as differential signal with an amplitude of 1  $V_{pp}$  ("A/B fine tracks")
- a reference signal (zero pulse) each revolution, as differential signal with an amplitude of 0.5  $V_{pp}$
- for several types, in addition, two sinusoidal signal periods, offset through 90 degrees as differential signals with an amplitude of 1  $V_{pp}$  ("C/D track")

To determine the actual position or angle value, initially an evaluation of the zero crossovers of the fine tracks is made (coarse evaluation, e.g. a total of  $4 \times 2048 = 8192$  zero crossovers per revolution). Further, the amplitude of a fine evaluation can be sensed using an analog signal acquisition. Resolutions of over 1.000.000 increments for each encoder revolution can be achieved by combining coarse and fine evaluation.

Typical sin/cos encoders are, for example: ERN1387, ERN1381.

### Incremental encoder TTL/HTL

Incremental distance and speed measuring encoders, which generally output two pulse trains (tracks), offset through 90 degrees, with square wave output signals and generally also 1 zero pulse per revolution. The output signals have a TTL level (generally, +5 V RS422 differential signals; TTL = Transistor-Transistor Logic) or HTL level (logic level, + 15 V or + 24 V; HTL = High Level Transistor Logic).

### Induction motor

An induction motor is a 3-phase motor whose speed lags somewhat behind the synchronous speed.

Induction motors can be connected in either a star or delta connection; they can also be connected to a three-phase line supply through a converter. Together with a converter, the induction motor becomes a "variable-speed drive system". Another commonly used name: squirrel-cage induction motor.

Also refer to → synchronous motor.

### IPD card

The Control Interface Module (electronics module) belonging to the SINAMICS power units includes an IPD Card (Individual Powerstack Data), on which device-specific data are saved.

### Line Connection Module

Line Connection Modules contain the line-side infeed with main switch with fuse switch disconnect or circuit breaker and provide the connection between the line supply on the plant side and the → Line Modules.

## Glossary

### Line filter

Line filters are filters at the converter input, which filter out harmonics and/or noise voltages generated in the converter, to prevent them from being injected into the line supply.

Line filters can either be passive or active filters; on one hand for low-frequency harmonics with 5, 7, 11, 13 etc. times the line frequency (called line harmonics), or on the other hand, filters for high-frequency noise voltages starting at 10 kHz (i.e. radio interference suppression filters).

For SINAMICS, line filters are exclusively passive radio interference suppression filters.

### Line Module

A Line Module is a power unit, which generates the DC link voltage for one or several → Motor Modules from a three-phase line supply.

For SINAMICS there are three types of Line Modules:

→ Basic Line Module, → Smart Line Module and  
→ Active Line Module.

### Line reactor

Line reactors limit low-frequency line harmonics to permissible values. In conjunction with → Active Line Modules, they also serve as energy storage device.

### Line-side power components

Power components such as line reactors, line filters, line contactors etc., located between the line supply and converter.

### Liquid cooling

Liquid cooling is a → cooling type for SINAMICS power units and is only available for the → chassis units. For this type of cooling, the devices have an integrated liquid cooler with intake and outlet connections. Only the specifications provided by Siemens AG apply to the liquid quality and the flow rate (amount of coolant per unit time). Liquid cooling can also be provided by the customer for the → Cold plate cooling type (for booksize).

### Motor

Electric motors controlled from SINAMICS are classified, regarding the type of motion, as either rotary or linear, and regarding the electromagnetic principal of operation, either synchronous or induction. For SINAMICS, the motors are connected to a → Motor Module.

See → Synchronous motor, → Induction motor,  
→ Motor encoder.

### Motor encoder

An → encoder, e.g. → resolver, → TTL/HTL incremental encoder or → sin/cos  $1 V_{pp}$  incremental encoder is integrated in the motor.

The encoder is used to sense the motor speed. For synchronous motors, it is also used to sense the rotor position angle (of the commutation angle for the motor currents).

For drives without an additional → direct measuring system, it is also used as a position encoder for closed-loop position control.

### Motor Module

A Motor Module is a power unit (DC-AC inverter), which provides the energy for the connected motor.

The energy is supplied via the → DC link of the drive line-up.

A Motor Module must be connected to a → Control Unit via → DRIVE-CLiQ; the open-loop and closed-loop control functions for the Motor Module are saved in the Control Unit.

There are Single Motor Modules and for booksize format units, also Double Motor Modules.

### Motor reactor

Reactor "inductance" at the converter or inverter output to reduce capacitive re-charging currents common to long power cables.

### Motor with DRIVE-CLiQ

Motors with → DRIVE-CLiQ comprise a motor, encoder and an integrated encoder evaluation. To operate these motors, starting from a → Motor Module, a → power cable and a → DRIVE-CLiQ cable should be connected.

### Motorized potentiometer

Using this function, an electromechanical motorized potentiometer is emulated to enter setpoints. The setpoint is adjusted using one control command each for "raise" and "lower".

### Optimized pulse pattern

Complex modulation technique of a converter gating unit, where the voltage pulses are arranged so that the output current has the best possible approximation to a sinusoidal characteristic. This is essential if a high modulation depth and an optimally low torque ripple are to be achieved.

### Power components on the motor side

Power components, for example output filter, output reactors etc., located between the converter and the motor.

### Power Module

A Power Module is an AC-AC converter without integrated → Control Unit.

### PROFIBUS

Standardized fieldbus according to IEC 61158, Parts 2 to 6.

### PROFIdrive

PROFIBUS profile for closed-loop speed and position control drives specified by PI (PROFIBUS & PROFINET International).

### PROFINET

Open component-based industrial communication system based on → Ethernet for distributed automation systems.



**Resolver**

A mechanically and electrically very rugged and favorably-priced → motor encoder, that has no integrated electronics and operates purely according to the electromagnetic principle: One sinusoidal and one cosinusoidal signal are induced in two coils offset through 90 degrees. The resolver supplies all of the signals necessary for closed-loop speed controlled operation of the converter or for closed-loop position control. The number of sinusoidal and cosinusoidal periods supplied per revolution is the same as the pole pair number of the resolver. For a two-pole resolver, the evaluation electronics can output an additional zero pulse for each encoder revolution. This allows a unique assignment of the position information to be made referred to one encoder revolution. A two-pole resolver can be used as singleturn encoder.

Two-pole resolvers can be used for motors with any number of poles. For multi-pole resolvers, the motor and resolver must always have the same numbers of pole pairs. Multi-pole resolvers have a correspondingly higher resolution than two-pole resolvers

**Safe Brake Control**

Function provided in → Safety Integrated.

For SINAMICS devices in the → booksize format, the motor holding brake is controlled through two channels using one electronic switch each in the + 24 V channel and in the ground channel. Both the channels are monitored. If one of the two channels fails, this is identified and signaled. For booksize devices, the brake cable is integrated in the power cable.

See → Brake control.

**Safe standstill**

"Safe Torque Off" function provided by → Safety Integrated (according to the new definition, replaces the term "Safe standstill").

In the case of a fault or in conjunction with a machine function, this function safely disconnects the torque-generating energy feed to the motor. This is realized on a drive-for-drive basis and is contactless. See → Safety Integrated.

**Safe Stop 1 (SS1)**

The Safe Stop 1 function can safely stop the drive in accordance with EN 60204-1, Stop Category 1. When the SS1 function is selected, the drive independently brakes along a quick stop ramp and automatically activates Safe Torque Off when the parameterized safety delay time has expired.

**Safe Torque Off (STO)**

This function is a mechanism that prevents the drive from restarting unexpectedly, in accordance with EN 60204-1, Section 5.4. This cancels the drive pulses and disconnects the energy feed to the motor. The drive is reliably torque-free.

**Safety Integrated**

Safety functions integrated in the product for effective protection of persons and machinery according to the EC Machinery Directive 98/37/EC.

The integrated safety functions allow the requirements according to DIN EN ISO 13849-1 Category 3 (previously EN 954-1), Performance Level (PL) d and according to IEC 61508 (SIL) 2 to be fulfilled simply and in a cost-effective fashion.

**Sensor Module**

Hardware module to evaluate speed/position encoder signals.

**Sine-wave filter**

The sine-wave filter is connected at the output of a converter or inverter. This involves a filter to generate a converter output voltage that is as close as possible to a sinusoidal characteristic.

This protects the insulation system of motors that are sensitive to voltage peaks.

Further, in many cases, it is not necessary to use shielded power cables.

In the chemical industry, in some instances sine-wave filters are required in order that the permissible insulation voltage is not exceeded, for example in the motor terminal box.

**Single Motor Module**

A Single Motor Module is a → Motor Module, to which precisely one motor can be connected and operated.

See also → Double Motor Module.

**SIZER for Siemens Drives**

SIZER for Siemens Drives is the engineering tool for the SINAMICS and MICROMASTER drive systems. SIZER for Siemens Drives can be used to engineer drive systems and to select the drive components required for the system.

See → STARTER.

**Skip frequency band**

A skip frequency band is a speed or frequency setpoint range that may not be used in operation. The upper and lower limits of the skip frequency band can be parameterized. If a signal value is entered from an internal or external setpoint source, which lies in the skip frequency band, then this is replaced by one of the skip frequency band limits. As a consequence, undesirable mechanical resonance effects can be suppressed by inhibiting those speeds that can excite these.

**Smart Line Module**

Uncontrolled infeed/regenerative feedback unit with diode bridge for the infeed and commutation fault-proof, line-commutated regenerative feedback into the line supply via IGBT (Insulated Gate Bipolar Transistor).

The Smart Line Module provides the DC link voltage for the → Motor Modules.

**SS1**

See → Safe Stop 1.

**STARTER**

The STARTER commissioning tool is used to commission and parameterize drive units. Further, if service is required, the necessary diagnostic functions can be executed (e.g. PROFIBUS diagnostics, function generator, trace).

See → SIZER for Siemens Drives.

## Glossary

**STO**

See → Safe Torque Off.

**Synchronous motor**

Synchronous motors operate precisely with the frequency with which they are operated. They have no slip (as is the case for → induction motors). Depending on their version, synchronous motors require different open-loop and closed-control concepts so that they can be controlled from a converter.

A distinction is made between the following synchronous motors

- permanent magnet/separately excited
- with/without damping cage
- with/without position encoder

Synchronous motors are used for various reasons:

- high drive dynamic performance (→ Synchronous servo motors)
- high overload capability
- high-speed accuracy when the frequency is precisely entered (SIEMOSYN motors)

**Synchronous servomotor**

Synchronous servomotors (e.g. 1FK, 1FT) are permanent-magnet → synchronous motors with position encoders such as → absolute encoders. The low intrinsic moments of inertia permit an extremely high dynamic performance of the drive to be achieved. As there are no rotor copper losses, a high power density can be achieved with associated low envelope dimensions. Synchronous servomotors can only be operated in conjunction with converters. The servo control required results in a torque-dependent motor current, whose instantaneous phase position is derived from the (mechanical) rotor position, determined using a position encoder.

**Terminal Board**

Terminals expansion board that is inserted in a → Control Unit.

For SINAMICS, the Terminal Board TB30 is available with analog and digital I/O terminals.

**Terminal Module**

Terminal expansion module that is snapped onto a mounting rail in the cabinet.

For SINAMICS, there is the TM31 Terminal Module with analog and digital I/O terminals as well as the TM15 Terminal Module with digital I/O terminals.

**Topology**

The topology describes the structure of a drive system with → Control Unit, → Motor Modules, → motors, → encoders, → Terminal Modules including the connection system.

**Travel to end stop**

Using this function, a motor can be traversed to a fixed end stop with a defined torque/force without a fault being signaled. When the end stop is reached, the torque/force defined using a parameter is established and is kept.

**Unlisted motor**

A motor is considered to be an unlisted motor if its motor data are not known to the drive line-up and cannot be identified using its order number.

When commissioning an unlisted motor, its motor data are required and must be manually entered into the appropriate parameters.

**Vector control**

Vector control (field-oriented control) is a high quality, sophisticated control mode for induction motors. The basis is a precise algorithm-based model of the motor and two current components, which emulate the flux and the torque in software so that they can be precisely controlled. As a consequence, the entered speeds and torques can be precisely maintained and limited with a good dynamic performance.

Vector control is available in two versions:

- as frequency control (sensorless vector control)
- as speed-torque control with speed feedback (→ encoder).

**Voltage Sensing Module**

Components that acquire the actual voltage value and provide it via → DRIVE-CLiQ. It is used in conjunction with an → Active Line Module (→ Smart Line Module, → Motor Module) to feedback the voltage actual value.

The components can be mounted on a rail and also have 2 analog inputs and a connection for a temperature sensor.







## Overview

Many of the products in this catalog are compliant with UL/CSA and FM requirements and are marked with the appropriate approval symbol.

All approvals or certifications have been realized with the associated system components, as described in the catalogs and/or engineering manuals. As a consequence, they are only valid if the described system components are actually used in the device or the system.

### **UL: Underwriters Laboratories** *Independent testing body in North America*

#### Test codes:

-  for end products, tested by UL according to the UL standard
- c for end products, tested by UL according to the CSA standard
- cus for end products, tested by UL according to UL and CSA standards
-  for components to be used in end products, tested by UL according to the UL standard
- c for components to be used in end products, tested by UL according to the CSA standard
- cus for components to be used in end products, tested by UL according to UL and CSA standards

#### Test standards:

- SIMOTION: Standard UL 508
- SINAMICS: Standard UL 508C

#### Product category/File-No.:

- SIMOTION: E164110
- SINAMICS: E192450
- Line reactors, motor reactors: E257859
- Line filters: E1283
- dv/dt filters: E224872
- Sine-wave filter: E219022
- TM15: E164110

### **TUV: TUV Rheinland of North America Inc.** *independent testing body in North America* *National recognized testing laboratory (NRTL)*

#### Test code:

- **cTUVus** Tested by TUV according to UL and CSA standards

### **CSA: Canadian Standards Association** *independent testing body in Canada*

#### Test code:

-  Tested by CSA according to the CSA standard

#### Test standard:

- Standard CAN/CSA-C22.2 No. 14-Industrial Control Equipment/No. 14-05/No. 14-M95/No. 142-M1987



## Software Software licenses

### Overview

#### Software types

Software requiring a license is categorized into types. The following software types have been defined:

- Engineering software
- Runtime software

#### Engineering software

This includes all software products for creating (engineering) user software, e.g. for configuring, programming, parameterizing, testing, commissioning or servicing.

Data generated with engineering software and executable programs can be duplicated for your own use or for use by third-parties free-of-charge.

#### Runtime software

This includes all software products required for plant/machine operation, e.g. operating system, basic system, system expansions, drivers, etc.

The duplication of the runtime software and executable programs created with the runtime software for your own use or for use by third-parties is subject to a charge.

You can find information about license fees according to use in the ordering data (e.g. in the catalog). Examples of categories of use include per CPU, per installation, per channel, per instance, per axis, per control loop, per variable, etc.

Information about extended rights of use for parameterization/configuration tools supplied as integral components of the scope of delivery can be found in the readme file supplied with the relevant product(s).

#### License types

Siemens Industry Automation & Drive Technologies offers various types of software license:

- Floating License
- Single License
- Rental License
- Trial License
- Factory License

#### Floating license

The software may be installed for internal use on any number of devices by the licensee. Only the concurrent user is licensed. The concurrent user is the person using the program. Use begins when the software is started.

A license is required for each concurrent user.

#### Single license

Unlike the floating license, a single license permits only one installation of the software.

The type of use licensed is specified in the ordering data and in the Certificate of License (CoL). Types of use include for example per device, per axis, per channel, etc.

One single license is required for each type of use defined.

#### Rental license

A rental license supports the "sporadic use" of engineering software. Once the license key has been installed, the software can be used for a specific number of hours (the operating hours do not have to be consecutive).

One license is required for each installation of the software.

#### Trial license

A trial license supports "short-term use" of the software in a non-productive context, e.g. for testing and evaluation purposes. It can be transferred to another license.

#### Factory License

With the Factory License the user has the right to install and use the software at one permanent establishment only. The permanent establishment is defined by one address only. The number of hardware devices on which the software may be installed results from the order data or the Certificate of License (CoL).

#### Certificate of License

The Certificate of License (CoL) is the licensee's proof that the use of the software has been licensed by Siemens. A CoL is required for every type of use and must be kept in a safe place.

#### Downgrading

The licensee is permitted to use the software or an earlier version/release of the software, provided that the licensee owns such a version/release and its use is technically feasible.

#### Delivery versions

Software is constantly being updated. The following delivery versions

- PowerPack
- Upgrade

can be used to access updates.

Existing bug fixes are supplied with the ServicePack version.

#### PowerPack

PowerPacks can be used to upgrade to more powerful software. The licensee receives a new license agreement and CoL (Certificate of License) with the PowerPack. This CoL, together with the CoL for the original product, proves that the new software is licensed.

A separate PowerPack must be purchased for each original license of the software to be replaced.

#### Upgrade

An upgrade permits the use of a new version of the software on the condition that a license for a previous version of the product is already held.

The licensee receives a new license agreement and CoL with the upgrade. This CoL, together with the CoL for the previous product, proves that the new version is licensed.

A separate upgrade must be purchased for each original license of the software to be upgraded.

#### ServicePack

ServicePacks are used to debug existing products. ServicePacks may be duplicated for use as prescribed according to the number of existing original licenses.

#### License key

Siemens Industry Automation & Drive Technologies supplies software products with and without license keys.

The license key serves as an electronic license stamp and is also the "switch" for activating the software (floating license, rental license, etc.).

The complete installation of software products requiring license keys includes the program to be licensed (the software) and the license key (which represents the license).

Detailed explanations concerning license conditions can be found in the "Terms and Conditions of Siemens AG" or at [www.siemens.com/industrymall](http://www.siemens.com/industrymall) (Industry Mall Online-Help System)

**Overview**

The "General License Conditions for Software Products for Automation and Drives" are applicable for supplies and deliveries of I DT software products.

**Legal notes during setup for new software products**

All software products feature a uniform reference to the license conditions. The license conditions are enclosed either with the documentation or in the software pack. When software is downloaded from the Internet, the license contract is displayed before the ordering procedure and must be accepted by the user before downloading can continue.

**Notice:**

This software is protected by German and/or US copyright laws and the regulations of international agreements. Unauthorized reproduction or sale of this software or parts of it is a criminal offense. This will lead to criminal and civil prosecution, and may result in significant fines and/or claims for damages. Prior to installing and using the software, please read the applicable license conditions for this software. You will find these in the documentation or packaging.

If you have received this software on a CD-ROM that is marked "Trial version", or accompanying software that is licensed for your use, the software is only permitted to be used for test and validation purposes in accordance with the accompanying conditions for the trial license. To this end, it is necessary for programs, software libraries, etc. are installed on your computer. We therefore urgently recommend that installation is performed on a single-user computer or on a computer that is not used in the production process or for storing important data, since it cannot be completely excluded that existing files will be modified or overwritten. We accept no liability whatsoever for damage and/or data losses that result from this installation or the non-observance of this warning. Every other type of use of this software is only permitted if you are in possession of a valid license from Siemens.

If you are not in possession of a valid license that can be proven by presenting an appropriate Certificate of License/software product certificate, please abort installation immediately and contact a Siemens office without delay to avoid claims for damages.

**Software update services****Order**

To order the software update service, an order number must be specified. The software update service can be ordered when the software products are ordered or at a later date. Subsequent orders require that the ordering party is in possession at least of a single license.

**Note:**

It is recommended that the software update service is ordered as early as possible. If a new software version of a software product is released for delivery by Siemens, only those customers will receive it automatically who are entered in the appropriate delivery list at Siemens at this time. Previous software versions, or the current software version are not supplied when the software update service is ordered. The software update service requires that the software product is up-to-date at the time of completion of the contract for the software update service.

**Delivery**

When a software update service is ordered, you will be sent the contractual conditions of this service and the price is due for payment. At the same time, you will be included in a delivery list for the software product to be updated. If Siemens releases a new software version for the corresponding software product for general sale (function version or product version), it will be delivered automatically to the goods recipient specified in the delivery address within the contract period.

# Appendix

## Partner at Industry Automation and Drive Technologies



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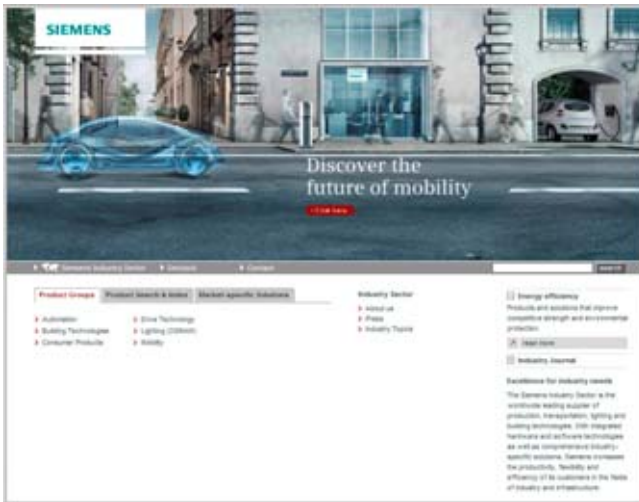
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- for other supplies and/or services the "General Conditions for the Supply of Products and Services of the Electrical and Electronics Industry"<sup>1)</sup>.

#### 1.2 For customers with a seat or registered office outside of Germany

For customers with a seat or registered office outside Germany the following applies subordinate to T&C

- the "General Terms of Payment"<sup>1)</sup> and
- for software products the "General License Conditions for Software Products for Automation and Drives for Customers with a Seat or registered Office outside of Germany"<sup>1)</sup> and
- for other supplies and/or services the "General Conditions for Supplies of Siemens, Automation and Drives for Customers with a Seat or registered Office outside of Germany"<sup>1)</sup>.

### 2. Prices

The prices are in € (Euro) ex works, exclusive packaging.

The sales tax (value added tax) is not included in the prices.

It shall be debited separately at the respective rate according to the applicable legal regulations.

Prices are subject to change without prior notice. We will debit the prices valid at the time of delivery.

Surcharges will be added to the prices of products that contain silver, copper, aluminium, lead and/or gold, if the respective basic official prices for these metals are exceeded. These surcharges will be determined based on the official price and the metal factor of the respective product.

The surcharge will be calculated on the basis of the official price on the day prior to receipt of the order or prior to the release order.

The metal factor determines the official price as of which the metal surcharges are charged and the calculation method used. The metal factor, provided it is relevant, is included with the price information of the respective products. An exact explanation of the metal factor can be downloaded at:

[www.siemens.com/automation/salesmaterial-as/catalog/en/terms\\_of\\_trade\\_en.pdf](http://www.siemens.com/automation/salesmaterial-as/catalog/en/terms_of_trade_en.pdf)

### 3. Additional Terms and Conditions

The dimensions are in mm. In Germany, according to the German law on units in measuring technology, data in inches only apply to devices for export.

Illustrations are not binding.

Insofar as there are no remarks on the corresponding pages, – especially with regard to data, dimensions and weights given – these are subject to change without prior notice.

### 4. Export regulations

We shall not be obligated to fulfill this agreement if such fulfillment is prevented by any impediments arising out of national or international foreign trade or customs requirements or any embargoes or other sanctions.

Export of goods listed in this catalog may be subject to license. We shall indicate in the delivery details whether licenses are required under German, European and US export lists. Goods labeled with "AL" not equal to "N" are subject to European or German export authorization when being exported out of the EU. Goods labeled with "ECCN" not equal to "N" are subject to US reexport authorization.

The export label is made available with the information of the respective goods on Industry Mall, our online-catalog-system, additionally. The deciding factors are the export label "AL" or "ECCN" indicated on order confirmations, delivery notes and invoices.

Even without a label, or with label "AL:N" or "ECCN:N", authorization may be required due to the final whereabouts and purpose for which the goods are to be used.

If you transfer goods (hardware and/or software and/or technology as well as corresponding documentation, regardless of the mode of provision) delivered by us or works and services (including all kinds of technical support) performed by us to a third party worldwide, you shall comply with all applicable national and international (re-) export control regulations.

If required to conduct export control checks, you, upon request by us, shall promptly provide us with all information pertaining to particular end customer, destination and intended use of goods, works and services provided by us, as well as any export control restrictions existing.

Errors excepted and subject to change without prior notice.

<sup>1)</sup> The text of the Comprehensive Terms and Conditions of Sale and Delivery can be downloaded at:  
[www.siemens.com/automation/salesmaterial-as/catalog/en/terms\\_of\\_trade\\_en.pdf](http://www.siemens.com/automation/salesmaterial-as/catalog/en/terms_of_trade_en.pdf)

## CD-ROM for Catalog D 21.3 · 2011

### Overview

*You will find the following planning and engineering information on the CD-ROM provided with Catalog D 21.3 · 2011:*

- Dimension drawings of the converter chassis units and cabinet units (PDF format)
- Catalog D 21.3 · 2011, SINAMICS S120/SINAMICS S150 (PDF format)
- SINAMICS Low Voltage Engineering Manual (PDF format)

#### *Hardware and software requirements*

- CD-ROM drive
- Windows from 2000/XP
- Acrobat Reader
- MS Internet Explorer from V5.5

#### *Start*

Insert the CD-ROM into your CD-ROM drive. The program starts automatically. If the autorun function is not activated on your system, then in your Windows Explorer, please start the "start.hta" file from the CD-ROM.

#### Note:

No installation is required to view the information on this CD-ROM.

## Industry Automation, Drive Technologies and Low-Voltage Power Distribution

Further information can be obtained from our branch offices listed in the appendix or at [www.siemens.com/automation/partner](http://www.siemens.com/automation/partner)

<b>Interactive Catalog on DVD</b> for Industry Automation, Drive Technologies and Low Voltage Distribution	<i>Catalog</i> <b>CA 01</b>	<b>Motion Control</b> SINAMICS and Motors for Single-Axis Drives SINUMERIK & SIMODRIVE Automation Systems for Machine Tools SINUMERIK & SINAMICS Equipment for Machine Tools SINUMERIK 828D BASIC T/BASIC M, SINAMICS S120 Combi and 1FK7/1PH8 motors SIMOTION, SINAMICS S120 and Motors for Production Machines Drive and Control Components for Cranes	<i>Catalog</i> D 31 NC 60 NC 61 NC 82 PM 21 CR 1
<b>Drive Systems</b> <u>Variable-Speed Drives</u> SINAMICS G130 Drive Converter Chassis Units SINAMICS G150 Drive Converter Cabinet Units SINAMICS GM150, SINAMICS SM150 Medium-Voltage Converters SINAMICS S120 Chassis Format Units and Cabinet Modules SINAMICS S150 Converter Cabinet Units SINAMICS DCM Converter Units SINAMICS and Motors for Single-Axis Drives <u>Three-phase Induction Motors</u> • H-compact • H-compact PLUS Asynchronous Motors Standardline Synchronous Motors with Permanent-Magnet Technology, HT-direct DC Motors SIMOREG DC MASTER 6RA70 Digital Chassis Converters SIMOREG K 6RA22 Analog Chassis Converters <i>PDF: SIMOREG DC MASTER 6RM70 Digital Converter Cabinet Units</i> SIMOVERT PM Modular Converter Systems SIEMOSYN Motors MICROMASTER 420/430/440 Inverters MICROMASTER 411/COMBIMASTER 411 SIMOVERT MASTERDRIVES Vector Control SIMOVERT MASTERDRIVES Motion Control Synchronous and asynchronous servomotors for SIMOVERT MASTERDRIVES SIMODRIVE 611 universal and POSMO SIMOTION, SINAMICS S120 and Motors for Production Machines SINUMERIK, SIMODRIVE and Motors for Machine Tools SINUMERIK, SINAMICS S120 and Motors for Machine Tools <u>Low-Voltage Three-Phase-Motors</u> IEC Squirrel-Cage Motors MOTOX Geared Motors <u>Mechanical Driving Machines</u> FLENDER Standard Couplings FLENDER SIG Standard industrial gear unit	D 11 D 12 D 21.3 D 23.1 D 31 D 84.1 D 86.1 D 86.2 DA 12 DA 21.1 DA 21.2 DA 22 DA 45 DA 48 DA 51.2 DA 51.3 DA 65.10 DA 65.11 DA 65.3 DA 65.4 PM 21 NC 60 NC 61 D 81.1 D 87.1 MD 10.1 MD 30.1	<b>Power Supply and System Cabling</b> Power supply SITOP System cabling SIMATIC TOP connect <b>Process Instrumentation and Analytics</b> Field Instruments for Process Automation SIREC Recorders and Accessories SIPART, Controllers and Software Products for Weighing Technology <i>PDF: Process Analytical Instruments</i> <i>PDF: Process Analytics, Components for the System Integration</i> <b>Safety Integrated</b> Safety Technology for Factory Automation <b>SIMATIC HMI/PC-based Automation</b> Human Machine Interface Systems/ PC-based Automation <b>SIMATIC Ident</b> Industrial Identification Systems <b>SIMATIC Industrial Automation Systems</b> Products for Totally Integrated Automation and Micro Automation SIMATIC PCS 7 Process Control System Add-ons for the SIMATIC PCS 7 Process Control System <i>PDF: Migration solutions with the SIMATIC PCS 7 Process Control System</i> <b>SIMATIC NET</b> Industrial Communication <b>SINVERT Photovoltaics</b> Inverters and Components for Photovoltaic Installations <b>SIRIUS Industrial Controls</b> SIRIUS Industrial Controls SIRIUS Industrial Controls (selected content from catalog IC 10) <b>System Solutions</b> Applications and Products for Industry are part of the interactive catalog CA 01	KT 10.1 KT 10.2 FI 01 MP 20 MP 31 WT 10 PA 01 PA 11 SI 10 ST 80/ ST PC ID 10 ST 70 ST PCS 7 ST PCS 7.1 ST PCS 7.2 IK PI RE 10 IC 10 IC 90
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