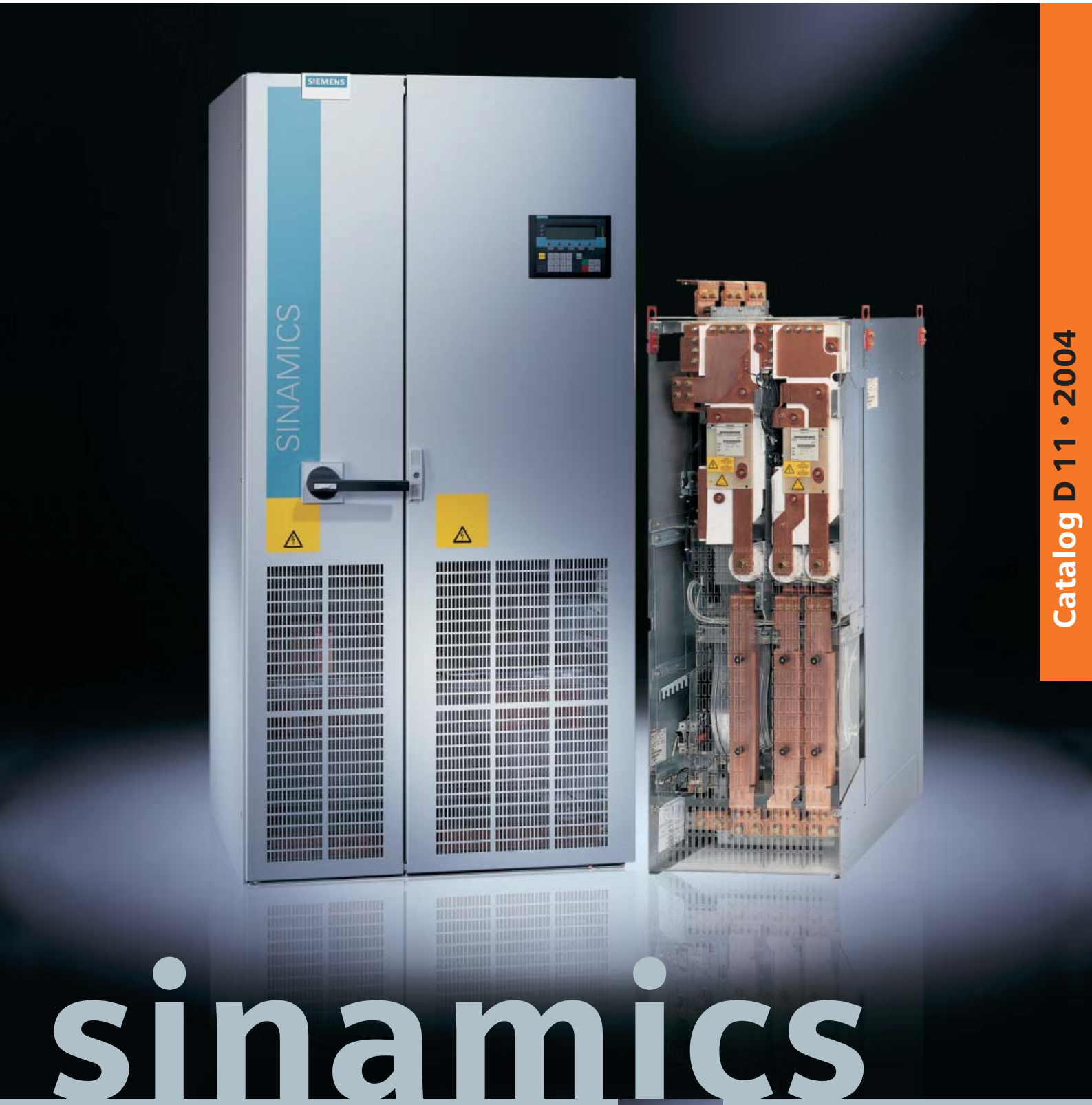


Catalog D 11 · 2004

sinamics

SINAMICS G130
Drive Converter Chassis Units

SINAMICS G150
Drive Converter Cabinet Units

SIEMENS

Related catalogs

SINAMICS G110 D 11.1
Inverter chassis units
0.12 kW to 3 kW
Order No.:
German: E86060-K5511-A111-A1
English: E86060-K5511-A111-A1-7600

SINAMICS S120 D 21.2
Servo control drive system

Order No.:
German: E86060-K5521-A121-A1
English: E86060-K5521-A121-A1-7600

SINAMICS S150 D 21.3
Drive converter cabinet units
75 kW to 1200 kW
Order No.:
German: E86060-K5521-A131-A1
English: E86060-K5521-A131-A1-7600

SIMOVERT MV DA 63
Medium-voltage drives
660 kVA to 9100 kVA
Order No.:
German: E86060-K5363-A101-A2
English: E86060-K5363-A101-A2-7600

SIMOVERT DA 65.10
MASTERDRIVES VC
0.55 kW to 2300 kW
Order No.:
German: E86060-K5165-A101-A3
English: E86060-K5165-A101-A3-7600

Low-voltage motors M 11

Order No.:
German: E86060-K1711-A101-A3
English: E86060-K1711-A101-A3-7600

Components for Automation CA 01

Order No.:
German: E86060-D4001-A100-C1
English: E86060-D4001-A100-C1-7600

A&D Mall

Internet:
http://www.siemens.com/automation/mall

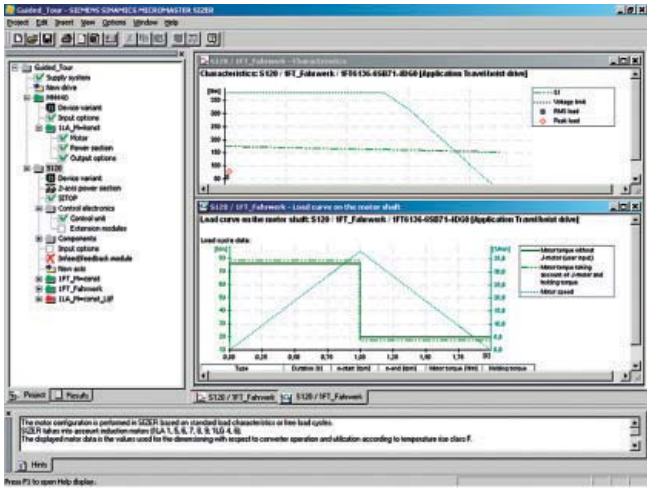
Trademarks

The SINAMICS MICROMASTER SIZER configuration tool

The SIZER tool speeds up and simplifies the configuration of
SINAMICS G110, SINAMICS G130, SINAMICS G150, SINAMICS S120, SINAMICS S150 and
MICROMASTER 4 drives.

The tool will support you during the technical configuration of all components required to complete a drive task. The SIZER will guide you through all stages of the configuration process, from the line supply through the drive components and motors.

Motors are configured by means of standardized load characteristics, pulse drives or free duty cycles. The drive components required (e.g., power modules, power supplies) are identified by means of calculation. The configuration completes the drive system by adding the supplementary components (e.g., sensor modules, terminal expansion, cables, reactors, filters).



Prompted configuration makes it easier for beginners to use the tool. Status information keeps you continually informed of the progress of the configuration process. The online help provides support during configuration. In addition to the data calculated, characteristics are also displayed to assist optimization and highlight reserves.

The Export function can be used to forward the parts list to the SAP-VSR ordering system.

Minimum hardware and software requirements

PG or PC with PentiumTM II 400 MHz (NT, 2000),
PentiumTM III 500 MHz (XP) 256 MB RAM
At least 600 MB of free hard disk space
An additional 100 MB of free hard disk space on Windows system drive
Monitor resolution 1024x768 pixels
WindowsTM NT 4.0 SP5, 2000 SP2, XP SP1
Microsoft Internet Explorer 5.5 SP2

Use

The SINAMICS MICROMASTER SIZER can be used for free. A token fee is charged for processing orders.

The user interface is available in German and English.

The SINAMICS MICROMASTER SIZER configuration tool can be ordered from your Siemens representative under Order No. **6SL3070-0AA00-0AG0**.

SINAMICS G130
Drive Converter Chassis Units

SINAMICS G150
Drive Converter Cabinet Units

Catalog D 11 · 2004

Replaces:
Catalog D 11 · November 2002

The products and systems described in this catalog are manufactured under application of a certified quality management system in accordance with DIN EN ISO 9001. The certificate is recognized in all IQ Net countries.

SIEMENS

Welcome to Automation and Drives

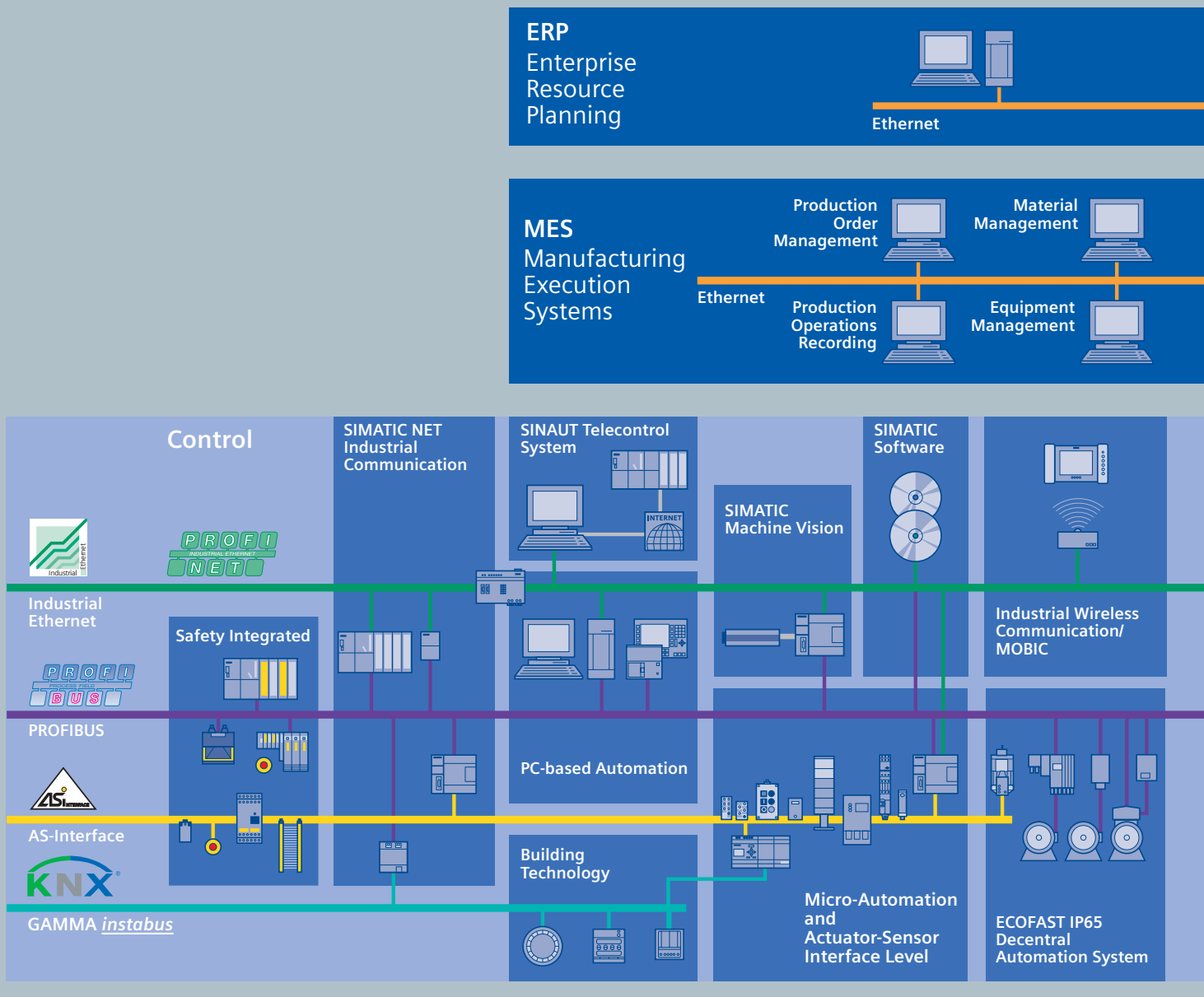
We would like to welcome you to Automation and Drives and our comprehensive range of products, systems, solutions and services for production and process automation and building technology worldwide.

With Totally Integrated Automation and Totally Integrated Power, we deliver solution platforms based on standards that offer you a considerable savings potential.

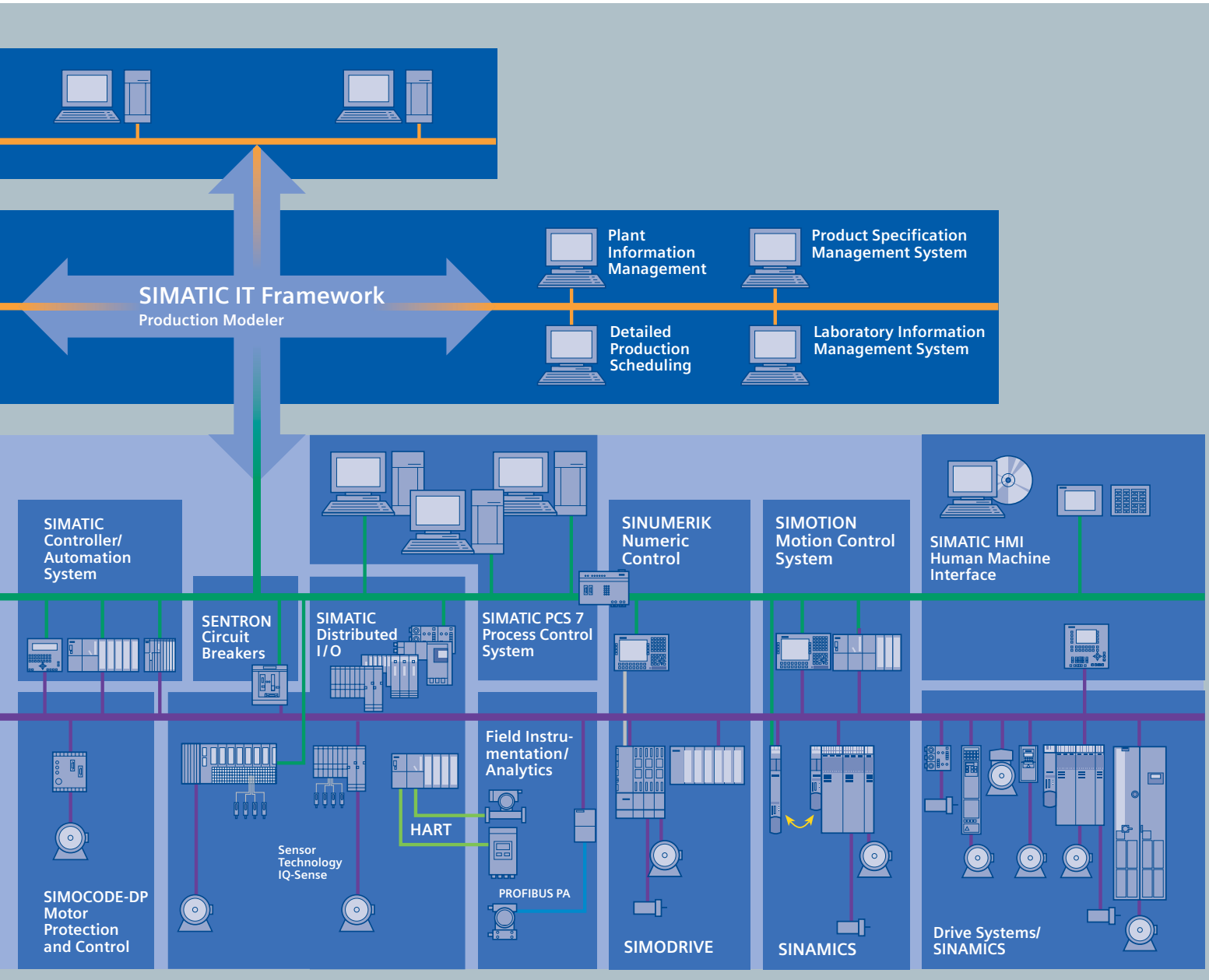
Discover the world of our technology now. If you need more detailed information, please contact one of your regional Siemens partners.
They will be glad to assist you.

Totally Integrated Automation – innovations for more productivity

With the launch of Totally Integrated Automation, we were the first ones on the market to consistently implement the trend from equipment to an integrated automation solution, and have continuously improved the system ever since.
Whether your industry is process- and production-oriented or a hybrid, Totally Integrated Automation is a unique "common solution" platform that covers all the sectors.
Totally Integrated Automation is an integrated platform for the entire production line - from receiving to technical processing

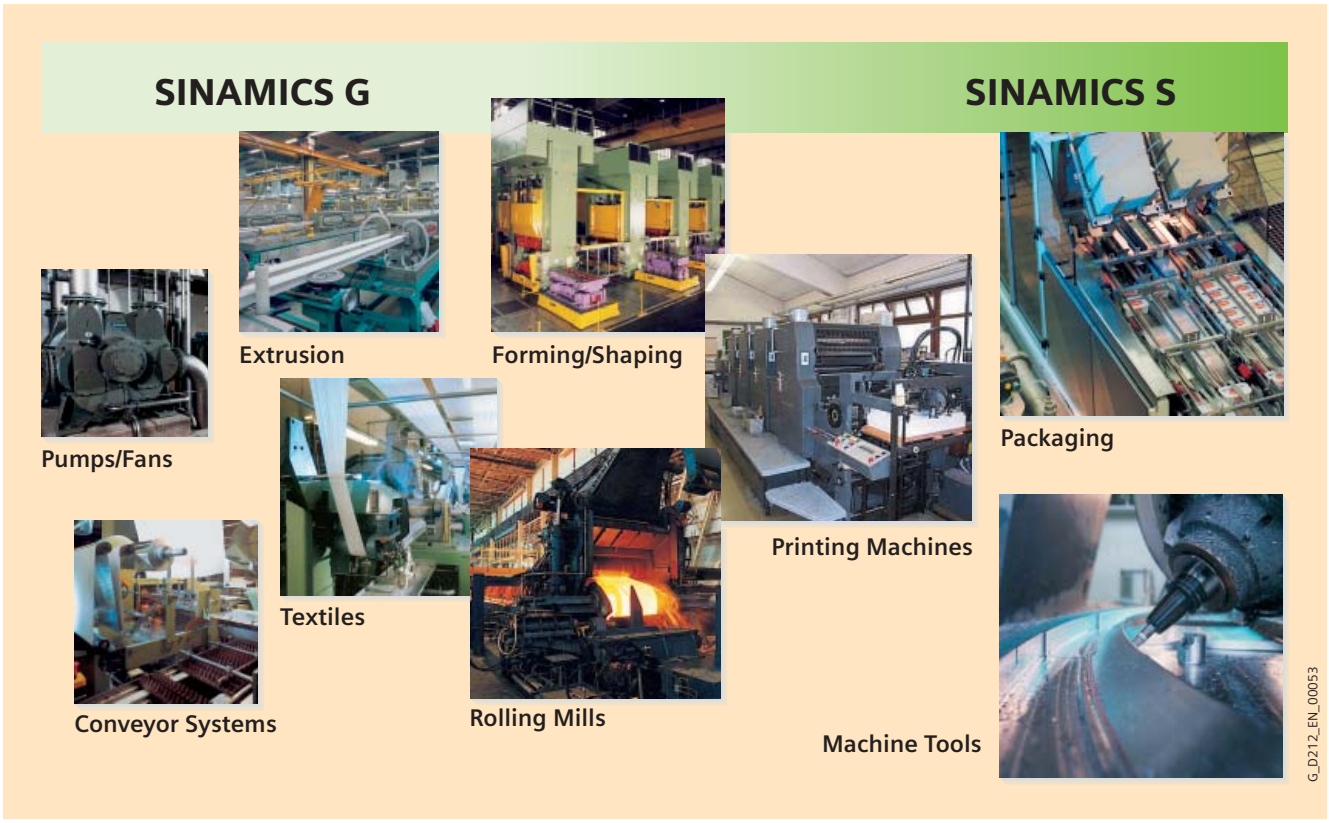


and production areas to shipping. Thanks to the system-oriented engineering environment, integrated, open communications as well as intelligent diagnostics options, your plant now benefits in every phase of the life cycle.
In fact, to this day we are the only company worldwide that can offer a control system based on an integrated platform for both the production and process industry.



1

The SINAMICS drive family



SINAMICS applications

Applications

SINAMICS is the new family of Siemens converters designed for machine and plant engineering applications. SINAMICS offers solutions for all drive tasks:

- Simple pump and fan applications in the process industry.
- Complex individual 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.
- Highly dynamic servo drives for machine tools, as well as packaging and printing machines.

Versions

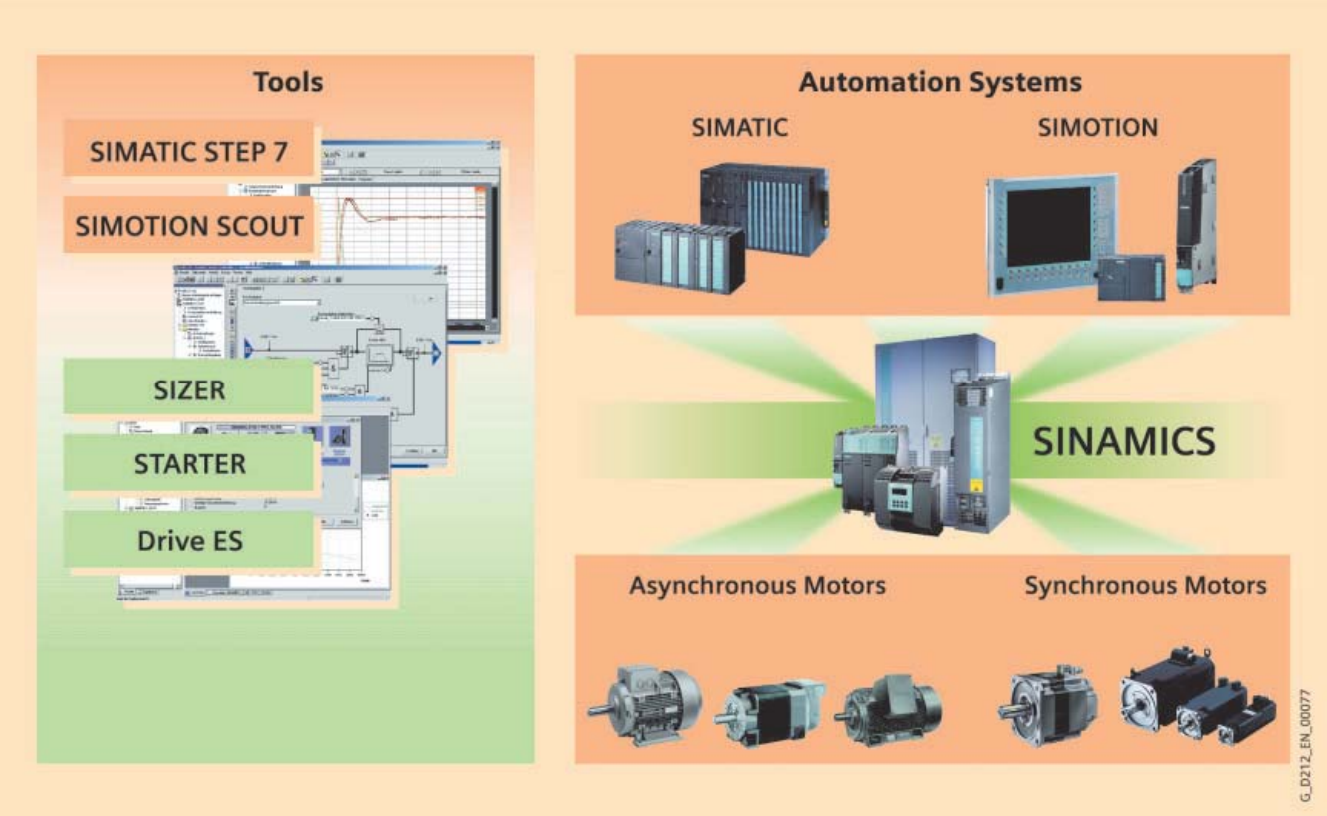
Depending on the application, the SINAMICS range offers the ideal version for any drive task.

- SINAMICS G is designed for standard applications with asynchronous motors. These applications have less stringent requirements regarding the dynamics and accuracy of the motor speed.
- SINAMICS S handles complex drive tasks with synchronous/asynchronous motors and fulfills stringent requirements regarding:
  - Dynamics and accuracy
  - Integration of extensive technological functions in the drive control system

Platform Concept and Totally Integrated Automation

All SINAMICS versions are based on a platform concept. Joint 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 with no system gaps. The different SINAMICS versions can be easily combined with each other.

SINAMICS is a part of the Siemens "Totally Integrated Automation" concept. Integrated SINAMICS systems covering configuration, data storage and communication at automation level, ensure low-maintenance solutions with SIMATIC® and SIMOTION®.



SINAMICS as part of the Siemens modular automation system

Quality to DIN EN ISO 9001

SINAMICS conforms with the most exacting quality requirements. Comprehensive quality assurance measures at the product design stage, as well as in all development and production processes, ensure a consistently high level of quality.

Of course, our quality assurance system is certified by an independent authority to DIN EN ISO 9001.

1

The SINAMICS drive family

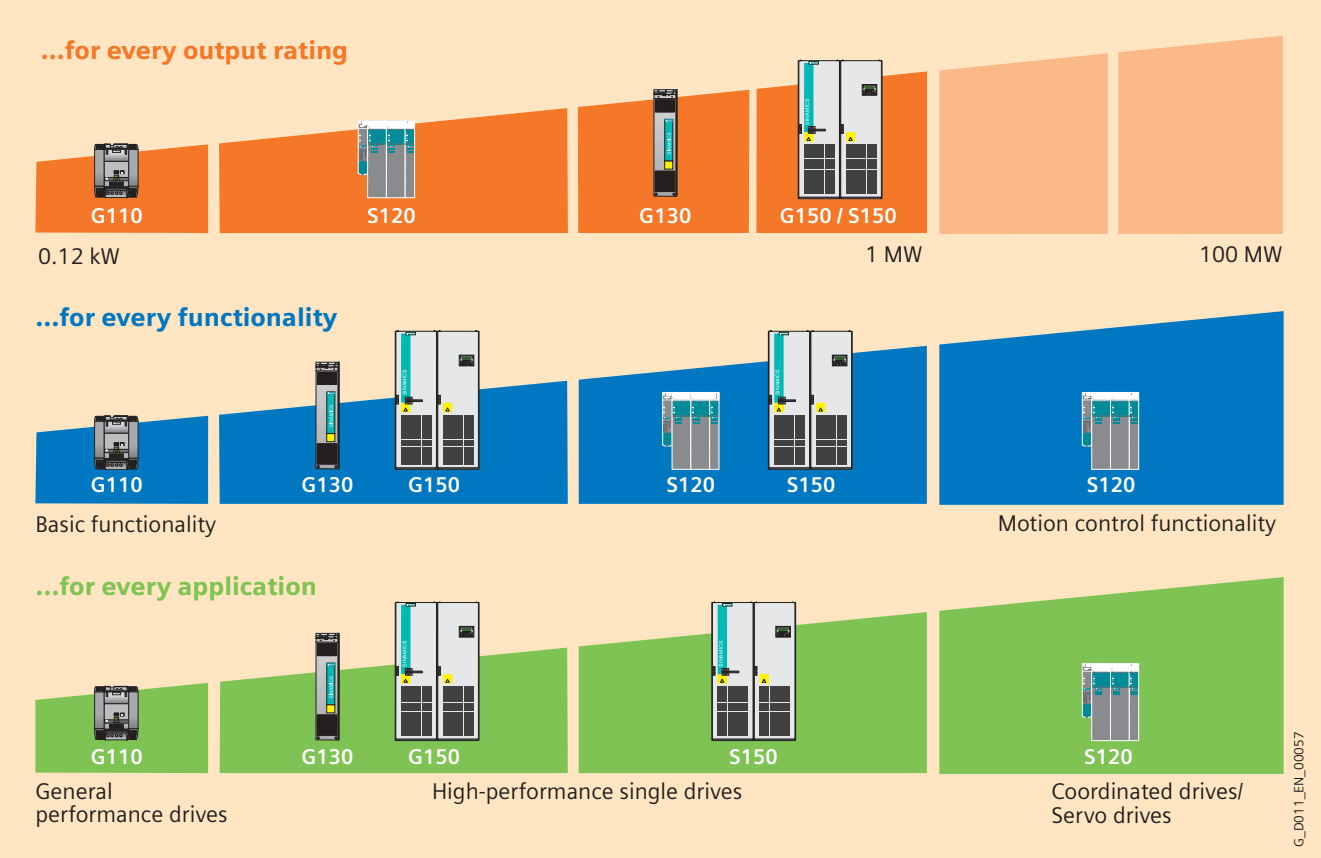
The SINAMICS family comprises members tailored to the respective application fields:

- SINAMICS G110 – the versatile drive in the lower power range
- SINAMICS G130 and SINAMICS G150 – the universal drive solution for single drives with high output ratings
- SINAMICS S120 – the flexible, modular drive system for demanding drive tasks
- SINAMICS S150 – the sophisticated drive solution for single drives with high output ratings.

SINAMICS is characterized by the following system features:

- Uniform functionality based on a common platform strategy
- Uniform engineering
- High degree of flexibility and combination
- Wide output power range
- Designed for worldwide use
- SINAMICS Safety Integrated
- Increased economy and effectiveness
- Flexible interfacing facilities to host controllers
- Totally Integrated Automation.

SINAMICS ...



The members of the SINAMICS family

SINAMICS G110	SINAMICS G130/G150	SINAMICS S120	SINAMICS S150
			
The versatile drive in the lower power range	***The universal drive solution for single drives with high output ratings***	***The flexible, modular drive system for demanding drive tasks***	***The sophisticated drive solution for single drives with high output ratings***
Main applications			
• Machines and plants for industrial and commercial applications	• Machines and plants for process and production applications, water/waste, power plants, oil and gas, petrochemicals, basic chemical industry, paper, cement, stone, steel	• Machines and plants for industrial applications (packaging, plastics, textiles, printing, wood, glass, ceramics, presses, paper, hoisting gear, semiconductors, automatic assembly and testing units, handling)	• Machines and plants for process and production applications, food and beverage industry, automotive and steel industry, deep/open-cast mining, shipbuilding, hoisting gear/conveyor technology
Application examples			
• Pumps and fans • Auxiliary drives • Conveyor belts • Billboards • Gate/door openers • Centrifuges	• Pumps and fans • Compressors • Extruders and mixers • Mills	• Motion control applications (e.g. positioning, synchronous speed) • Technological applications	• Test bay drives • Centrifuges • Elevators and cranes • Cross cutters and shears • Conveyor belts • Presses • Cable winches
Highlights			
• Compact • Flexible adaptation to different applications • Simple, fast start-up • Ready-to-use • Clearly arranged terminals • Optimum interaction with SIMATIC and LOGO!	• Space-saving • Low noise • Simple, fast start-up • SINAMICS G130: modular components • SINAMICS G150: cabinet unit ready to connect • Optimum interaction with SIMATIC	• For universal use • Flexible, modular • Scalable power, function, number of axes and performance • Simple, fast start-up, auto-configuration • Innovative system architecture • Wide range of motors • Optimum interaction with SIMOTION and SIMATIC • SINAMICS Safety Integrated	• Standard four-quadrant operation • High control accuracy and dynamic response • Almost line harmonic reaction-free • Tolerant towards variations in mains voltage • Possibility for compensation of reactive power • Simple, fast start-up • Cabinet unit ready to connect • Optimum interaction with SIMATIC

1

The versatile drive in the lower power range

Overview

SINAMICS G110 inverter chassis units are frequency inverters for the whole range of industrial variable-speed drive applications. The particularly compact SINAMICS G110 inverter works with voltage/frequency control (*V/f*) and is the ideal frequency inverter solution in the lower output and performance ranges of the SINAMICS product family.

The inverter is available in three housing sizes, and covers a range of outputs from 0.12 kW to 3.0 kW for connection to single-phase supplies of 200 V to 240 V.

For further information see Catalog D 11.1

Benefits

- Flexible use due to comprehensive parameterization facilities and various interfaces (analog and USS versions)
- Simple installation, parameterization and commissioning
- Powerful diagnostic facilities with optional operator panel
- Fast standard commissioning by copying parameters using the optional operator panel
- Low-noise motor operation resulting from high pulse frequency
- Low mechanical wear through
  - skipped frequency band in case of resonance
  - programmable ramp-up/ramp-down times
  - ramp smoothing and
  - connection of the converter to the rotating motor (flying restart)
- Increase in plant availability as a result of automatic restarting following a power failure or stoppage
- Fast current limitation for fault-free operation in the event of sudden load surges
- Versions with integral EMC filters for industrial and public supplies
- DIP switches for quickly adapting to 50 Hz or 60 Hz applications
- DIP switches for simple bus termination for the USS version (RS485)

Application

The SINAMICS G110 is particularly suitable

- for use as a drive in industrial and commercial applications
- in many different sectors, e.g. food, textile, packaging
- in conveyor system applications
- for applications using pumps and fans
- for factory gate, garage door operating mechanisms and barrier openers
- as a drive for changing advertisement panels.

Design

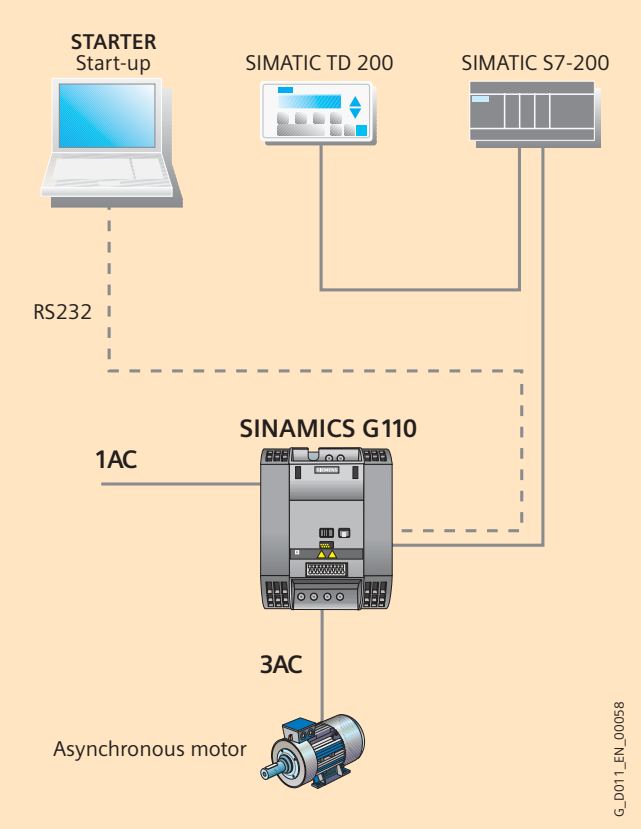
SINAMICS G110 inverters are compact units that are ready to connect. All units contain state-of-the-art IGBT technology in the power section as well as digital microprocessor technology. SINAMICS G110 inverters are quick to install and easy to connect.

SINAMICS G110 is available with an analog input or an RS485 communications interface (USS). The digital inputs can be programmed as required, and thus can be adapted flexibly to a wide range of applications. A version with a rib-free heat sink is particularly suitable for installation in flat control cabinets.

The SINAMICS G110 is programmed either from a PC using the STARTER commissioning tool or using an optional basic operator panel. For a standard commissioning of several converters with the same parameters, the entered settings can be saved in the operator panel and can be easily transferred to each further converter.

The versatile drive in the lower power range

Integration



SINAMICS G110 configuration example
(USS version together with SIMATIC S7-200, connection between PC and inverter using optional PC connection kit)

Technical data

Electrical data	
Supply voltages; output ranges	200 V to 240 V 1 AC, ±10%; 0.12 kW to 3.0 kW
Supply systems	IT, TN, TT
Line frequency	50/60 Hz
Output frequency	0 Hz to 650 Hz
Control methods	*V/f* control, linear ($M \sim n$) *V/f* control, quadratic ($M \sim n^2$) *V/f* control, programmable
Fixed frequencies	3, programmable
Skipped frequency ranges	1, programmable
Digital inputs	3 programmable 24 V DC digital inputs
Analog input (for analog version)	1 analog input for setpoints from 0 V to 10 V, scaleable or for use as 4th digital input
Digital output	1 DC 24 V digital output
Communication interface (for USS version)	RS485 serial interface for use with USS protocol
Functions	
Software functions	• Automatic restart following interruptions in operation due to a power failure • Smooth connection of the converter to the rotating motor • Programmable ramp-up/ramp-down times • Ramp smoothing
Protective functions	• Undervoltage • Overvoltage • Earth fault • Short-circuit • Stall prevention • Thermal motor protection I^2t • Converter overtemperature • Motor overtemperature
Suitable motors	Asynchronous motors
Mechanical data	
Degree of protection	IP20
Type of cooling	
• Converters ≤ 0.75 kW	Convection cooling, version with flat heat sink
• Converters > 0.75 kW	Internal air cooling (integral fan)
Standards	
Compliance with standards	CE, UL, cUL, c-tick

1

The universal drive solution for single drives with high output ratings

Overview

SINAMICS G130 converter chassis units and SINAMICS G150 converter cabinet units are designed for variable-speed drives in machine building and plant construction.

They have been specially tuned to the requirements of drives with quadratic and constant load characteristics, with medium performance requirements and without regenerative feedback.

The control accuracy of the sensorless vector control is suitable for most applications, and additional actual speed value encoders are therefore superfluous.

However, the SINAMICS G130/G150 converters are optionally available with an encoder evaluator in order to handle applications that require an encoder for plant-specific reasons.

The SINAMICS G130 and SINAMICS G150 offer an economic drive solution that can be matched to customers' specific requirements by adding from the wide range of available components and options.

Benefits

- Particularly quiet and compact converters due to the use of state-of-the-art IGBT power semiconductors and an innovative cooling concept.
- All unit modules are easily accessible, making them extremely service-friendly
- Can be easily integrated into automation solutions due to PROFIBUS interface supplied as standard and various analog and digital interfaces
- Increase in plant availability since individual modules and power components can be replaced quickly and easily
- Easy commissioning and parameterization using interactive menus on the user-friendly AOP30 operator panel with graphical LCD and plain-text display.

Application

Variable-speed drives are advantageous for all applications that involve moving, conveying, pumping or compressing solids, liquids or gases.

This means the following applications, in particular:

- Pumps and fans
- Compressors
- Extruders and mixers
- Mills

Design

SINAMICS G130

The SINAMICS G130 provides machine builders and plant constructors with a modular drive system that can be tailored to specific applications.

SINAMICS G130 consists of two modular, stand-alone components:

- Power module and
- Control unit

They may be located separately from one another or combined in a single unit. The power module contains a slot for the control unit.

The user-friendly AOP30 operator panel can be used for commissioning and local operation.

Predefined interfaces, via terminal block or PROFIBUS, make commissioning and control of the drive much easier. The control unit interfaces can be supplemented with add-on modules.

SINAMICS G150

SINAMICS G150 are ready-to-connect AC/AC converters in the standard control cabinet.

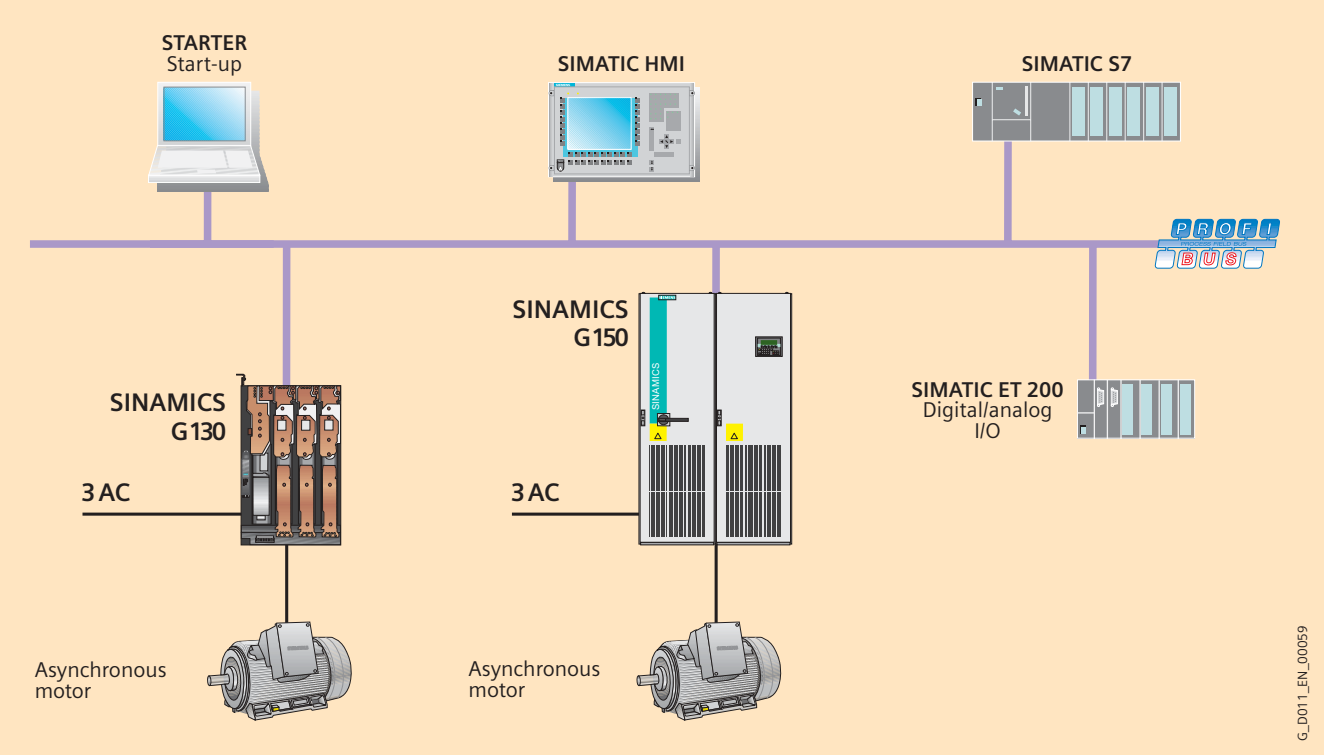
They can be matched to individual requirements by selecting from an extensive range of options.

Available with cabinet widths from 400 mm upwards in intervals of 200 mm, with various degrees of protection up to IP54 and two design versions.

- *Version A*
  offers sufficient space for all the options available.
  The different variants allow the power and motor connections to be arranged at the top or bottom, as required, which in turn offers excellent flexibility in terms of location in the plant.
- *Version C*
  is a particularly space-saving version envisaged for applications where the power supply components are accommodated in a central low-voltage distribution unit and need not be provided again in the control cabinet.

The user-friendly AOP30 operator panel is fitted as standard in the cabinet door for both versions.

Integration



Configuration example for SINAMICS G130 and SINAMICS G150 with SIMATIC S7

1

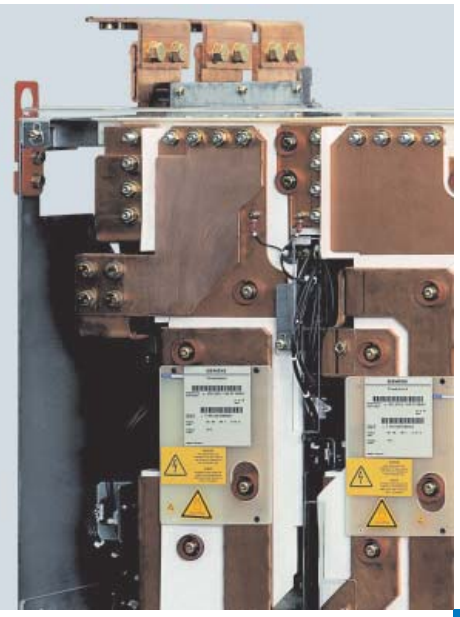
The universal drive solution for single drives with high output ratings

Technical data

	SINAMICS G130	SINAMICS G150
Electrical data		
Supply voltages; output ranges		
• 380 V to 480 V 3 AC, ±10% (-15% < 1 min)	315 kW to 560 kW	110 kW to 560 kW
• 660 V to 690 V 3 AC, ±10% (-15% < 1 min)	315 kW to 800 kW	75 kW to 800 kW
Supply systems	IT, TN, TT	
Line frequency	47 Hz to 63 Hz	
Output frequency	0 Hz to 300 Hz	
Control method	Vector control with and without sensor or *V/f* control	
Fixed speeds	15 fixed speeds plus 1 basic speed, programmable	
Skipped speed ranges	4, programmable	
Customer's terminal block	Digital inputs/outputs Analog inputs/outputs Inputs for motor temperature evaluation	
Communication interface	PROFIBUS DP as standard	
Braking operation	Braking module as system component	Braking module optional
Functions		
Software functions	• Automatic restart following interruptions in operation due to a power failure • Smooth connection of the converter to the rotating motor • Kinetic buffering • Automatic motor identification for control optimization • Programmable ramp-up/ramp-down times • Ramp smoothing	
Protective functions	• Undervoltage • Overvoltage • Earth fault • Short-circuit • Stall prevention • Thermal motor protection I^2t • Thermal converter protection	
Suitable motors	Asynchronous motors	
Mechanical data		
Degree of protection	IP00 for 315 kW/690 V: IP20	IP20 optionally IP21, IP23, IP54
Type of cooling	Internal fan (forced air ventilation)	
Noise level L_{pA} (1 m) at 50 Hz	≤ 73 dB	≤ 72 dB
Cabinet system	-	Rittal TS 8
Standards		
Compliance with standards	CE, cULus (available soon)	CE

SINAMICS G130
Drive converter chassis units

2



Drive converter chassis units

315 kW to 800 kW

Overview

SINAMICS G130 drive converter chassis units

The SINAMICS G130 is an AC/AC converter that can be combined very flexibly with the associated system components and integrated into customer-specific control cabinets or directly into machines.

The SINAMICS G130 drive converter chassis units are available for the following voltages and outputs:

Supply voltage	Output
380 V to 480 V	315 kW to 560 kW
660 V to 690 V	315 kW to 800 kW

A wide range of add-on electrical components allow the drive system to be optimized for specific requirements. Configuration and commissioning are greatly simplified by predefined interfaces.

The control accuracy of the sensorless vector control is suitable for most applications, and additional actual speed value encoders are therefore superfluous.

However, the SINAMICS G130 converters are optionally available with an encoder evaluator in order to handle applications that require an encoder for plant-specific reasons.

Communication between the control unit, the power module and other active SINAMICS components takes place via DRIVE-CLiQ - the drive's internal interface. The DRIVE-CLiQ connections, which are available as preassembled cables of different lengths, allow a complete converter system to be quickly put together.

A PROFIBUS interface is provided as standard to communicate with the control system. The units also have a customer terminal block with digital and analog inputs and outputs.

Benefits

- Particularly quiet and compact converters due to the use of state-of-the-art IGBT power semiconductors and an innovative cooling concept.
- All unit modules are easily accessible, making them extremely service-friendly
- Can be easily integrated into automation solutions due to PROFIBUS interface supplied as standard and various analog and digital interfaces
- Increase in plant availability since individual modules and power components can be replaced quickly and easily
- Easy commissioning and parameterization using interactive menus on the user-friendly AOP30 operator panel with graphical LCD and plain-text display.

Application

Variable-speed drives are advantageous for all applications that involve moving, conveying, pumping or compressing solids, liquids or gases.

This means the following applications, in particular:

- Pumps and fans
- Compressors
- Extruders and mixers
- Mills

Design

The SINAMICS G130 provides machine builders and plant constructors with a modular drive system that can be tailored to specific applications.

SINAMICS G130 consists of two modular, stand-alone components:

- Power module and
- Control unit

They may be located separately from one another or combined in a single unit. The power module contains a slot for the control unit.

The user-friendly AOP30 operator panel can be used for commissioning and local operation.

Predefined interfaces, via terminal block or PROFIBUS, make commissioning and control of the drive much easier. The control unit interfaces can be supplemented with add-on modules.

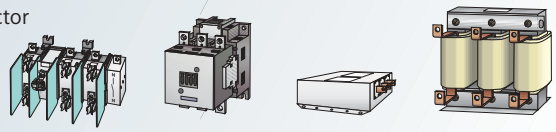
Design (continued)

3-phase AC supply

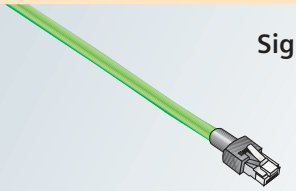
Connection system

Line-side power components

Switch disconnector
Line contactors
Line filters
Line reactors

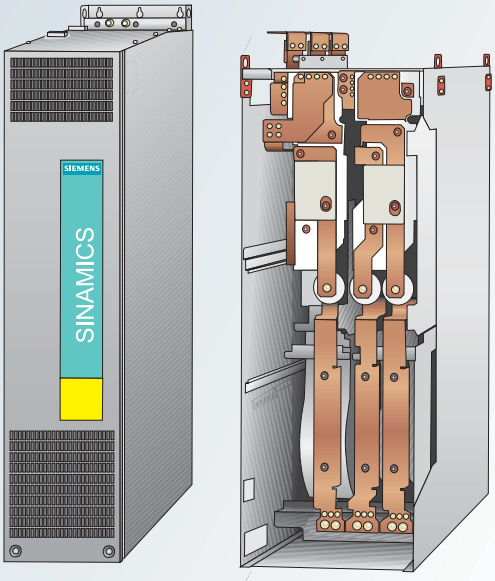


Signal cables



SINAMICS G130 components

Power Modules



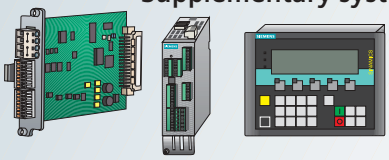
Control Unit Kit

Control Unit CU320
with CompactFlash Card

Supplementary system components

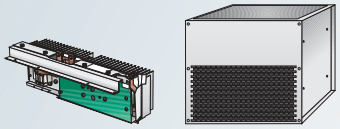
Terminal Board
Terminal Module

Advanced
Operator Panel



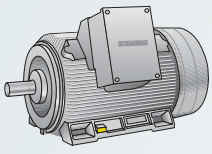
DC link components

Braking Modules
with Braking resistors



Motors

Asynchronous motors



G_D011_EN_00060

315 kW to 800 kW

Function

Communication with higher-level control and customer's terminal block

A PROFIBUS interface is provided on the CU320 control unit as standard for use as the customer interface. An optional TM31 terminal module is also available.

You can use this customer terminal block to connect the system to the higher-level controller using analog and digital signals, or to connect additional units.

To simplify configuration and commissioning of the drive, the TM31 terminal module is supplied with factory default settings (→ Engineering information).

Open-loop and closed-loop control functions

The converter closed-loop control contains a high-quality sensorless vector control with speed and current controls as well as motor and converter protection.

Software and protection functions

The software functions available as standard are described below:

Software and protection functions	Description
Setpoint input	The setpoint can be defined internally or externally, internally as a fixed, motorized potentiometer or jog setpoint, externally via the PROFIBUS interface or an analog input of the customer terminal block. The internal fixed setpoint and the motorized potentiometer setpoint can be switched over or adjusted using control commands via all interfaces.
Motor identification	Automatic motor identification permits fast and simple commissioning and optimization of the drive control.
Ramp-function generator	A user-friendly ramp-function generator with separately adjustable ramp-up and ramp-down times, together with variable smoothing times in the lower and upper speed ranges, improve the control response and therefore prevent mechanical overloading of the drive train. The ramp-down ramps can be parameterized separately for emergency stop.
$V_{dc\ max}$ controller	The $V_{dc\ max}$ controller automatically prevents overvoltages in the DC link if the set ramp-down ramp is too short, for example. This can also extend the set ramp-down time.
Kinetic buffering (KIP)	Power supply failures are bridged to the extent permitted by the kinetic energy of the drive train. The speed drops depending on the moment of inertia and the load torque. The current speed setpoint is resumed when the power supply returns.
Automatic restart [1]	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.
Flying restart [1]	The flying restart permits connection of the converter to a rotating motor.
***I²t* detection for motor protection**	The motor temperature is calculated in a motor model stored in the converter software, taking into account the current speed and load. More exact detection of the temperature, also taking into account the influence of the ambient temperature, is possible by means of direct temperature detection using KTY84 sensors in the motor winding.
Evaluation of motor temperature	Motor protection by evaluating a KTY84 or PTC temperature sensor. When a KTY84 sensor is connected, the limit values can be set for alarm or shutdown. When connecting a PTC thermistor, the reaction following triggering of it (alarm or shutdown) can be defined.
Motor blocking protection	A blocked motor is recognized and protected against thermal overloading by shutting down.
Power section protection	
Earth fault monitoring on the output side	An earth fault on the output side is recognized by a total current monitor, and results in shutdown in earthed-neutral systems.
Electronic short-circuit protection on the output side	A short-circuit between motor and converter (on the converter output terminals, in the motor cable, in the terminal box) is detected and switched off.
Thermal overload protection	A warning message is issued first when the overtemperature threshold responds. If the temperature rises further, either a shutdown is carried out or automatic influencing of the pulse frequency or output current so that a reduction in the thermal load is achieved. Following elimination of the cause of the fault (e.g. improvement in the ventilation), the original operating values are automatically resumed.

1) Factory setting: not activated (can be programmed)

Technical data

Electrical data			
Supply voltages and output ranges	380 V to 480 V 3 AC, ±10% (-15% < 1 min) 315 kW to 560 kW 660 V to 690 V 3 AC, ±10% (-15% < 1 min) 315 kW to 800 kW		
Supply systems	TN/TT supplies or isolated supplies (IT supplies)		
Line frequency	47 Hz to 63 Hz		
Output frequency	0 Hz to 300 Hz		
Power factor			
- Fundamental mode	> 0.98		
- Total	0.93 to 0.96		
Converter efficiency	> 98%		
Control method	Vector control with and without sensor or *V/f* control		
Fixed speeds	15 fixed speeds plus 1 minimum speed, programmable (in the default setting 3 fixed setpoints plus 1 minimum speed can be selected via the terminal block / PROFIBUS)		
Skipped speed ranges	4, programmable		
Setpoint resolution	0.001 rpm digital 12 bit analog		
Braking operation	By means of additional braking modules and braking resistors		
Mechanical data			
Degree of protection	IP00 at 315 kW/690 V: IP20		
Protection class	Acc. to EN 50 178 Part 1		
Type of cooling	Forced air ventilation		
Noise level L_{pA} (1 m)	≤ 73 dB at 50 Hz line frequency		
Shock protection	BGV A2		
Compliance with standards			
Standards	EN 60 146-1, EN 61 800-2, EN 61 800-3, EN 50 178, EN 60 204-1, EN 60 529		
CE marking	According to EMC directive No. 89/336/EC and low voltage directive No. 73/23/EC		
RI suppression	According to EMC product standard for variable-speed drives EN 61 800-3, "second environment". "First environment" available upon request		
	Operation	**Storage**	**Transport**
Ambient conditions			
Ambient temperature	0 °C to +40 °C Up to +50 °C: see derating data	-25 °C to +55 °C	-25 °C to +70 °C above -40 °C for 24 hours
Relative humidity (non-condensing)	5% to 95% corresponds to 3K3 to IEC 60 721-3-3	5% to 95% corresponds to 1K4 to IEC 60 721-3-1	5% to 95% at 40 °C corresponds to 2K3 to IEC 60 721-3-2
Installation altitude	Up to 2000 m above sea level without reduction in performance, > 2000 m: see derating data		
Mechanical stability			
Vibratory load			
- Deflection	0.075 mm at 10 Hz to 58 Hz	1.5 mm at 5 Hz to 9 Hz	3.1 mm at 5 Hz to 9 Hz
- Acceleration	9.8 m/s^2 at > 58 Hz to 200 Hz -	5 m/s^2 at > 9 Hz to 200 Hz corresponds to 1M2 to IEC 60 721-3-1	10 m/s^2 at > 9 Hz to 200 Hz corresponds to 2M2 to IEC 60 721-3-2
Shock load			
- Acceleration	100 m/s^2 at 11 ms corresponds to 3M4 to IEC 60 721-3-3	40 m/s^2 at 22 ms corresponds to 1M2 to IEC 60 721-3-1	100 m/s^2 at 11 ms corresponds to 2M2 to IEC 60 721-3-2

Deviations from the defined classes are identified by underlining.

Technical data (continued)

Derating data

Compensation of current derating as a function of installation altitude / ambient temperature

If the converters are operated at an **installation altitude > 2000 m** above sea level, the maximum permissible output current can be calculated using the following tables. The air throughput specified in the technical data for the chassis units must be guaranteed. The specified values already include a permitted correction between installation altitude and ambient temperature (incoming air temperature at the inlet to the power module).

Installation altitude above sea level	**Current derating** at an ambient temperature of						
m	20 °C	25 °C	30 °C	35 °C	40 °C	45 °C	50 °C
0-2000	100%					95.0%	87.0%
2001-2500					96.3%	91.4%	83.7%
2501-3000				96.2%	92.5%	87.9%	80.5%
3001-3500			96.7%	92.3%	88.8%	84.3%	77.3%
3501-4000		97.8%	92.7%	88.4%	85.0%	80.8%	74.0%

Current derating as a function of the ambient temperature (inlet air temperature) and installation altitude

Voltage derating as a function of the installation altitude

In addition to the current derating, the voltage derating must be considered according to the following table with **installation altitudes > 2000 m** above sea level.

Installation altitude above sea level	**Voltage derating** for a rated input voltage of						**Voltage derating** for a rated input voltage of	
m	380 V	400 V	420 V	440 V	460 V	480 V	660 V	690 V
0-2000	100%						100%	
2001-2250						96%		96%
2251-2500					98%	94%	98%	94%
2501-2750		100%		98%	94%	90%	95%	90%
2751-3000				95%	91%	88%	92%	88%
3001-3250			97%	93%	89%	85%	89%	85%
3251-3500		98%	93%	89%	85%	82%	85%	82%
3501-3750		95%	91%	87%	83%	79%	–	–
3751-4000	96%	92%	87%	83%	80%	76%	–	–

Voltage derating as a function of the installation altitude

Technical data (continued)

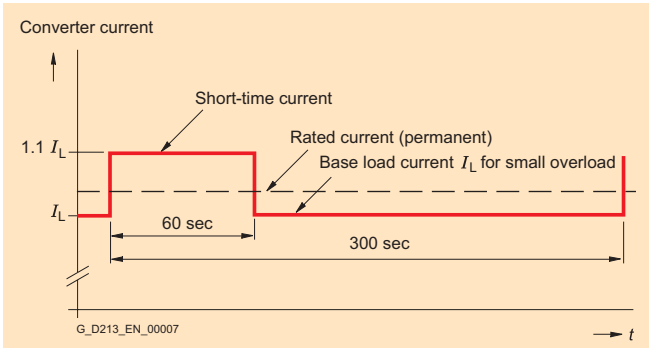
Overload capability

The SINAMICS G130 drive converter chassis 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.

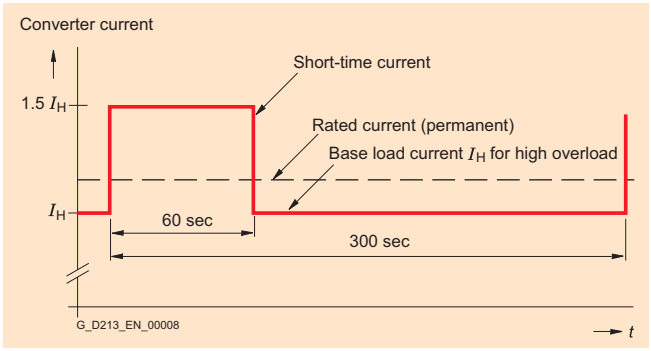
The criterion for overload is that the drive is operated with its base load current before and after the overload occurs, and a load duration of 300 s is assumed.

The base load current I_L for a small overload is based on a duty cycle of 110% for 60 s or 150% for 10 s.

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



Small overload



High overload

EMC information

The electromagnetic compatibility describes - according to the definition of the EMC directive - the "capability of a device to work satisfactorily in the electromagnetic environment without itself causing electromagnetic interferences which are unacceptable for other devices present in this environment". To guarantee that the appropriate EMC directives are observed, the devices must demonstrate a sufficiently high noise immunity, and also the emitted interference must be limited to acceptable values.

The EMC requirements for "Variable-speed drive systems" are described in the product standard EN 61 800-3. A variable-speed drive system (or power drive system PDS) consists of the drive converter and the electric motor including cables. The driven machine is not part of the drive system. EN 61 800-3 defines different limits depending on the location of the drive system, referred to as the first and second environments.

The **first environment** comprises living accommodation or locations where the drive system is directly connected to the public low-voltage network without an intermediate transformer.

The **second environment** is understood to be all locations outside living areas. These are basically industrial areas which are powered from the medium-voltage network via their own transformers.

Four different categories are defined in EN 61 800-3 Ed.2 depending on the location and the power of the drive:

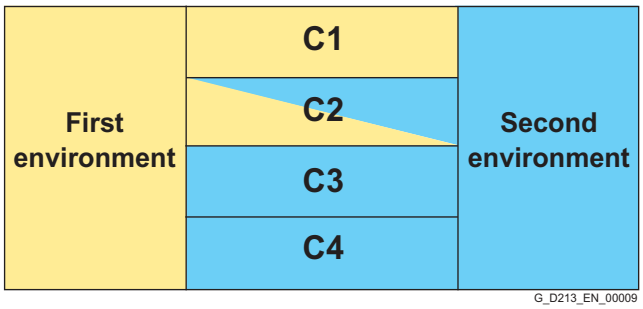
Category C1: Drive systems for rated voltages < 1000 V for unlimited use in the first environment.

Category C2: Stationary drive systems for rated voltages < 1000 V for use in the second environment. Use in the first environment is possible if the drive system is installed and used by qualified personnel. The warning and installation information supplied by the manufacturer must be observed.

Category C3: Drive systems for rated voltages < 1000 V for exclusive use in the second environment.

Category C4: Drive systems for rated voltages ≥ 1000 V or for rated currents ≥ 400 A for use in complex systems in the second environment.

The following graphic shows the assignment of the four categories to the first and second environments.



SINAMICS G130 drive converter chassis units are almost exclusively used in the second environment (categories C3 and C4).

To limit the **emitted interference**, SINAMICS G130 drive converter chassis units are equipped as standard with a radio interference suppression filter that conforms to the limits defined in Category C3. Optional filters are available on request for use in the first environment (Category C2).

SINAMICS G130 drive converter chassis units conform to the **noise immunity** requirements defined in EN 61 800-3 for the second environment, and thus also with the lower noise immunity requirements in the first environment.

The warning and installation information (part of the device documentation) must be observed.

Line-side power components
Line filters

Overview

Line-side power components are used to protect the connected components against transient or continuous overvoltages and ensure that prescribed limit values are adhered to.

The power modules are equipped as standard with a line filter that conforms to the limits defined in category C3 (second environment) in order to limit emitted interference. The additional line filters described here are available for use in the first environment (Category C2).

When combined with line reactors, the line filters limit the conducted interference emitted by the power modules to the limit values defined in the product standard EN 61800-3. When combined with a plant design rigorously based on the EMC design directives, the limit values at the installation site will conform to the requirements for the first environment. Line filters are only suitable for direct connection to TN systems.

Selection and ordering data

Suitable for power module	Rated output of the power module	Order No. **Line filter**
Supply voltage 380 V to 480 V		
6SL3310-1GE36-1AA0	315 kW	**6SL3000-0BE41-2AA0**
6SL3310-1GE37-5AA0	400 kW	
6SL3310-1GE38-4AA0	450 kW	
6SL3310-1GE41-0AA0	560 kW	
Supply voltage 660 V to 690 V		
6SL3310-1GH33-3AA0	315 kW	**6SL3000-0BG34-4AA0**
6SL3310-1GH34-1AA0	400 kW	
6SL3310-1GH34-7AA0	450 kW	**6SL3000-0BG36-0AA0**
6SL3310-1GH35-8AA0	560 kW	**6SL3000-0BG41-2AA0**
6SL3310-1GH37-4AA0	710 kW	
6SL3310-1GH38-1AA0	800 kW	

Technical data

Supply voltage 380 V to 480 V		**Line filters 6SL3000-0BE41-2AA0**			
Suitable for **power module**		6SL3310-1GE36-1AA0	6SL3310-1GE37-5AA0	6SL3310-1GE38-4AA0	6SL3310-1GE41-0AA0
Rated output of the power module	kW	**315**	**400**	**450**	**560**
Rated current	A	1200			
Power loss	kW	0.137			
Line/power connection		M12 connecting lugs			
PE connection		on housing with M10 bolts			
Width	mm	425			
Height	mm	265			
Depth	mm	145			
Weight, approx.	kg	25.2			

Supply voltage 660 V to 690 V		**Line filters 6SL3000-0BG34-4AA0**		**Line filters 6SL3000-0BG36-0AA0**	**Line filters 6SL3000-0BG41-2AA0**		
Suitable for **power module**		6SL3000-1GH33-3AA0	6SL3000-1GH34-1AA0	6SL3000-1GH34-7AA0	6SL3000-1GH35-8AA0	6SL3000-1GH37-4AA0	6SL3000-1GH38-1AA0
Rated output of the power module	kW	**315**	**400**	**450**	**560**	**710**	**800**
Rated current	A	440		600	1200		
Power loss	kW	0.049		0.055	0.137		
Line/power connection L1, L2, L3 / U, V, W		M10 connecting lugs		M10 connecting lugs	M12 connecting lugs		
PE connection		on housing with M8 bolts		on housing with M10 bolts	on housing with M10 bolts		
Width	mm	360		400	425		
Height	mm	240		265	265		
Depth	mm	116		140	145		
Weight, approx.	kg	12.3		19	25.2		

Line-side power components
Line reactors

Overview

A line reactor is needed for high system fault levels, partly to protect the actual converter against excessive harmonic currents, and thus against overload, and partly to limit the system perturbation to the permitted values (see also Engineering information)

Selection and ordering data

Suitable for power module	Rated output of the power module	Order No. **Line reactor**
Supply voltage 380 V to 480 V		
6SL3310-1GE36-1AA0	315 kW	**6SL3000-0CE36-3AA0**
6SL3310-1GE37-5AA0	400 kW	**6SL3000-0CE37-7AA0**
6SL3310-1GE38-4AA0	450 kW	**6SL3000-0CE38-7AA0**
6SL3310-1GE41-0AA0	560 kW	**6SL3000-0CE41-0AA0**
Supply voltage 660 V to 690 V		
6SL3310-1GH33-3AA0	315 kW	**6SL3000-0CH33-4AA0**
6SL3310-1GH34-1AA0	400 kW	**6SL3000-0CH34-8AA0**
6SL3310-1GH34-7AA0	450 kW	
6SL3310-1GH35-8AA0	560 kW	**6SL3000-0CH36-0AA0**
6SL3310-1GH37-4AA0	710 kW	**6SL3000-0CH38-4AA0**
6SL3310-1GH38-1AA0	800 kW	

Technical data

Supply voltage 380 V to 480 V		**Line reactor 6SL3000-0CE36-3AA0**	**6SL3000-0CE37-7AA0**	**6SL3000-0CE38-7AA0**	**6SL3000-0CE41-0AA0**
Suitable for **power module**		6SL3310-1GE36-1AA0	6SL3310-1GE37-5AA0	6SL3310-1GE38-4AA0	6SL3310-1GE41-0AA0
Rated output of power module	kW	**315**	**400**	**450**	**560**
I_{thmax}	A	628	773	871	1022
Nominal inductance L_N	µH	27	22	19	16
Power loss at 50 Hz/60 Hz	kW	0.287/0.324	0.273/0.311	0.356/0.400	0.386/0.434
Line/power connection		M12 connecting lugs	M12 connecting lugs	M12 connecting lugs	M12 connecting lugs
Degree of protection		IP00	IP00	IP00	IP00
Weight, approx.	kg	41.4	51.3	63.2	69.6

Supply voltage 660 V to 690 V		**Line reactor 6SL3000-0CH33-4AA0**	**Line reactor 6SL3000-0CH34-8AA0**		**Line reactor 6SL3000-0CH36-0AA0**	**Line reactor 6SL3000-0CH38-4AA0**	
Suitable for **power module**		6SL3310-1GH33-3AA0	6SL3310-1GH34-1AA0	6SL3310-1GH34-7AA0	6SL3310-1GH35-8AA0	6SL3310-1GH37-4AA0	6SL3310-1GH38-1AA0
Rated output of power module	kW	**315**	**400**	**450**	**560**	**710**	**800**
I_{thmax}	A	342	482	482	597	840	840
Nominal inductance L_N	µH	81	65	46	46	40	40
Power loss at 50 Hz/60 Hz	kW	0.210/0.238	0.279/0.313	0.371/0.418	0.376/0.423	0.390/0.416	0.480/0.541
Line/power connection		M10 connecting lugs	M12 connecting lugs	M12 connecting lugs	M12 connecting lugs	M12 connecting lugs	M12 connecting lugs
Degree of protection		IP00	IP00	IP00	IP00	IP00	IP00
Weight, approx.	kg	38.9	55.6	55.6	63.8	98	98

Overview

The following table contains recommendations only.

Catalog LV10 contains further details of the listed main contactors, switch-disconnectors, fuses and circuit-breakers.

Output (at 400 V or 690 V)	Rated input current	Suitable for power module	Line reactor	Line filter	Main contactor	Non-withdrawable circuit-breaker
kW	A	Type 6SL3310-...	Order No.	Order No.	Order No.	Order No.
Supply voltage 380 V to 480 V						
315	629	1GE36-1AA0	**6SL3000-0CE36-3AA0**	**6SL3000-0BE41-2AA0**	**3RT1476-6AP36**	-
400	775	1GE37-5AA0	**6SL3000-0CE37-7AA0**	**6SL3000-0BE41-2AA0**	**3RT1466-6AP36 (3 x)**	-
450	873	1GE38-4AA0	**6SL3000-0CE38-7AA0**	**6SL3000-0BE41-2AA0**	-	**3WL1110-2BB34-4AN2**
560	1024	1GE41-0AA0	**6SL3000-0CE41-0AA0**	**6SL3000-0BE41-2AA0**	-	**3WL1112-2BB34-4AN2**
Supply voltage 660 V to 690 V						
315	343	1GH33-3AA0	**6SL3000-0CH33-4AA0**	**6SL3000-0BG34-4AA0**	**3RT1466-6AP36**	-
400	426	1GH34-1AA0	**6SL3000-0CH34-8AA0**	**6SL3000-0BG34-4AA0**	**3RT1476-6AP36**	-
450	483	1GH34-7AA0	**6SL3000-0CH34-8AA0**	**6SL3000-0BG36-0AA0**	**3RT1476-6AP36**	-
560	598	1GH35-8AA0	**6SL3000-0CH36-0AA0**	**6SL3000-0BG41-2AA0**	**3RT1476-6AP36**	-
710	764	1GH37-4AA0	**6SL3000-0CH38-4AA0**	**6SL3000-0BG41-2AA0**	**3RT1466-6AP36 (3 x)**	-
800	842	1GH38-1AA0	**6SL3000-0CH38-4AA0**	**6SL3000-0BG41-2AA0**	-	**3WL1210-4BB34-4AN2**

Output (at 400 V or 690 V)	Rated input current	Suitable for power module	Switch-disconnector without handle and shaft	Switch-disconnector with handle and shaft	Cable protection fuse		Cable protection fuse with semiconductor protection	
kW	A	Type 6SL3310-...	Order No.	Order No.	Order No.	Rated current	Order No.	Rated current
Supply voltage 380 V to 480 V								
315	629	1GE36-1AA0	**3KL6230-1AB02**	**3KL6230-1EB02**	**3NA3475**	800 A	**3NE1438-2**	800 A
400	775	1GE37-5AA0	**3KL6230-1AB02**	**3KL6230-1EB02**	**3NA3475**	800 A	**3NE1448-2**	850 A
450	873	1GE38-4AA0	-	-	-	-	-	-
560	1024	1GE41-0AA0	-	-	-	-	-	-
Supply voltage 660 V to 690 V								
315	343	1GH33-3AA0	**3KL5730-1AB01**	**3KL5730-1EB01**	**3NA3365-6**	500 A	**3NE1334-2**	500 A
400	426	1GH34-1AA0	**3KL6130-1AB02**	**3KL6130-1EB02**	**3NA3365-6**	500 A	**3NE1334-2**	500 A
450	483	1GH34-7AA0	**3KL6130-1AB02**	**3KL6130-1EB02**	**3NA3252-6**	2 x 315 A	**3NE1435-2**	560 A
560	598	1GH35-8AA0	**3KL6230-1AB02**	**3KL6230-1EB02**	**3NA3354-6**	2 x 355 A	**3NE1447-2**	670 A
710	764	1GH37-4AA0	**3KL6230-1AB02**	**3KL6230-1EB02**	**3NA3365-6**	2 x 500 A	**3NE1448-2**	850 A
800	842	1GH38-1AA0	-	-	-	-	-	-

Power modules

Overview

The power module contains

- the line-side 6-pulse rectifier
- the capacitors for the voltage source DC link
- the IGBT-based inverter
- the associated gating and monitoring electronics
- the precharging for the DC link
- the control and power supply for the fans in the power module

Design

The power module features the following interfaces as standard:

- Connecting lugs for the line supply
- Connecting lugs for the motor circuit
- Connection for external 24 V supply
- 3 x DRIVE-CLiQ sockets
- 24 V voltage tapping points to supply the
  - CU320 control unit and the
  - AOP30 operator panel
- 1 x temperature sensor input (KTY84-130)
- PE (protective earth) connection

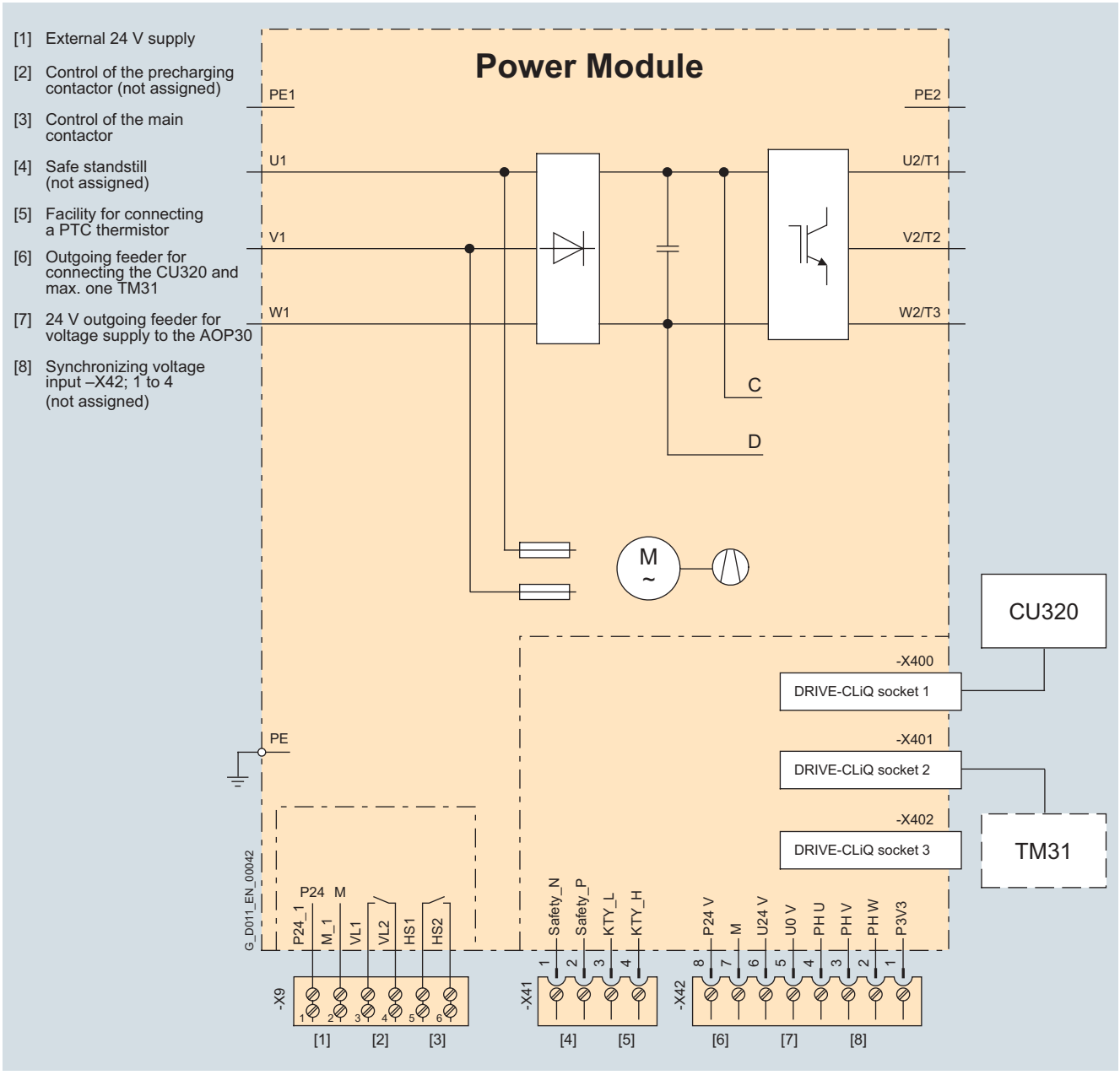
Selection and ordering data

Power modules			Order No.
Rated output	at 460 V/60 Hz	Rated output current	
kW	hp	A	
Supply voltage 380 V to 480 V			
315	500	605	**6SL3310-1GE36-1AA0**
400	600	745	**6SL3310-1GE37-5AA0**
450	700	840	**6SL3310-1GE38-4AA0**
560	800	985	**6SL3310-1GE41-0AA0**
Supply voltage 660 V to 690 V			
315		330	**6SL3310-1GH33-3AA0**
400		410	**6SL3310-1GH34-1AA0**
450		465	**6SL3310-1GH34-7AA0**
560		575	**6SL3310-1GH35-8AA0**
710		735	**6SL3310-1GH37-4AA0**
800		810	**6SL3310-1GH38-1AA0**

Integration

The power module communicates with the CU320 control unit via DRIVE-CLiQ (a fast serial interface) and receives its control information via this route.

The DRIVE-CLiQ cable required to connect to the next DRIVE-CLiQ device can be ordered, made up to the right length (→ Signal cables).



Connection diagram for power module

Power modules

Technical data

Supply voltage 380 V to 480 V		Power modules 6SL3310-1GE36-1AA0	6SL3310-1GE37-5AA0	6SL3310-1GE38-4AA0	6SL3310-1GE41-0AA0
Rated output current I_{rated}	A	605	745	840	985
Base load current I_L [1]	A	590	725	820	960
Base load current I_H [2]	A	460	570	700	860
Rated output for I_L	kW	315	400	450	560
Rated output for I_H	kW	250	315	400	450
Rated output for I_L 460 V/60 Hz	hp	500	600	700	800
Rated output for I_H 460 V/60 Hz	hp	400	500	600	700
Max. current demand [3] (for DC 24 V)	A	1	1	1	1,25
Rated input current [4]	A	629	775	873	1024
Power loss	kW	7.8	9.1	9.6	13.8
Cooling air requirement	m^3/s	0.78	0.78	0.78	1.48
Degree of protection		IP00	IP00	IP00	IP00
Noise level L_{pA} (1 m) at 50 Hz/60 Hz	dB	70/73	70/73	70/73	72/75
Line connection U1, V1, W1		Flanged connection with M12 screws	Flanged connection with M12 screws	Flanged connection with M12 screws	Flanged connection with M12 screws
Motor connection U2/T1, V2/T2, W2/T3		Flanged connection with M12 screws	Flanged connection with M12 screws	Flanged connection with M12 screws	Flanged connection with M12 screws
Max. conductor cross-section for the following cables		4 x 240 mm^2 per conductor	4 x 240 mm^2 per conductor	4 x 240 mm^2 per conductor	6 x 240 mm^2 per conductor
PE1/GND or PE2/GND conductor		M12 mounting screw	M12 mounting screw	M12 mounting screw	M12 mounting screw
Max. conductor cross-section for PE1/GND		2 x 240 mm^2	2 x 240 mm^2	2 x 240 mm^2	4 x 240 mm^2
Max. conductor cross-section for PE2/GND		4 x 240 mm^2	4 x 240 mm^2	4 x 240 mm^2	6 x 240 mm^2
Width	mm	503	503	503	908
Height	mm	1506	1506	1506	1510
Depth	mm	540	540	540	540
Weight, approx.	kg	294	294	294	530

1) The base load current I_L is based on a duty cycle of 110% for 60 s or 150% for 10 s with a duration of 300 s.
2) The base load current I_H is based on a duty cycle of 150% for 60 s or 160% for 10 s with a duration of 300 s.
3) If the auxiliary supply is to be fed in separately from the load supply, e.g. if the closed-loop control should be able to continue communication if the line voltage fails.
4) The line currents listed here apply to operation with rated output current.

Technical data (continued)

Supply voltage 660 V to 690 V		Power modules 6SL3310-1GH33-3AA0	6SL3310-1GH34-1AA0	6SL3310-1GH34-7AA0	6SL3310-1GH35-8AA0	6SL3310-1GH37-4AA0	6SL3310-1GH38-1AA0
Rated output current I_{rated}	A	330	410	465	575	735	810
Base load current I_L [1]	A	320	400	452	560	710	790
Base load current I_H [2]	A	280	367	416	514	657	724
Rated output for I_L	kW	315	400	450	560	710	800
Rated output for I_H	kW	250	315	400	450	630	710
Max. current demand [3] (for DC 24 V)	A	0.9	1	1	1	1.25	1.25
Rated input current [4]	A	343	426	483	598	764	852
Power loss	kW	5.8	7.5	8.5	10.3	12.8	13.9
Cooling air requirement	m^3/s	0.36	0.78	0.78	0.78	1.48	1.48
Degree of protection		IP20	IP00	IP00	IP00	IP00	IP00
Noise level L_{pA} (1 m) at 50 Hz/60 Hz	dB	69/73	70/73	70/73	70/73	73/75	73/75
Line connection U1, V1, W1		Flanged connection with M10 screws	Flanged connection with M12 screws	Flanged connection with M12 screws	Flanged connection with M12 screws	Flanged connection with M12 screws	Flanged connection with M12 screws
Motor connection U2/T1, V2/T2, W2/T3		Flanged connection with M10 screws	Flanged connection with M12 screws	Flanged connection with M12 screws	Flanged connection with M12 screws	Flanged connection with M12 screws	Flanged connection with M12 screws
Max. conductor cross-section for the following cables		2 x 240 mm^2 per conductor	4 x 240 mm^2 per conductor	4 x 240 mm^2 per conductor	4 x 240 mm^2 per conductor	6 x 240 mm^2 per conductor	6 x 240 mm^2 per conductor
PE1/GND or PE2/GND conductor		M10 mounting screw	M12 mounting screw	M12 mounting screw	M12 mounting screw	M12 mounting screw	M12 mounting screw
Max. conductor cross-section for PE1/GND		2 x 240 mm^2	2 x 240 mm^2	2 x 240 mm^2	2 x 240 mm^2	4 x 240 mm^2	4 x 240 mm^2
Max. conductor cross-section for PE2/GND		2 x 240 mm^2	4 x 240 mm^2	4 x 240 mm^2	4 x 240 mm^2	6 x 240 mm^2	6 x 240 mm^2
Width	mm	326	503	503	503	908	908
Height	mm	1533	1506	1506	1506	1510	1510
Depth	mm	545	540	540	540	540	540
Weight, approx.	kg	162	294	294	294	530	530

1) The base load current I_L is based on a duty cycle of 110% for 60 s or 150% for 10 s with a duration of 300 s.

2) The base load current I_H is based on a duty cycle of 150% for 60 s or 160% for 10 s with a duration of 300 s.

3) If the auxiliary supply is to be fed in separately from the load supply, e.g. if the closed-loop control should be able to continue communication if the line voltage fails.

4) The line currents listed here apply to operation with rated output current.

DC link components
Braking modules

Overview

A braking module is required if the drive will occasionally require braking or to be stopped (e.g. for EMERGENCY STOP category 1). The braking module houses the power electronics and the associated control circuit. The supply voltage for the electronics is taken from the DC link.

During operation, the DC link power is converted into heat loss in an external braking resistor.

The braking module works autonomously from the converter control. Several braking modules may be operated in parallel in order to increase the output. In this case, each braking module must have its own braking resistor.

Design

The braking module is installed in a slot inside the power module, and receives forced ventilation via the power module's fan. The braking module is connected to the DC link using the busbars or flexible cables supplied with the module.

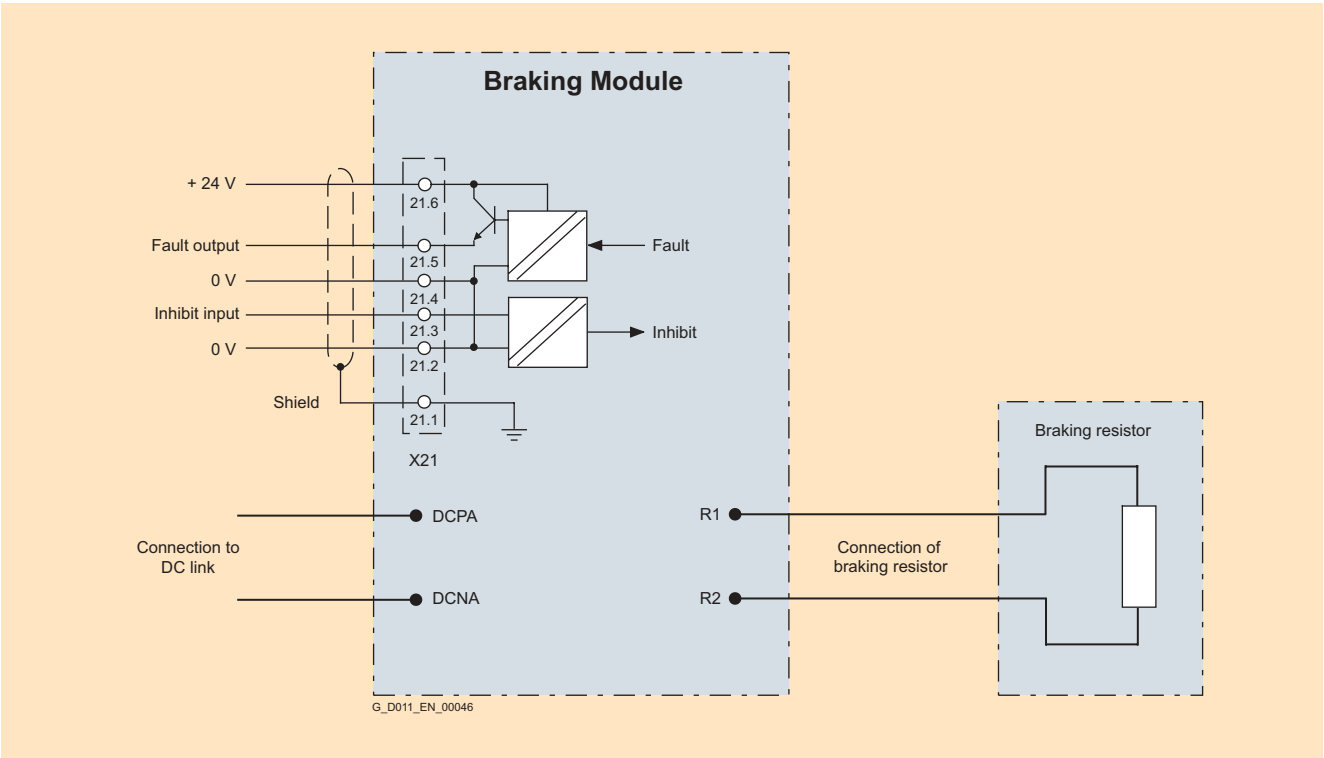
The braking module features the following interfaces as standard:

- DC link connection
- Braking resistor connection terminal
- 1 x digital input (disable braking module/acknowledge faults)
- 1 x digital output (fault in braking module)
- PE (protective earth) connection

Selection and ordering data

Suitable for power module	Rated output of the power module	Order No. **Braking module**
Supply voltage 380 V to 480 V		
6SL3310-1GE36-1AA0	315 kW	**6SL3300-1AE32-5BA0**
6SL3310-1GE37-5AA0	400 kW	
6SL3310-1GE38-4AA0	450 kW	
6SL3310-1GE41-0AA0	560 kW	
Supply voltage 660 V to 690 V		
6SL3310-1GH33-3AA0	315 kW	**6SL3300-1AH32-5AA0**
6SL3310-1GH34-1AA0	400 kW	**6SL3300-1AH32-5BA0**
6SL3310-1GH34-7AA0	450 kW	
6SL3310-1GH35-8AA0	560 kW	
6SL3310-1GH37-4AA0	710 kW	
6SL3310-1GH38-1AA0	800 kW	

Integration



Connection diagram for braking module

Technical data

Braking module		6SL3300-1AE32-5BA0	6SL3300-1AH32-5AA0	6SL3300-1AH32-5BA0
Line voltage of the power module		380 V to 480 V	660 V to 690 V	660 V to 690 V
P_{DB} output	kW	50		
P_{40} output	kW	100		
P_{20} output (rated output)	kW	200		
P_{15} output	kW	250		
Digital input				
• Voltage	V	-3 to +30		
• Low level (an open digital input is interpreted as "low")	V	-3 to +5		
• High level	V	15 to 30		
• Current consumption (typical for 24 V DC)	mA	10		
• Max. connectable cross-section	mm^2	1.5		
Digital output (continuously short-circuit-proof)				
• Voltage		24 V DC		
• Max. load current of the digital output	mA	500		
• Max. connectable cross-section	mm^2	1.5		
DC link busbar current capacity	A	378	255	255
Design conforms to		UL and IEC	IEC	IEC
Terminal/R1/R2		M8 mounting screw	M8 mounting screw	M8 mounting screw
Max. conductor cross-section R1/R2	mm^2	50	50	50
Width	mm	152	120	152
Height	mm	140	130	140
Depth	mm	472	500	472
Weight, approx.	kg	7.5	7.3	7.5

Output	
P_{DB}	Continuous braking power
$P_{40} = 2 \times P_{DB}$	40 s output related to a braking interval of 90 s
$P_{20} = 4 \times P_{DB}$	20 s output related to a braking interval of 90 s
$P_{15} = 5 \times P_{DB}$	15 s output related to a braking interval of 90 s

DC link components
Braking resistors

Overview

Excess power in the DC link is dissipated via the braking resistor.

The braking resistor is connected to a braking module. The maximum distance between the braking module and the braking resistor must not exceed 50 mm. This means that the resulting heat loss can be dissipated outside of the switchgear room.

A 200 kW resistor is available for braking.

Greater outputs can be implemented by connecting braking modules and braking resistors in parallel. The braking resistors can be used on converters with a wide voltage range, so the voltage can be adjusted by setting the response threshold on the braking module.

A thermostat monitors the braking resistor for overheating, and if the limit value is exceeded, it is signaled via a floating contact.

Technical data

Braking resistor		**6SL3000-1BE32-5AA0**	**6SL3000-1BH32-5AA0**
Line voltage of the power module		380 V to 480 V	660 V to 690 V
P_{DB} output	kW	50	
P_{40} output	kW	100	
P_{20} output (rated output)	kW	200	
P_{15} output	kW	250	
Resistor	W	2.2 ±7.5%	4.9 ±7.5%
Max. current	A	378	255
Max. connectable cable cross-section	mm^2	70	
Cable gland		via M50 cable gland	
Line connection		via M10 bolt-type terminal	
Max. conductor cross-section R1/R2	mm^2	50	
Degree of protection		IP20	
Width	mm	810	
Height	mm	1325	
Depth	mm	485	
Weight, approx.	kg	120	

Selection and ordering data

Braking resistor 200 kW	Order No.
for supply voltage 380 V to 480 V	**6SL3000-1BE32-5AA0**
for supply voltage 660 V to 690 V	**6SL3000-1BH32-5AA0**

Overview

The control unit kit, which consists of the CU320 control unit and the drive software installed on the CompactFlash card, provides predefined interfaces that simplify configuration and commissioning. The CompactFlash card is plugged into the CU320, and can be quickly replaced in order to upgrade or install software. The communication, open-loop and closed-loop control functions for the chassis units run in the CU320 control unit.

Design

The CU320 control unit kit features the following interfaces as standard:

- 4 x DRIVE-CLiQ sockets for communication with other DRIVE-CLiQ devices, e.g., chassis units or terminal modules
- 1 x PROFIBUS interface
- 8 x parameterizable digital inputs (floating)
- 8 x parameterizable bidirectional digital inputs/digital outputs (non-floating), of which 6 are high-speed digital inputs
- 1 x serial RS232 interface
- 1 x option slot
- 3 x test sockets and one reference ground for commissioning support
- 1 x PE (protective earth) connection
- 1 x ground connection

A shield connection for the signal cable shield on the option module is located on the CU320 control unit.

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

The status of the CU320 control unit is indicated via multi-color LEDs.

Technical data

CU320 control unit kit	
Max. current requirement (at 24 V DC) without taking account of digital outputs, option slot expansion	0.8 A
Max. connectable cross-section	2.5 mm^2
Max. fuse protection	20 A
Digital inputs	8 x floating digital inputs 8 x bidirectional non-floating digital inputs/digital outputs
• Voltage	-3 V to +30 V
• Low level (an open digital input is interpreted as "low")	-3 V to +5 V
• High level	15 V to 30 V
• Current consumption (typ. at 24 V DC)	10 mA
• Signal propagation delays for digital inputs	L → H: approx. 50 µs H → L: approx. 100 µs
• Signal propagation delays for high-speed digital inputs (high-speed digital inputs can be used for position detection)	L → H: approx. 5 µs H → L: approx. 50 µs
• Max. connectable cross-section	0.5 mm^2
Digital outputs (continuously short-circuit-proof)	8 x bidirectional non-floating digital outputs/digital inputs
• Voltage	24 V DC
• Max. load current per digital output	500 mA
• Max. connectable cross-section	0.5 mm^2
Power loss	20 W
PE connection	On housing with M5 screw
Earth connection	On housing with M5 screw
Width	50 mm
Height	270 mm
Depth	226 mm
Weight, approx.	1.5 kg

Selection and ordering data

Description	Order No.
CU320 Control unit kit consisting of : • CU320 control unit kit • CompactFlash card with the latest firmware • Device documentation on CD-ROM	**6SL3040-0GA00-1AA0**

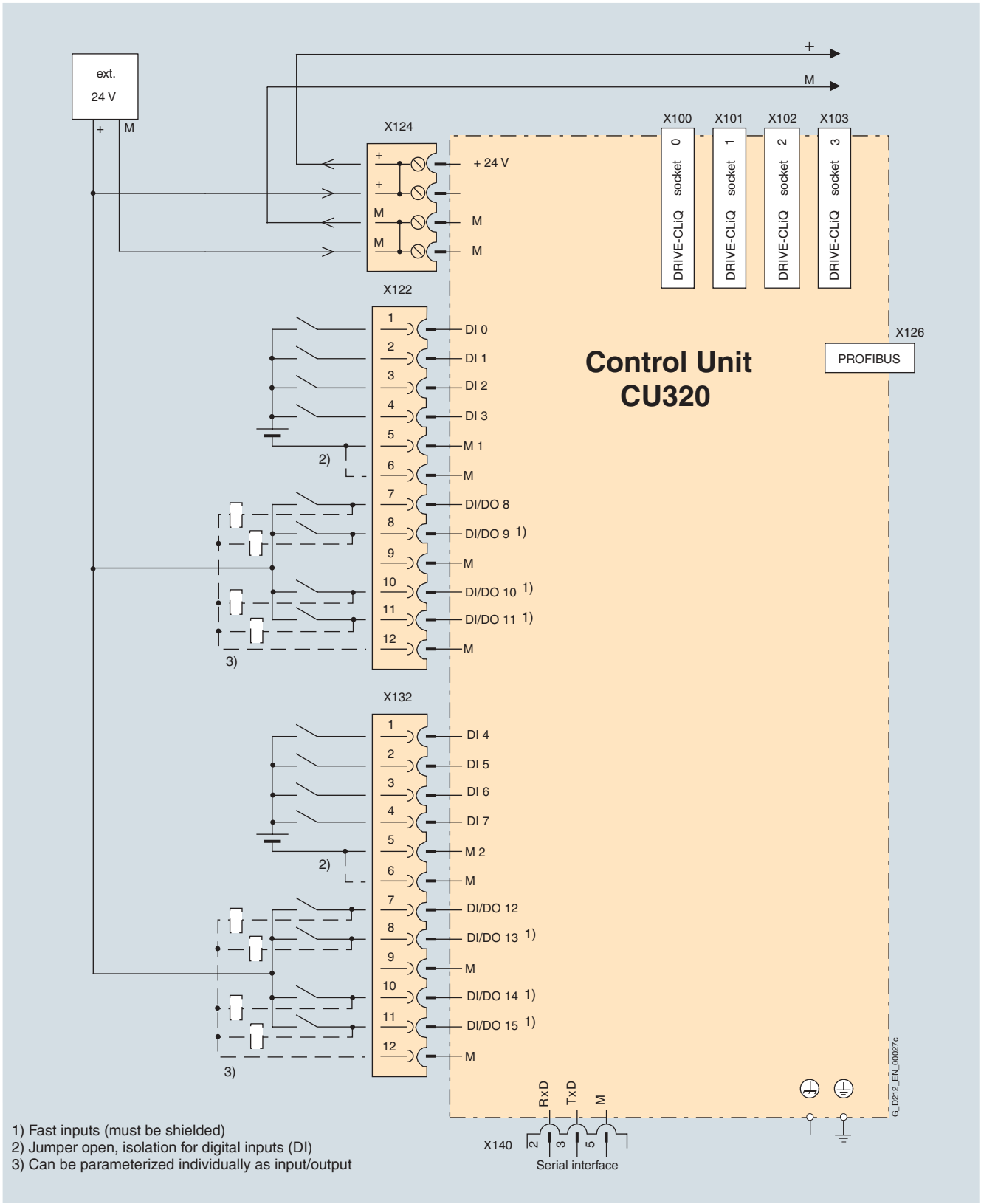
Accessories

Description	Order No.
PROFIBUS connector without PG/PC connection	**6ES7972-0BA41-0XA0**
PROFIBUS connector with PG/PC connection	**6ES7972-0BB41-0XA0**

CU320 Control unit kit

Integration

Communication between a CU320 control unit and the connected components takes place via DRIVE-CLiQ.



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

Connection diagram for CU320 control unit kit

Overview

The TB30 terminal board expands the number of digital inputs/digital outputs and analog inputs/analog outputs of the CU320 control unit.

Design

The following are located on the TB30 terminal board:

- Power supply for digital inputs/digital outputs
- 4 x digital inputs
- 4 x digital outputs
- 2 x analog inputs
- 2 x analog outputs

The TB30 terminal board plugs into the option slot on the CU320 control unit.

A shield connection for the signal cable shield is located on the CU320 control unit.

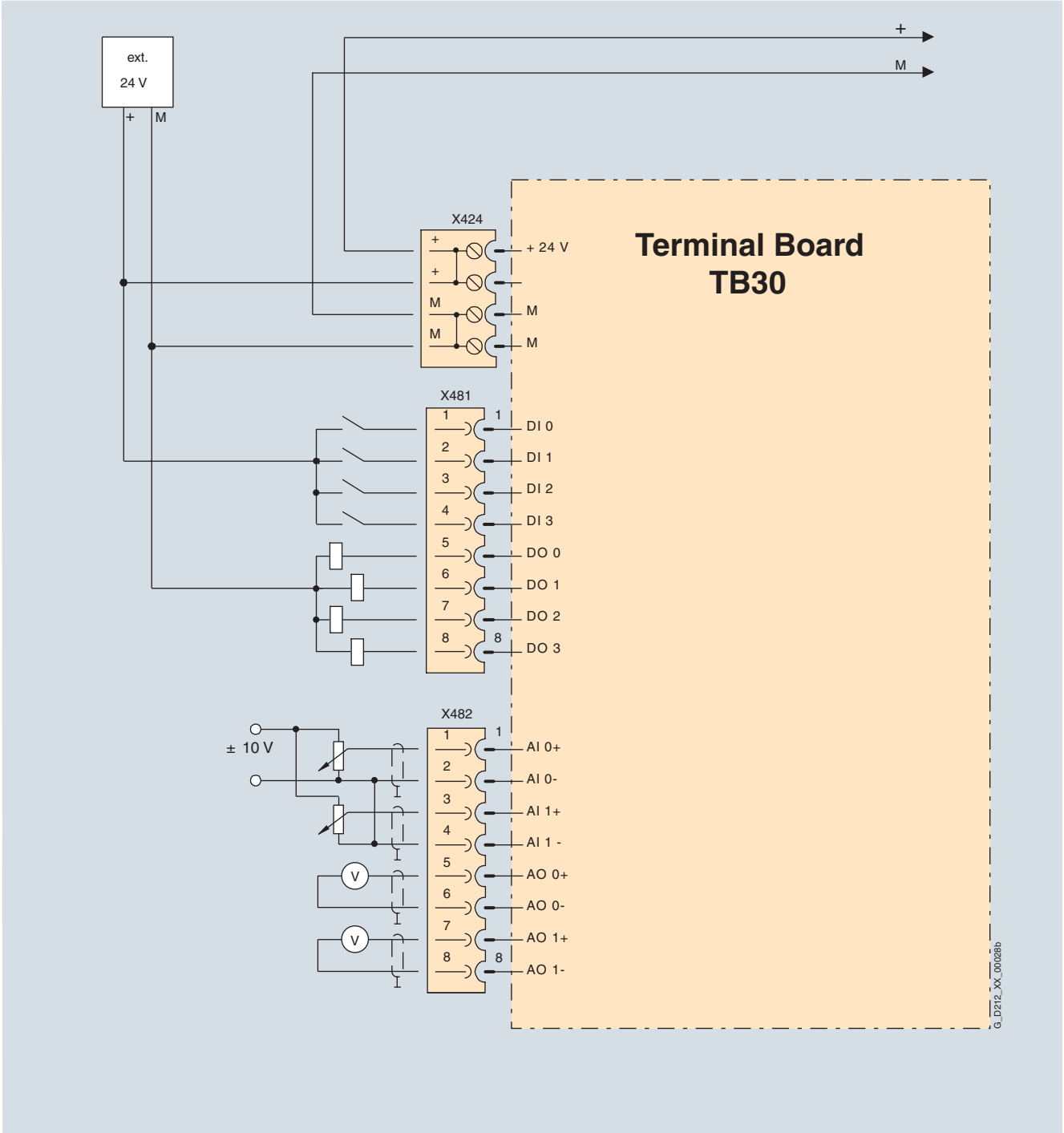
Technical data

TB30 terminal board	
Max. current requirement (at 24 V DC) via CU320 control unit without taking account of digital outputs	0.05 A
Max. connectable cross-section	2.5 mm^2
Max. fuse protection	20 A
Digital inputs	
• Voltage	-3 V to +30 V
• Low level (an open digital input is interpreted as "low")	-3 V to +5 V
• High level	15 V to 30 V
• Current consumption (at 24 V DC)	typ. 10 mA
• Signal propagation delays for digital inputs	L → H: approx. 50 µs H → L: approx. 100 µs
• Max. connectable cross-section	0.5 mm^2
Digital outputs (continuously short-circuit-proof)	
• Voltage	24 V DC
• Max. load current per digital output	500 mA
• Max. connectable cross-section	0.5 mm^2
Analog inputs (differential)	
• Voltage range (an open analog input is interpreted as 0 V)	-10 V to +10 V
• Internal resistance R_i	65 kΩ
• Resolution	13 bit + sign
• Max. connectable cross-section	0.5 mm^2
Analog outputs (continuously short-circuit-proof)	
• Voltage range	-10 V to +10 V
• Max. load current	-3 mA to +3 mA
• Resolution	11 bit + sign
• Max. connectable cross-section	0.5 mm^2
Power loss	< 3 W
Weight, approx.	0.1 kg

Selection and ordering data

Description	Order No.
TB30 terminal board	**6SL3055-0AA00-2TA0**

Integration



Connection diagram for TB30 terminal board

Overview

With the TM31 terminal module, the number of available digital inputs and outputs and the number of analog inputs and outputs within a drive can be expanded.

Design

The following interfaces are located on the TM31 terminal module:

- 8 x digital inputs
- 4 x bidirectional digital inputs/digital outputs
- 2 x relay outputs with changeover contact
- 2 x analog inputs
- 2 x analog outputs
- 1 x temperature sensor input (KTY84-130 or PTC)
- 2 x DRIVE-CLiQ sockets
- 1 x connection for the electronics power supply via the 24 V DC power supply connector
- 1 x PE (protective earth) connection

The TM31 terminal module can be snapped onto a 35×15/7.5 DIN rail to EN 50 022.

The signal line 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.
TM31 terminal module (without DRIVE-CLiQ cable)	**6SL3055-0AA00-3AA0**

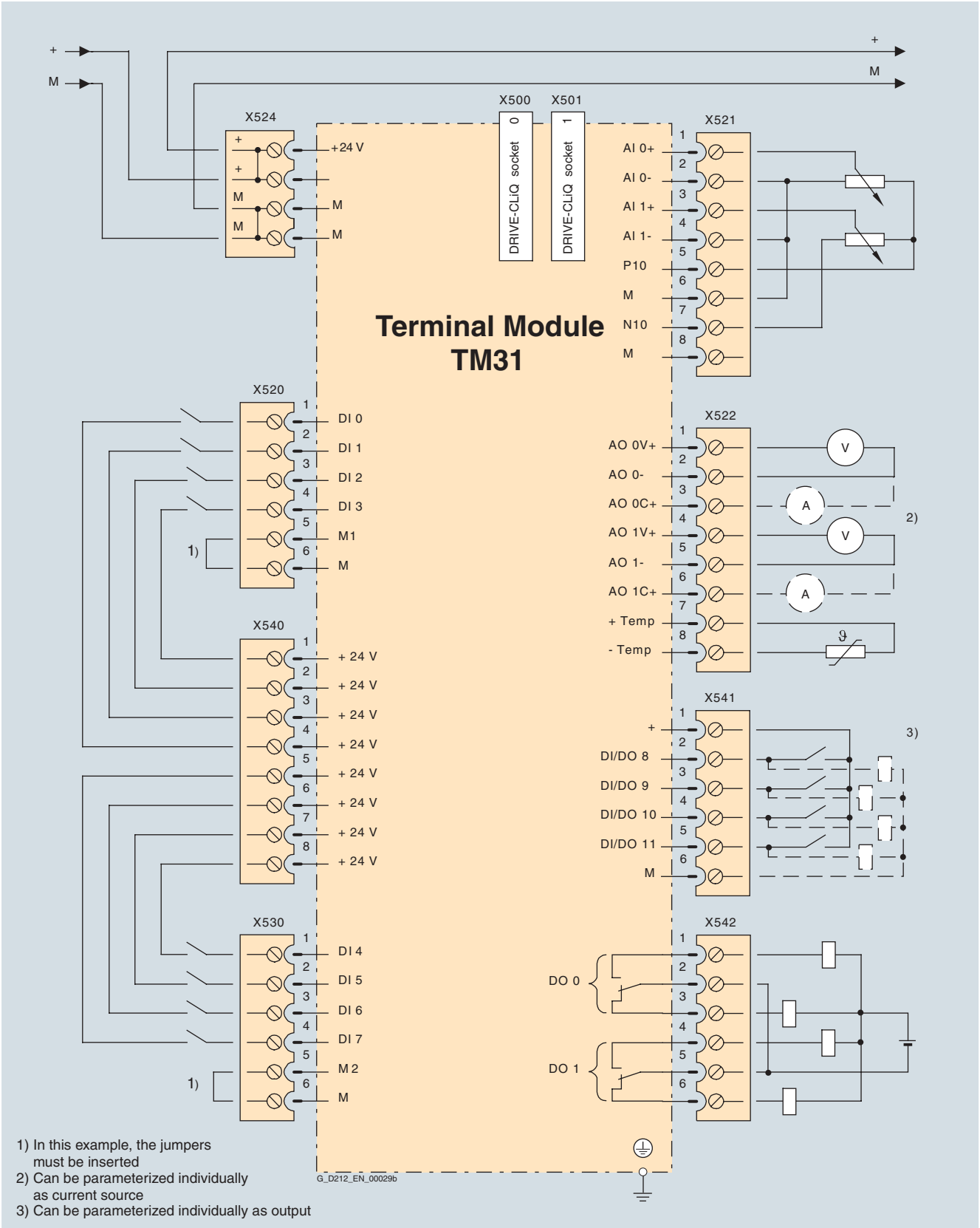
Technical data

TM31 terminal module	
Max. current requirement (at 24 V DC) without taking account of digital outputs	0.5 A
Max. connectable cross-section	2.5 mm^2
Max. fuse protection	20 A
Digital inputs	
• Voltage	-3 V to +30 V
• Low level (an open digital input is interpreted as "low")	-3 V to +5 V
• High level	15 V to 30 V
• Current consumption (at 24 V DC)	typ. 10 mA
• Signal propagation delays for digital inputs	L → H: approx. 50 µs H → L: approx. 100 µs
• Max. connectable cross-section	1.5 mm^2
Digital outputs (continuously short-circuit-proof)	
• Voltage	24 V DC
• Max. load current per digital output	100 mA
• Max total current of digital outputs	400 mA
• Max. connectable cross-section	1.5 mm^2
Analog inputs (a switch is used to toggle between voltage and current input)	
• As voltage input	
- Voltage range	-10 V to +10 V
- Internal resistance R_i	100 kΩ
• As current input	
- Current range	4 mA to 20 mA/-20 mA to +20 mA/ 0 mA to 20 mA
- Internal resistance R_i	250 Ω
- Resolution	11 bit + sign
• Max. connectable cross-section	1.5 mm^2
Analog outputs (continuously short-circuit-proof)	
• Voltage range	-10 V to +10 V
• Max. load current	-3 mA to +3 mA
• Current range	4 mA to 20 mA, -20 mA to +20 mA, 0 mA to 20 mA
• Max. load resistance	500 Ω for outputs in the range -20 mA to +20 mA
• Resolution	11 bit + sign
• Max. connectable cross-section	1.5 mm^2
Relay outputs (change-over contacts)	
• Max. load current	8 A
• Max. switching voltage	250 V AC, 30 V DC
• Max. switching power (at 250 V AC)	2000 VA (cos φ = 1) 750 VA (cos φ = 0.4)
• Max. switching power (at 30 V DC)	240 W (ohmic load)
• Required minimum current	100 mA
• Max. connectable cross-section	2.5 mm^2
Power loss	< 10 W
PE connection	On housing with M4 screw
Width	50 mm
Height	150 mm
Depth	111 mm
Weight, approx.	0.87 kg

2

Integration

The TM31 terminal module communicates with the CU320 control unit via DRIVE-CLiQ.



1) In this example, the jumpers must be inserted
2) Can be parameterized individually as current source
3) Can be parameterized individually as output

Connection diagram for TM31 terminal module

Overview

The SMC30 sensor module cabinet-mounted is required when a motor with a DRIVE-CLiQ interface is not available or when external encoders are required in addition to the motor encoder.

TTL/HTL incremental encoders with and without cable-break detection are supported.

The motor temperature can also be detected using KTY84-130 PTC sensors.

Design

The SMC30 sensor module cabinet-mounted features the following interfaces as standard:

- 1 x DRIVE CLiQ interface
- 1 x encoder connection including motor temperature detection (KTY84-130) via SUB-D connector or terminals
- 1 x connection for the electronics power supply via the 24 V DC power supply connector
- 1 x PE (protective earth) connection

The status of the SMC30 sensor module cabinet-mounted is indicated via a multi-color LED.

SMC30 sensor modules cabinet-mounted can be snapped onto a 35×15/7.5 DIN rail to EN 50 022.

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 signals A+/A- and B+/B- are evaluated and the power supply cable has a minimum cross-section of 0.75 mm^2.

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. The shield connection terminal must not be used for strain relief.

Integration

The SMC30 sensor module cabinet-mounted communicates with the CU320 control unit via DRIVE-CLiQ.

Technical data

SMC30 sensor module cabinet-mounted	
Max. current requirements (at 24 V DC) without taking account of encoder	0.6 A
Max. connectable cross-section	2.5 mm^2
Max. fuse protection	20 A
Power loss	< 10 W
PE connection	On housing with M4 screw
Width	50 mm
Height	150 mm
Depth	111 mm
Weight, approx.	0.8 kg

Selection and ordering data

Description	Order No.
SMC30 sensor module cabinet-mounted (without DRIVE-CLiQ cable)	**6SL3055-0AA00-5CA0**

Supplementary system components
AOP30 advanced operator panel

Overview

The AOP30 advanced operator panel is an optional input/output device for converters from the SINAMICS G130 series. On the SINAMICS G150 drive converter cabinet units, it is fitted in the cabinet doors as standard.

It has the following features and characteristics:

- Graphical LCD display with backlighting for plain-text display and a bar display of process variables
- LEDs for displaying the operational status
- Help function describing causes of and remedies for faults and alarms
- Keypad for operational control of a drive
- Local/remote switchover for selecting the input point (priority assigned to operator panel or customer's terminal block / PROFIBUS)
- Numeric keypad for input of setpoint or parameter values
- Function keys for prompted navigation in the menu
- Two-stage safety strategy to protect against accidental or unauthorized changes to settings.
  Operation of the drive from the operator panel can be disabled by a password, ensuring that only parameter values and process variables can be displayed in the panel. A password can be used to prevent the unauthorized modification of converter parameters.
- IP54 degree of protection (when installed).

The AOP30 and SINAMICS drive communicate via an RS 232 serial interface with PPI protocol. A null modem cable can be used to connect them.

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 will be plugged into the RS 232 interface on the CU320 control unit.

An external 24 V power supply (max. power consumption 200 mA) is needed to run the AOP30. This can be tapped off from the power supply of the power module (see also Engineering information).

Design

The AOP30 is an operator panel with graphical display and membrane keyboard. An RS 232 port is used as the interface to the drive unit. The unit is suitable for installation in control cabinet doors that are 2 mm to 4 mm thick.

Features:

- Green backlit display, 240 x 64 pixels resolution
- Membrane keyboard with 26 keys
- Connection for an external 24 V supply
- RS 232 interface
- Time and date stored by an internal buffer battery
- 3 LEDs to signal the operating state of the drive:
  - RUN (green)
  - ALARM (yellow)
  - FAULT (red)

Function

The current operating states, setpoints and actual values, parameters, indices, faults and alarms are displayed in the display panel.

The basic operator panel language is English. Further languages may be optionally selected as the second language.

Selection and ordering data

AOP30 advanced operator panel	Order No.
with display languages English/German	**6SL3055-0AA00-4CA0**
with display languages English/Italian	**6SL3055-0AA00-4CC0**
with display languages English/French	**6SL3055-0AA00-4CD0**
with display languages English/Spanish	**6SL3055-0AA00-4CE0**

Accessories

RS 232 plug-in cable	Order No.
Length 1 m	**6FX8002-1AA01-1AB0**
Length 2 m	**6FX8002-1AA01-1AC0**
Length 3 m	**6FX8002-1AA01-1AD0**
Length 4 m	**6FX8002-1AA01-1AE0**
Length 5 m	**6FX8002-1AA01-1AF0**
Length 6 m	**6FX8002-1AA01-1AG0**
Length 7 m	**6FX8002-1AA01-1AH0**
Length 8 m	**6FX8002-1AA01-1AJ0**
Length 9 m	**6FX8002-1AA01-1AK0**
Length 10 m	**6FX8002-1AA01-1BA0**

Signal cables

Overview

Communication between the CU320 control unit, the power module and other active SINAMICS components takes place via DRIVE-CLiQ - the drive's internal serial interface. Preassembled cables are available for this purpose.

MOTION-CONNECT DRIVE-CLiQ cables

Preassembled MOTION-CONNECT cables for DRIVE-CLiQ are available precut to length in order to connect the control units to the power modules and terminals.

The DRIVE-CLiQ cable needed to connect the power module to the control unit is already supplied, together with the 24 V supply cable, with the power module.

Application

The DRIVE-CLiQ cables are only suitable for wiring DRIVE-CLiQ components that have an external 24 V DC power supply.

Serial plug-in cable for connecting the AOP30 to the CU320

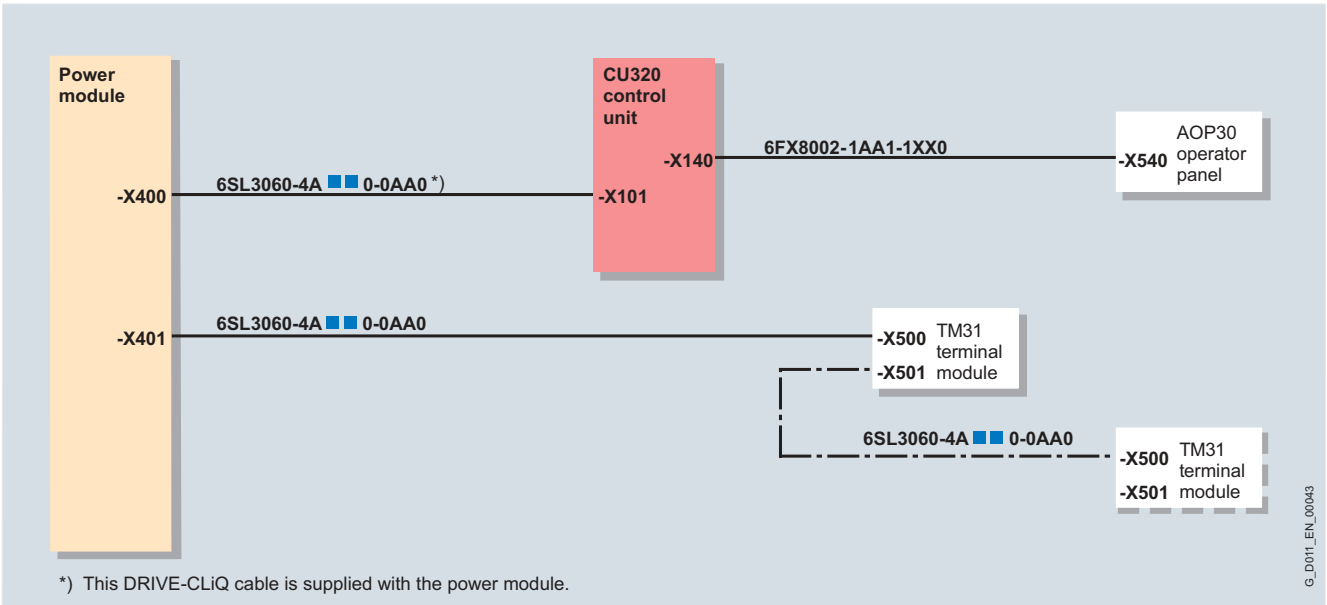
The AOP30 operator panel is connected to the CU320 control unit via a serial plug-in cable (RS 232 cable).

The maximum cable length is 10 m. To guarantee uninterrupted communication, a shielded cable is recommended, and the cable shield should be connected to both connector housings.

Selection and ordering data

Signal cable	Length m	Order No.
Preassembled DRIVE-CLiQ cable Degree of protection of connector IP20/IP20	0.11	**6SL3060-4AB00-0AA0**
	0.16	**6SL3060-4AD00-0AA0**
	0.21	**6SL3060-4AF00-0AA0**
	0.26	**6SL3060-4AH00-0AA0**
	0.36	**6SL3060-4AM00-0AA0**
	0.60	**6SL3060-4AU00-0AA0**
	0.95	**6SL3060-4AA10-0AA0**
	1.20	**6SL3060-4AW00-0AA0**
	1.45	**6SL3060-4AF10-0AA0**
	2.80	**6SL3060-4AJ20-0AA0**
	5.00	**6SL3060-4AA50-0AA0**
Preassembled RS 232 plug-in cable for connecting the AOP30 to the CU320	1	**6FX8002-1AA01-1AB0**
	2	**6FX8002-1AA01-1AC0**
	3	**6FX8002-1AA01-1AD0**
	4	**6FX8002-1AA01-1AE0**
	5	**6FX8002-1AA01-1AF0**
	6	**6FX8002-1AA01-1AG0**
	7	**6FX8002-1AA01-1AH0**
	8	**6FX8002-1AA01-1AJ0**
	9	**6FX8002-1AA01-1AK0**
	10	**6FX8002-1AA01-1BA0**

Integration



*) This DRIVE-CLiQ cable is supplied with the power module.

Connection example - CU320 control unit

Notes

SINAMICS G150
Drive converter cabinet units

3

SINAMICS

Drive converter cabinet units

75 kW to 800 kW

Overview

SINAMICS G150 drive converter cabinet units, version A and C

SINAMICS G150 drive converter cabinet units are designed for variable-speed drives in machine building and plant construction.

They have been specially tuned to the requirements of drives with quadratic and constant load characteristics, with medium performance requirements and without regenerative feedback.

The control accuracy of the sensorless vector control is suitable for most applications, and additional actual speed value encoders are therefore superfluous.

However, the SINAMICS G150 converters are optionally available with an encoder evaluator in order to handle applications that require an encoder for plant-specific reasons.

SINAMICS G150 converter cabinet units offer an economic drive solution that can be matched to customers' specific requirements by adding from the wide range of available components and options.

The SINAMICS G150 drive converter cabinet units are available for the following voltages and outputs:

Supply voltage	Output
380 V to 480 V	110 kW to 560 kW
660 V to 690 V	75 kW to 800 kW

Degrees of protection are IP20 (standard), and as an option IP21, IP23 and IP54.

There are two versions of the drive converter cabinet units:

- *Version A*
  All the required line connection components, such as the main control switch, circuit-breakers, main contactor, line fuses, line filter, motor components, and additional monitoring devices, can be installed as required.
- *Version C*
  With its particularly space-optimized structure without the line-side components. This version can be used where the line connection components are accommodated in a central low-voltage distribution panel (MCC) on the plant side.

Global use

SINAMICS G150 drive converter cabinet units are manufactured in compliance with relevant international standards and directives, and are therefore suitable for global use (→ Technical data).

Benefits

- Particularly quiet and compact converters due to the use of state-of-the-art IGBT power semiconductors and an innovative cooling concept.
- All unit modules are easily accessible, making them extremely service-friendly
- Can be easily integrated into automation solutions due to PROFIBUS interface supplied as standard and various analog and digital interfaces
- Increase in plant availability since individual modules and power components can be replaced quickly and easily
- Easy commissioning and parameterization using interactive menus on the user-friendly AOP30 operator panel with graphical LCD and plain-text display.

Application

Variable-speed drives are advantageous for all applications that involve moving, conveying, pumping or compressing solids, liquids or gases.

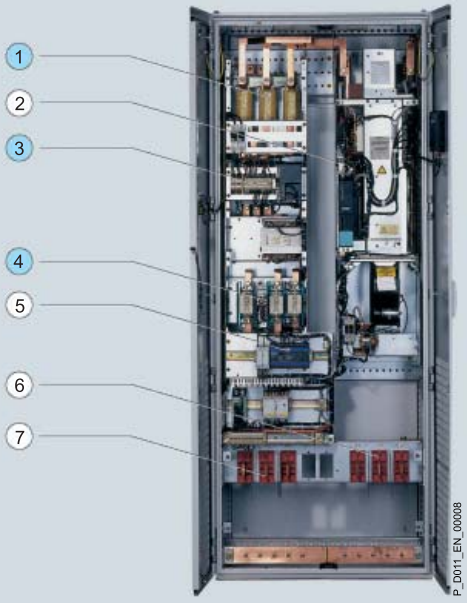
This means the following applications, in particular:

- Pumps and fans
- Compressors
- Extruders and mixers
- Mills

Design

SINAMICS G150 drive converter cabinet units are characterized by their compact, modular, and service-friendly design.

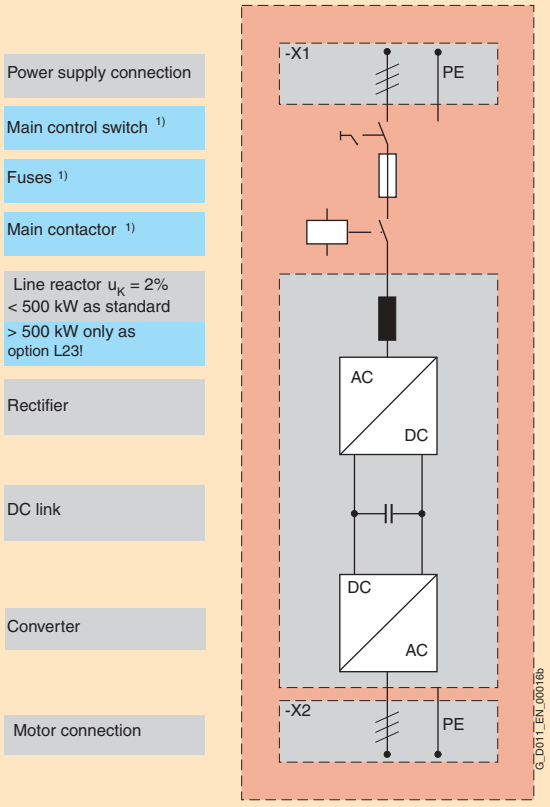
A wide range of options is available depending on the cabinet version which permit optimum adaptation of the drive system to the respective requirements (→ Options).



1 Line reactor (< 500 kW standard)
2 PROFIBUS connection
3 Main contactor
4 Main control switch with fuses
5 Customer's terminal block
6 Motor connection
7 Power supply connection

Standard Version
Options

Example of design of a SINAMICS G150 drive converter cabinet unit, version A



Converter version A
Converter version C
Options

1) With an output current >800 A, the main control switch, fuses and main contactor are replaced by a circuit-breaker.

Basic design of a SINAMICS G150 drive converter cabinet unit with a number of version-specific options

Function

AOP30 operator panel

An operator panel is located in the cabinet door of the converter for operation, monitoring and commissioning tasks.

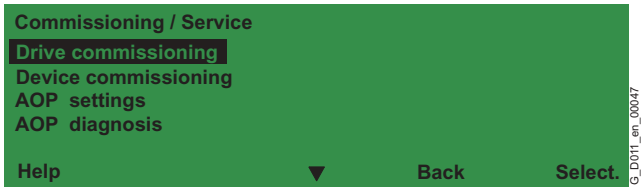
The AOP30's two-stage safety concept prevents unintentional or unauthorized changes to settings. The keyboard lock disables operation of the drive from the operator panel, so that only parameter values and process variables can be displayed. The OFF key is factory-set to "active" but can also be "deactivated" by the customer. A password can be used to prevent the unauthorized modification of converter parameters.

The user is guided through the screens for commissioning the drive by the menu-driven display. Only 6 motor parameters (which can be found on the motor rating plate) have to be entered when the AOP30 is started up for the first time. The control is then optimized automatically to fine-tune the converter to the motor.

The plain text for the display is saved in two languages, and the currently desired language can be selected using parameters (English/German as standard, see options for other languages).

The following pictures show examples of plain text displays in various operating phases.

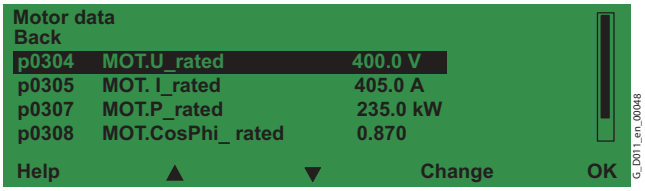
The **first commissioning** is carried out using the operator panel.



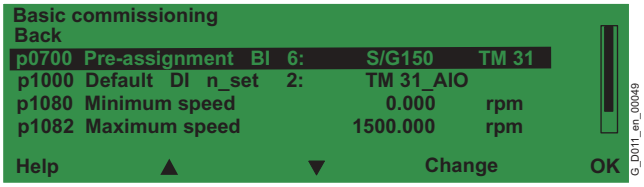
Only 6 motor parameters have to be entered:

Output, speed, current, cos φ, voltage and frequency of the motor.

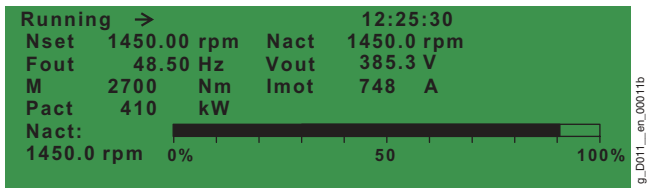
This information can be found on the motor rating plate, and is entered into the screens on the display by following a short, menu-driven procedure. The type of motor cooling must be entered in addition.

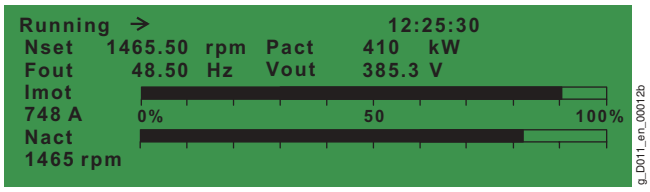


The next screen contains the parameter values that are used to automatically optimize the control.

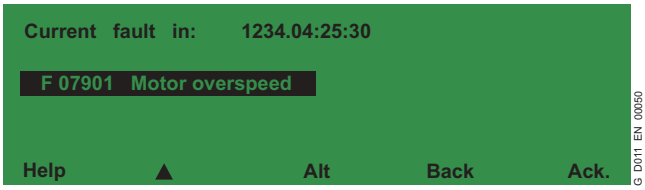


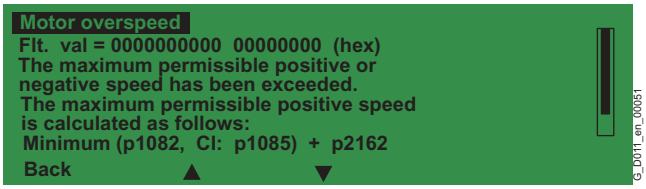
During **running**, current data are indicated on the display as absolute values, such as setpoint and actual values, or it is possible to parameterize up to 3 process variables as a quasi-analog bar display.





Any **alarms** which occur are indicated by flashing of the yellow "ALARM" LED, while **faults** are signaled by a lit red "FAULT" LED. There is also an indication of the cause displayed in plain text on the display's status line.





Function (continued)

Communication with higher-level control and customer's terminal block

A PROFIBUS interface on the CU320 control unit and the TM31 terminal module is provided as standard for use as the customer interface.

You can use this customer terminal block to connect the system to the higher-level controller using analog and digital signals, or to connect additional units.

To simplify configuration and commissioning of the drive, the TM31 terminal module is supplied with factory default settings (→ Engineering information).

Open-loop and closed-loop control functions

The converter closed-loop control contains a high-quality sensorless vector control with speed and current controls as well as motor and converter protection.

Software and protection functions

The software functions available as standard are described below:

Software and protection functions	Description
Setpoint input	The setpoint can be defined internally or externally, internally as a fixed, motorized potentiometer or jog setpoint, externally via the PROFIBUS interface or an analog input of the customer terminal block. The internal fixed setpoints and the motorized potentiometer setpoint can be switched over or adjusted using control commands via all interfaces.
Motor identification	Automatic motor identification permits fast and simple commissioning and optimization of the drive control.
Ramp-function generator	A user-friendly ramp-function generator with separately adjustable ramp-up and ramp-down times, together with variable smoothing times in the lower and upper speed ranges, improve the control response and therefore prevent mechanical overloading of the drive train. The ramp-down ramps can be parameterized separately for emergency stop.
$V_{dc\ max}$ controller	The $V_{dc\ max}$ controller automatically prevents overvoltages in the DC link if the set ramp-down ramp is too short, for example. This can also extend the set ramp-down time.
Kinetic buffering (KIP)	Power supply failures are bridged to the extent permitted by the kinetic energy of the drive train. The speed drops depending on the moment of inertia and the load torque. The current speed setpoint is resumed when the power supply returns.
Automatic restart [1]	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.
Flying restart [1]	The flying restart permits connection of the converter to a rotating motor.
***I²t* detection for motor protection**	The motor temperature is calculated in a motor model stored in the converter software, taking into account the current speed and load. More exact recording of the temperature, also taking into account the influence of the ambient temperature, is possible by means of direct temperature recording using KTY84 sensors in the motor winding.
Evaluation of motor temperature	Motor protection by evaluating a KTY84 or PTC temperature sensor. When a KTY84 sensor is connected, the limit values can be set for alarm or shutdown. When connecting a PTC thermistor, the reaction following triggering of it (alarm or shutdown) can be defined.
Motor blocking protection	A blocked motor is recognized and protected against thermal overloading by shutting down.
Power section protection	
Earth fault monitoring on the output side	An earth fault on the output side is recognized by a total current monitor, and results in shutdown in earthed-neutral systems.
Electronic short-circuit protection on the output side	A short-circuit between motor and converter (on the converter output terminals, in the motor cable, in the terminal box) is detected and switched off.
Thermal overload protection	A warning message is issued first when the overtemperature threshold responds. If the temperature rises further, either a shutdown is carried out or automatic influencing of the pulse frequency or output current so that a reduction in the thermal load is achieved. Following elimination of the cause of the fault (e.g. improvement in the ventilation), the original operating values are automatically resumed.

1) Factory setting: not activated (can be programmed)

75 kW to 800 kW

Technical data

Electrical data			
Supply voltages and output ranges	380 V to 480 V 3 AC, ±10% (-15% < 1 min) 110 kW to 560 kW 660 V to 690 V 3 AC, ±10% (-15% < 1 min) 75 kW to 800 kW		
Supply systems	TN/TT supplies or isolated supplies (IT supplies)		
Line frequency	47 Hz to 63 Hz		
Output frequency	0 Hz to 300 Hz		
Power factor - Fundamental mode - Total	 > 0.98 0.93 to 0.96		
Converter efficiency	> 98%		
Control method	Vector control with and without sensor or *V/f* control		
Fixed speeds	15 fixed speeds plus 1 minimum speed, programmable (in the default setting 3 fixed setpoints plus 1 minimum speed can be selected via the terminal block / PROFIBUS)		
Skipped frequency ranges	4, programmable		
Setpoint resolution	0.001 rpm digital 12 bit analog		
Braking operation	optional via braking unit		
Mechanical data			
Degree of protection	IP20 (higher degrees of protection up to IP54 optional)		
Protection class	Acc. to EN 50 178 Part 1		
Type of cooling	Forced air ventilation		
Noise level L_{pA} (1 m)	≤ 72 dB at 50 Hz line frequency		
Shock protection	BGV A2		
Cabinet system	Rittal TS 8, doors with double-barb lock, three-section base plates for cable entry		
Paint	RAL 7035 (indoor requirements)		
Compliance with standards			
Standards	EN 60 146-1, EN 61 800-2, EN 61 800-3, EN 50 178, EN 60 204-1, EN 60 529		
CE marking	According to EMC directive No. 89/336/EC and low voltage directive No. 73/23/EC		
RI suppression	According to EMC product standard for variable-speed drives EN 61 800-3, "second environment". "First environment" available upon request		
	Operation	**Storage**	**Transport**
Ambient conditions			
Ambient temperature	0 °C to +40 °C Up to +50 °C: see derating data	-25 °C to +55 °C	-25 °C to +70 °C above -40 °C: for 24 hours
Relative humidity (non-condensing)	5% to 95% corresponds to 3K3 to IEC 60 721-3-3	5% to 95% corresponds to 1K4 to IEC 60 721-3-1	5% to 95% at 40 °C corresponds to 2K3 to IEC 60 721-3-2
Installation altitude	Up to 2000 m above sea level without reduction in performance, > 2000 m: see derating data		
Mechanical stability			
Vibratory load - Deflection - Acceleration	 0.075 mm at 10 Hz to 58 Hz 10 m/s² at > 58 Hz to 200 Hz -	 1.5 mm at 5 Hz to 9 Hz 5 m/s² at > 9 Hz to 200 Hz corresponds to 1M2 to IEC 60 721-3-1	 3.1 mm at 5 Hz to 9 Hz 10 m/s² at > 9 Hz to 200 Hz corresponds to 2M2 to IEC 60 721-3-2
Shock load - Acceleration	 100 m/s² at 11 ms corresponds to 3M4 to IEC 60 721-3-3	 40 m/s² at 22 ms corresponds to 1M2 to IEC 60 721-3-1	 100 m/s² at 11 ms corresponds to 2M2 to IEC 60 721-3-2

Deviations from the defined classes are identified by underlining.

Technical data (continued)

Derating data

Compensation of current derating as a function of installation altitude / ambient temperature

If the converters are operated at an **installation altitude > 2000 m** above sea level, the maximum permissible output current can be calculated using the following tables according to the degree of protection selected for the cabinet unit. The specified values already include a permitted correction between installation altitude and ambient temperature (incoming air temperature at the inlet to the converter cabinet unit).

Installation altitude above sea level m	**Current derating** at an ambient temperature of						
	20 °C	25 °C	30 °C	35 °C	40 °C	45 °C	50 °C
0-2000						95.0%	87.0%
2001-2500					96.3%	91.4%	83.7%
2501-3000		100%		96.2%	92.5%	87.9%	80.5%
3001-3500			96.7%	92.3%	88.8%	84.3%	77.3%
3501-4000		97.8%	92.7%	88.4%	85.0%	80.8%	74.0%

Current derating depending on ambient temperature (temperature of inlet air) and installation altitude for cabinet units with degree of protection IP20, IP21 and IP23

Installation altitude above sea level m	**Current derating** at an ambient temperature of						
	20 °C	25 °C	30 °C	35 °C	40 °C	45 °C	50 °C
0-2000					95.0%	87.5%	80.0%
2001-2500		100%		96.3%	91.4%	84.2%	77.0%
2501-3000			96.2%	92.5%	87.9%	81.0%	74.1%
3001-3500		96.7%	92.3%	88.8%	84.3%	77.7%	71.1%
3501-4000	97.8%	92.7%	88.4%	85.0%	80.8%	74.7%	68.0%

Current derating depending on ambient temperature (temperature of inlet air) and installation altitude for cabinet units with degree of protection IP54

Voltage derating as a function of the installation altitude

In addition to the current derating, the voltage derating must be considered according to the following table with **installation altitudes > 2000 m** above sea level.

Installation altitude above sea level	**Voltage derating** for a rated input voltage of						**Voltage derating** for a rated input voltage of	
m	380 V	400 V	420 V	440 V	460 V	480 V	660 V	690 V
0-2000							100%	
2001-2250						96%		96%
2251-2500					98%	94%	98%	94%
2501-2750		100%		98%	94%	90%	95%	90%
2751-3000				95%	91%	88%	92%	88%
3001-3250			97%	93%	89%	85%	89%	85%
3251-3500		98%	93%	89%	85%	82%	85%	82%
3501-3750		95%	91%	87%	83%	79%	-	-
3751-4000	96%	92%	87%	83%	80%	76%	-	-

Voltage derating as a function of the installation altitude

Technical data (continued)

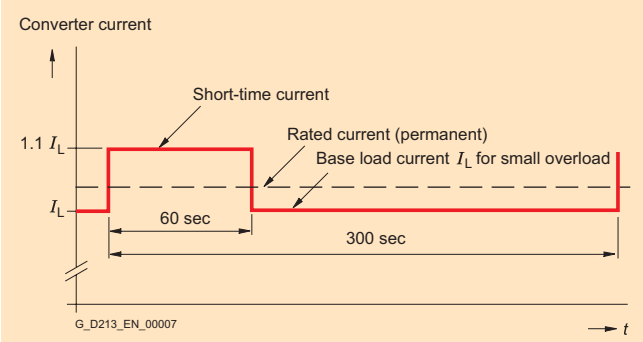
Overload capability

The SINAMICS G150 drive 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.

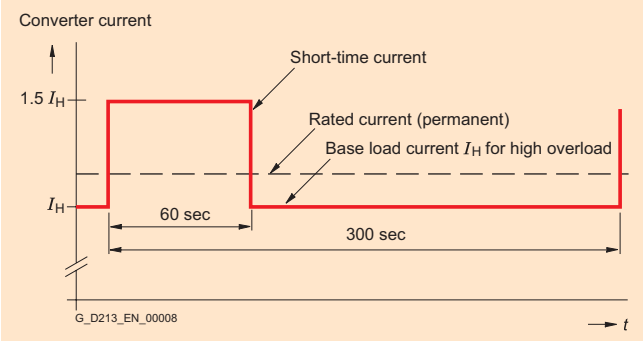
The criterion for overload is that the drive is operated with its base load current before and after the overload occurs, and a load duration of 300 s is assumed.

The base load current I_L for a small overload is based on a duty cycle of 110% for 60 s or 150% for 10 s.

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



Small overload



High overload

EMC information

The electromagnetic compatibility describes - according to the definition of the EMC directive - the "capability of a device to work satisfactorily in the electromagnetic environment without itself causing electromagnetic interferences which are unacceptable for other devices present in this environment". To guarantee that the appropriate EMC directives are observed, the devices must demonstrate a sufficiently high noise immunity, and also the emitted interference must be limited to acceptable values.

The EMC requirements for "Variable-speed drive systems" are described in the product standard EN 61 800-3. A variable-speed drive system (or power drive system PDS) consists of the drive converter and the electric motor including cables. The driven machine is not part of the drive system. EN 61 800-3 defines different limits depending on the location of the drive system, referred to as the first and second environments.

The **first environment** comprises living accommodation or locations where the drive system is directly connected to the public low-voltage network without an intermediate transformer.

The **second environment** is understood to be all locations outside living areas. These are basically industrial areas which are powered from the medium-voltage network via their own transformers.

Four different categories are defined in EN 61 800-3 Ed.2 depending on the location and the power of the drive:

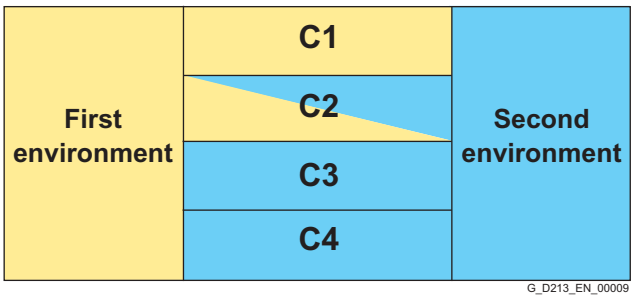
Category C1: Drive systems for rated voltages < 1000 V for unlimited use in the first environment.

Category C2: Stationary drive systems for rated voltages < 1000 V for use in the second environment. Use in the first environment is possible if the drive system is installed and used by qualified personnel. The warning and installation information supplied by the manufacturer must be observed.

Category C3: Drive systems for rated voltages < 1000 V for exclusive use in the second environment.

Category C4: Drive systems for rated voltages ≥ 1000 V or for rated currents ≥ 400 A for use in complex systems in the second environment.

The following graphic shows the assignment of the four categories to the first and second environments.



SINAMICS G150 drive converter cabinet units are almost exclusively used in the second environment (categories C3 and C4).

To limit the **emitted interference**, SINAMICS G150 drive converter cabinet units are equipped as standard with a radio interference suppression filter that conforms to the limits defined in Category C3. Optional filters are available on request for use in the first environment (Category C2).

SINAMICS G150 drive converter cabinet units conform to the **noise immunity** requirements defined in EN 61 800-3 for the second environment, and thus also with the lower noise immunity requirements in the first environment.

The warning and installation information (part of the device documentation) must be observed.

Selection and ordering data

Small overload					High overload			Power loss	Cooling air requirement	Noise level L_{pA} (1 m) at 50/60 Hz	Drive converter cabinet units SINAMICS G150
Output (at 400 V or 690 V)	(at 460 V, 60 Hz)	Rated input current [1]	Rated output current	Base load current I_L [2]	Output to I_H (at 400 V or 690 V)	(at 460 V, 60 Hz)	Base load current I_H [3]				
kW	hp	A	A	A	kW	hp	A	kW	m³/s	dB	Order No.
Supply voltage 380 V to 480 V 3 AC											
110	**150**	239	210	205	**90**	**125**	178	2.9	0.17	67/68	**6SL3710-1GE32-1■A0**
132	**200**	294	260	250	**110**	**150**	233	3.8	0.23	69/73	**6SL3710-1GE32-6■A0**
160	**250**	348	310	302	**132**	**200**	277	4.4	0.36	69/73	**6SL3710-1GE33-1■A0**
200	**300**	405	380	370	**160**	**250**	340	5.3	0.36	69/73	**6SL3710-1GE33-8■A0**
250	**400**	519	490	477	**200**	**350**	438	6.4	0.36	69/73	**6SL3710-1GE35-0■A0**
315	**500**	639	605	590	**250**	**400**	460	8.2	0.78	70/73	**6SL3710-1GE36-1■A0**
400	**600**	785	745	725	**315**	**500**	570	9.6	0.78	70/73	**6SL3710-1GE37-5■A0**
450	**700**	883	840	820	**400**	**600**	700	10.1	0.78	70/73	**6SL3710-1GE38-4■A0**
560	**800**	1034	985	960	**450**	**700**	860	14.4	1.48	72/75	**6SL3710-1GE41-0■A0**
Supply voltage 660 V to 690 V 3 AC											
75		103	85	80	**55**		76	1.7	0.17	67/68	**6SL3710-1GH28-5■A0**
90		119	100	95	**75**		89	2.1	0.17	67/68	**6SL3710-1GH31-0■A0**
110		141	120	115	**90**		107	2.7	0.17	67/68	**6SL3710-1GH31-2■A0**
132		174	150	142	**110**		134	2.8	0.17	67/68	**6SL3710-1GH31-5■A0**
160		201	175	171	**132**		157	3.8	0.36	69/73	**6SL3710-1GH31-8■A0**
200		234	215	208	**160**		192	4.2	0.36	69/73	**6SL3710-1GH32-2■A0**
250		280	260	250	**200**		233	5.0	0.36	69/73	**6SL3710-1GH32-6■A0**
315		353	330	320	**250**		280	6.1	0.36	69/73	**6SL3710-1GH33-3■A0**
400		436	410	400	**315**		367	8.1	0.78	72/75	**6SL3710-1GH34-1■A0**
450		493	465	452	**400**		416	9.1	0.78	72/75	**6SL3710-1GH34-7■A0**
560		608	575	560	**450**		514	10.8	0.78	72/75	**6SL3710-1GH35-8■A0**
710		774	735	710	**630**		657	13.5	1.48	72/75	**6SL3710-1GH37-4■A0**
800		852	810	790	**710**		724	14.7	1.48	72/75	**6SL3710-1GH38-1■A0**

• Version A (with option of installing all available line connection components)	**A**
• Version C (particularly space-optimized design)	**C**

1) The currents listed here are based on the rated output current and include 10 A for the external auxiliaries as required for options **L19** and **B03**, for example.

2) The base load current I_L is based on a duty cycle of 110% for 60 s or 150% for 10 s with a duration of 300 s.
See Technical data → Overload capability.

3) The base load current I_H is based on a duty cycle of 150% for 60 s or 160% for 10 s with a duration of 300 s.
See Technical data → Overload capability.

75 kW to 800 kW

Weights and dimensions

Converter	Output		Version A		Version C	
Type	(at 400 V or 690 V)	(at 460 V, 60 Hz)	Weight (standard version)	Dimensions for degree of protection IP20 *) W × H × D	Weight (standard version)	Dimensions for degree of protection IP20 **) W × H × D
6SL3710-...	kW	hp	kg	mm	kg	mm
Supply voltage 380 V to 480 V 3 AC						
-1GE32-1 . A0	110	150	320	800 × 2000 × 600	225	400 × 2000 × 600
-1GE32-6 . A0	132	200	320	800 × 2000 × 600	225	400 × 2000 × 600
-1GE33-1 . A0	160	250	390	800 × 2000 × 600	300	400 × 2000 × 600
-1GE33-8 . A0	200	300	480	1000 × 2000 × 600	300	400 × 2000 × 600
-1GE35-0 . A0	250	400	480	1000 × 2000 × 600	300	400 × 2000 × 600
-1GE36-1 . A0	315	500	860	1200 × 2000 × 600	670	600 × 2000 × 600
-1GE37-5 . A0	400	600	865	1200 × 2000 × 600	670	600 × 2000 × 600
-1GE38-4 . A0	450	700	1075	1200 × 2000 × 600	670	600 × 2000 × 600
-1GE41-0 . A0	560	800	1360	1600 × 2000 × 600	980	1000 × 2000 × 600
Supply voltage 660 V to 690 V 3 AC						
-1GH28-5 . A0	75		320	800 × 2000 × 600	225	400 × 2000 × 600
-1GH31-0 . A0	90		320	800 × 2000 × 600	225	400 × 2000 × 600
-1GH31-2 . A0	110		320	800 × 2000 × 600	225	400 × 2000 × 600
-1GH31-5 . A0	132		320	800 × 2000 × 600	225	400 × 2000 × 600
-1GH31-8 . A0	160		390	800 × 2000 × 600	300	400 × 2000 × 600
-1GH32-2 . A0	200		390	800 × 2000 × 600	300	400 × 2000 × 600
-1GH32-6 . A0	250		390	800 × 2000 × 600	300	400 × 2000 × 600
-1GH33-3 . A0	315		390	800 × 2000 × 600	300	400 × 2000 × 600
-1GH34-1 . A0	400		860	1200 × 2000 × 600	670	600 × 2000 × 600
-1GH34-7 . A0	450		860	1200 × 2000 × 600	670	600 × 2000 × 600
-1GH35-8 . A0	560		860	1200 × 2000 × 600	670	600 × 2000 × 600
-1GH37-4 . A0	710		1320	1600 × 2000 × 600	940	1000 × 2000 × 600
-1GH38-1 . A0	800		1360	1600 × 2000 × 600	980	1000 × 2000 × 600

*) The cabinet height is increased by
250 mm for degree of protection IP21,
400 mm for IP23 and IP54,
405 mm for the **M13** and **M78** options.

**) The cabinet height is increased by
250 mm for degree of protection IP21,
400 mm for IP23 and IP54.

Accessories

Output		Converter	Fuse with existing fuse switch-disconnector (option L26)			Fuse (with semiconductor protection effect) without fuse switch-disconnector [1]		
(at 400 V or 690 V)	(at 460 V, 60 Hz)	Type	Order No.	Rated current	Frames as per DIN 43 620-1	Order No.	Rated current	Frames as per DIN 43 620-1
kW	hp	6SL3710-...		A			A	
Supply voltage 380 V to 480 V 3 AC								
110	**150**	-1GE32-1 . A0	**3NA3252**	315	2	**3NE1230-2**	315	1
132	**200**	-1GE32-6 . A0	**3NA3254**	355	2	**3NE1331-2**	350	2
160	**250**	-1GE33-1 . A0	**3NA3365**	500	3	**3NE1334-2**	500	2
200	**300**	-1GE33-8 . A0	**3NA3365**	500	3	**3NE1334-2**	500	2
250	**400**	-1GE35-0 . A0	**3NA3372**	630	3	**3NE1436-2**	630	3
315	**500**	-1GE36-1 . A0	**3NA3475**	800	4	**3NE1438-2**	800	3
400	**600**	-1GE37-5 . A0	**3NA3475**	800	4	**3NE1448-2**	850	3
450	**700**	-1GE38-4 . A0	Circuit-breaker	-	-	Circuit-breaker	-	-
560	**800**	-1GE41-0 . A0	Circuit-breaker	-	-	Circuit-breaker	-	-
Supply voltage 660 V to 690 V 3 AC								
75		-1GH28-5 . A0	**3NA3132-6**	125	1	**3NE1022-2**	125	00
90		-1GH31-0 . A0	**3NA3132-6**	125	1	**3NE1022-2**	125	00
110		-1GH31-2 . A0	**3NA3136-6**	160	1	**3NE1224-2**	160	1
132		-1GH31-5 . A0	**3NA3240-6**	200	2	**3NE1225-2**	200	1
160		-1GH31-8 . A0	**3NA3244-6**	250	2	**3NE1227-2**	250	1
200		-1GH32-2 . A0	**3NA3252-6**	315	2	**3NE1230-2**	315	1
250		-1GH32-6 . A0	**3NA3354-6**	355	3	**3NE1331-2**	350	2
315		-1GH33-3 . A0	**3NA3365-6**	500	3	**3NE1334-2**	500	2
400		-1GH34-1 . A0	**3NA3365-6**	500	3	**3NE1334-2**	500	2
450		-1GH34-7 . A0	**3NA3352-6**	2x315	3	**3NE1435-2**	560	3
560		-1GH35-8 . A0	**3NA3354-6**	2x355	3	**3NE1447-2**	670	3
710		-1GH37-4 . A0	**3NA3365-6**	2x500	3	**3NE1448-2**	850	3
800		-1GH38-1 . A0	Circuit-breaker	-	-	Circuit-breaker	-	-

1) If the drive converter cabinet units (I < 800 A) are used without the option **L26**, the user must ensure that relevant precautions to protect the cables and semiconductors are taken on the plant side. The combined fuses 3NE1... are recommended for currents up to 800 A.

75 kW to 800 kW

Options

When ordering a converter with options, add **"-Z**" to the order number of the converter, followed by the order code(s) for the desired option(s).

Example:
6SL3710-1GE32-1CA0-Z
+M07+D60+...

See also ordering examples.

Available options	Order code	for version A	for version C
Input-side options			
Line filter for use in the first environment to EN 61 800-3 category C2 (TN/TT supplies)	**L00**	✓	–
Main contactor (for currents < 800 A)	**L13**	✓	–
Without line reactor in output range P < 500 kW (available soon)	**L22**	✓	✓
2% line reactor may be needed for P > 500 kW	**L23**	✓	✓
Main control switch (incl. fuses/circuit-breakers)	**L26**	✓	–
EMC shield bus [1]) (cable connection from below)	**M70**	✓	✓
PE bus [1]) (cable connection from below)	**M75**	✓	✓
Output-side options			
Sinusoidal filter (on request, only for converters up to 200 kW, 380 V to 480 V)	**L15**	✓	–
EMC shield bus [1]) (cable connection from below)	**M70**	✓	✓
PE bus [1]) (cable connection from below)	**M75**	✓	✓
Motor protection and safety functions			
EMERGENCY STOP button in the cabinet door	**L45**	✓	–
EMERGENCY STOP category 0, 230 V AC or 24 V DC, uncontrolled stop	**L57**	✓	–
EMERGENCY STOP category 1, 230 V AC, controlled stop [2])	**L59**	✓	–
EMERGENCY STOP category 1, 24 V DC, controlled stop [2])	**L60**	✓	–
Thermistor motor protection unit with PTB approval (alarm)	**L83**	✓	–
Thermistor motor protection unit with PTB approval (switch-off)	**L84**	✓	–
PT100 evaluation unit (for six PT100 sensors)	**L86**	✓	–
Insulation monitoring	**L87**	✓	–
Additional shock protection	**M60**	✓	✓
Increase in degree of protection			
IP21 degree of protection	**M21**	✓	✓
IP23 degree of protection	**M23**	✓	✓
IP54 degree of protection	**M54**	✓	✓
Mechanical options			
Plinth 100 mm high, RAL 7022	**M06**	✓	✓
Cable connection area 200 mm high, RAL 7035	**M07**	✓	✓
Line connection from above	**M13**	✓	–
Motor connection from above	**M78**	✓	–
Top-mounted crane transport assembly for cabinets	**M90**	✓	✓

✓	possible
–	not possible

The selection matrix must be observed with respect to the combination of options

1) This option is listed for the input and output side options, but is only required once.
2) The stopping requirement should be noted for this option. Additional braking units may be required.

Converter version A

Converter version C

Options (continued)

Available options	Order code	for version A	for version C
Other options			
TM31 customer's terminal block extension	**G61**	✓	–
SMC 30 sensor module cabinet-mounted for detecting the actual motor speed (available soon)	**K50**	✓	–
Connection for external auxiliary equipment (controlled max. 10 A)	**L19**	✓	–
Cabinet illumination with service socket	**L50**	✓	–
Anti-condensation heating for cabinet	**L55**	✓	–
Braking unit 100 kW	**L61**	✓	–
Braking unit 200 kW	**L62**	✓	–
Special cabinet paint finish[3])	**Y09**	✓	✓
Languages			
Documentation in English / French	**D58**	✓	✓
Documentation in English / Spanish	**D60**	✓	✓
Documentation in English / Italian	**D80**	✓	✓
Rating plate and operator panel in English / French	**T58**	✓	✓
Rating plate and operator panel in English / Spanish	**T60**	✓	✓
Rating plate and operator panel in English / Italian	**T80**	✓	✓
Options specific to chemical industry			
NAMUR terminal block	**B00**	✓	–
Protective separation for 24 V supply (PELV)	**B02**	✓	–
Separate output for external auxiliaries (uncontrolled)	**B03**	✓	–
Converter acceptance inspections in presence of customer			
Visual inspection	**F03**	✓	✓
Function test of the converter without motor connected	**F71**	✓	✓
Function test of the converter with test bay motor (no load)	**F75**	✓	✓
Converter insulation test	**F77**	✓	✓
Customer-specific converter acceptance inspections (on request)	**F97**	✓	✓

✓	possible
–	not possible

The selection matrix must be observed with respect to the combination of options

3) The order code Y.. requires data in plain text.

Converter version A

Converter version C

3

Options (continued)

Option selection matrix

Certain options are mutually excluding

✓	possible combinations
–	not possible

Electrical options

	L00	L13	L15	L19	L22	L23	L26	L45	L50	L55	L57	L59	L60	L61	L62	L83	L84	L86	L87
L00		✓	✓	✓	–	1)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	–
L13	✓		✓	✓	✓	✓	2)	✓	✓	✓	3)	3)	3)	✓	✓	✓	✓	✓	✓
L15	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
L19	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
L22	–	✓	✓	✓		–	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
L23	1)	✓	✓	✓	–		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
L26	✓	2)	✓	✓	✓	✓		✓	✓	✓	3)	3)	3)	✓	✓	✓	✓	✓	✓
L45	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
L50	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
L55	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓
L57	✓	3)	✓	✓	✓	✓	3)	✓	✓	✓		–	–	✓	✓	✓	✓	✓	✓
L59	✓	3)	✓	✓	✓	✓	3)	✓	✓	✓	–		–	✓	✓	✓	✓	✓	✓
L60	✓	3)	✓	✓	✓	✓	3)	✓	✓	✓	–	–		✓	✓	✓	✓	✓	✓
L61	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		–	✓	✓	✓	✓
L62	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	–		✓	✓	✓	✓
L83	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓
L84	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓
L86	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓
L87	–	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	

1) For converters < 500 kW/700 hp, the line reactor (order code **L23**) is supplied with the converter.
For converters > 500 kW/700 hp, the **L23** option should also be ordered if
- the converters are to be operated with supplies with a high short-circuit capacity (RSC > 20) (see Engineering information) or
- if a line filter is used (option **L00**).

2) Combination **L13/L26** is only possible for currents < 800 A.
From 800 A upwards, circuit-breakers are used. These perform the same function as options **L13** and **L26**.

3) Either option **L13** is required or, for currents > 800 A, option **L26** (circuit-breaker) is required. Braking units may also be needed, depending on the drive stopping time required.

Options (continued)

Mechanical options/electrical options

	L00	M06	M07	M13	M21	M23	M54	M60	M70	M75	M78	M90
L00		✓	✓	✓	✓	✓	✓	✓	4)	✓	–	✓
M06	✓		–	✓	✓	✓	✓	✓	✓	✓	✓	✓
M07	✓	–		✓	✓	✓	✓	✓	✓	✓	✓	✓
M13	✓	✓	✓		–	✓	✓	–	5)	5)	✓	✓
M21	✓	✓	✓	–		–	–	6)	✓	✓	–	✓
M23	✓	✓	✓	✓	–		–	–	✓	✓	✓	✓
M54	✓	✓	✓	✓	–	–		–	✓	✓	✓	✓
M60	✓	✓	✓	–	6)	–	–		✓	✓	–	✓
M70	4)	✓	✓	5)	✓	✓	✓	✓		✓	5)	✓
M75	✓	✓	✓	5)	✓	✓	✓	✓	✓		5)	✓
M78	–	✓	✓	✓	–	✓	✓	–	5)	5)		✓
M90	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	

4) Option **L00** includes option **M70**.

5) If the line connection (option **M13**) and the motor connection (option **M78**) are from above, the EMC shield bus and the PE bus are not required in the lower cabinet area.

6) 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 supplied as standard for larger outputs.

✓	possible combinations
–	not possible

Rating plate data

	T58	T60	T80
T58		–	–
T60	–		–
T80	–	–	

Ordering examples

Example 1

Task:
A drive converter cabinet unit is needed to control the fan speed for a 380 kW fan drive for connecting to an existing 400 V MCC outgoing circuit. The rated speed of the fan is 975 rpm. As a result of the ambient conditions, the converter should be mounted on a 100 mm cabinet plinth and the degree of protection should be IP54. The installation altitude is < 1000 m above sea level and the ambient temperature is 45 °C.

Solution:
Due to the existing MCC outgoing circuit, the line connection components, such as main switch, main contactor and line fuses, can be omitted and the space-saving version C can be selected. For this constellation, taking into account the derating factors for IP54 degree of protection and for the increased ambient temperature, select a drive converter cabinet unit 450 kW, 400 V with the options
M06 (100 mm cabinet plinth) and
M54 (IP54 degree of protection).

The Order No. is:
6SL3710-1GE38-4CA0-Z
+M06 +M54

Example 2

Task:
A 280 kW pump to control the pressure equalization is to be supplied via a converter for a brand new district heating pumping station. A 690 V supply is available. The installation altitude is 350 m above sea level and the ambient temperature is 40 °C. The rated speed of the pump is 740 rpm. The pump unit and motor are located in an unmanned substation, so the winding temperature of the motor is to be monitored by PT100 resistance thermometers and evaluated by the converter. The color of the drive converter cabinet units is to be RAL 3002.

Solution:
Select a drive converter cabinet unit 315 kW, 690 V, version A with the following options:
L26 (main switch including fuses),
L13 (main contactor),
L86 (PT100 evaluation unit) and
Y09 (special cabinet paint finish).

The Order No. is:
6SL3710-1GH33-3AA0-Z
+L26 +L13 +L86 +Y09
Cabinet color RAL 3002

Options (continued)

Description of options

B00, B02, B03
Options according to NAMUR requirements

Exclusion list to other options:

The following limitations and exclusions resulting together with the NAMUR terminal block **B00** must be observed with regard to the other available options.

Not permissible with option	Reason
L45, L57, L59, L60	An EMERGENCY STOP of category 0 is already included in the NAMUR version. Access to the forced power supply disconnection is at the terminals -A1-X2: 17, 18.
L83, L84	The **B00** option already provides a PTC thermistor evaluation unit as standard (shutdown).
L19	Option **B03** could be selected as an alternative. This will provide a reduced scope for external auxiliary equipment.
L87	The insulation monitor monitors the complete network which is electrically connected together. An insulation monitor must therefore be provided on the plant side.

With options such as **L50, L55, L86**, the connection is as described in the standard. There is no wiring to the NAMUR terminal block.

B00
NAMUR terminal block

The terminal block is designed according to the requirements and directives of the standards association for measurement and control in the chemical industry (NAMUR recommendation NE37), i.e. fixed terminals are assigned to certain functions of the devices. The inputs and outputs connected to the terminals comply with the requirements "Protective extra-low voltage PELV".

The terminal block and the associated functions are reduced to a required amount. In comparison to the NAMUR recommendation, optional terminals are not listed.

Terminal -A1-X2:	Meaning	Preassignment	Comment
10	DI	ON (dynamic) / ON/OFF (static)	The effective mode can be coded using a wire jumper on the terminal -A1-400:9; 10.
11	DI	OFF (dynamic)	
12	DI	Faster	
13	DI	Slower	
14	DI	RESET	
15	DI	Interlocking	
16	DI	Counterclockwise	"0" signal for CW phase sequence "1" signal for CCW phase sequence
17, 18		PS disconnection	EMERGENCY STOP sequence
30, 31		Ready to run	Relay output (NO contact)
32, 33		Motor rotates	Relay output (NO contact)
34	DO (NO)	Fault	Relay output (changeover contact)
35	DO (COM)		
36	DO (NC)		
50, 51	AI 0/4-20 mA	Speed setpoint	
60, 61	AO 0/4-20 mA	Motor frequency	
62, 63	AO 0/4-20 mA	Motor current	Motor current is default setting; can be reparameterized for other variables

The 24 V supply is made at the customer end via the terminals -A1-X2:1-3 (fused inside converter with 1 A). It must be ensured that the safety requirements "Protective extra-low voltage PELV" are complied with.

Terminal -A1-X2:	Meaning	
1	M	Reference conductor
2	P24	Incoming supply 24 V DC
3	P24	Outgoing circuit 24 V DC

For temperature monitoring of explosion-proof motors, the **B00** option contains a PTC thermistor with PTB approval. A switch-off is carried out if the limit is exceeded. The associated PTC sensor is connected to terminal -A1-X3:90, 91.

Terminal -A1-X3:	Meaning	
90, 91	AI	Connection of PTC sensor

B02
Protective separation for 24 V supply (PELV)

If no protective separation for 24 V supply (PELV) is available at the customer end, this option is used to fit a second power supply to guarantee the PELV. (Terminal assignments as for **B00** option, 24 V supply at terminals -A1-X1:1, 2, 3 omitted)

Attention: The **B02** option is only possible together with **B00**.

B03
Separate output for external auxiliaries (uncontrolled)

If a motor fan is to be powered on the plant side, the **B03** option provides an uncontrolled external output fused with 10 A. As soon as the supply voltage is present at the converter input, a voltage is also present at these terminals. This corresponds to the converter input voltage ($V = V_{PS}$). This should be observed when planning the external fans.

Terminal -A1-X1:	Meaning
1, 2, 3, PE	Output for motor of external fan

Attention: The **B03** option is only possible together with **B00**.

Options (continued)

F03, F71, F75, F77, F97
Converter acceptance inspections in presence of the customer

Order code	Description	
F03	Visual inspection	The scope of the acceptance inspection comprises: • Checking the degree of protection • Checking the equipment (components) • Checking the equipment identifier • Checking the clearance and creepage distances • Checking the cables • Checking the customer documentation • Submitting the acceptance report The checks are carried out with the converter deenergized.
F71	Functional test of the converter without motor connected	The scope of the acceptance inspection comprises: • Visual inspection as described for option **F03** • Check of power supply • Check of protective and monitoring devices (simulation) • Check of fans • Precharging test • Functional test without connected motor • Submitting the acceptance report After the visual inspection with the converter switched off, the converter is connected to rated voltage. No current flows at the converter's output.
F75	Functional test of the converter with test-bay motor (no load)	The scope of the acceptance inspection comprises: • Visual inspection as described for option **F03** • Check of power supply • Check of protective and monitoring devices (simulation) • Check of fans • Precharging test • Functional test with test-bay motor (no load) • Submitting the acceptance report After the visual inspection with the converter switched off, the converter is connected to the rated voltage. A low-level current flows at the converter's output in order to operate the the test-bay motor (no load).
F77	Insulation test of converter	The scope of the acceptance inspection comprises: • High-voltage test • Measurement of insulation resistance
F97	Customer-specific converter acceptance inspections (on request)	If acceptances are desired which are not covered by the options **F03, F71, F75** or **F77**, customer-specific converter acceptance inspections/supplementary tests can be ordered using the Order code **F97** on request and following technical clarification.

Options (continued)

G61
TM31 Customer's terminal block extension

In the standard version, the SINAMICS G150 cabinet units already include an interface module (TM31 terminal module). With a second module, the number of available digital inputs/outputs and the number of analog inputs/outputs within the drive system can be expanded.

K50
SMC30 sensor module cabinet-mounted for detecting the actual motor speed *(available soon)*

The SMC30 encoder module can be used to record the actual motor speed. The signals from the rotary pulse encoder are converted here and made available for evaluation via the DRIVE-CLiQ interface of the controller.

The following encoders are supported by the SMC30:

- TTL encoders
- HTL encoders

L00
Line filter for use in the first environment, category C2 (TN/TT supplies)

To limit the emitted interference, the drive converters are equipped as standard with a radio interference suppression filter that conforms to the limits defined in Category C3. Optional filters are available for use in the first environment (Category C2).

The drive converters conform to the noise immunity requirements defined in EN 61 800-3 for the second environment, and thus also with the lower noise immunity requirements in the first environment.

In conjunction with the line reactor, the line filters reduce the radio interference voltage that occurs at the converter. Option **L23** should be ordered in addition for converter outputs > 500 kW.

To allow the power cable shield to be connected in conformance with EMC requirements, an additional EMC shield bus (**M70** option) is factory fitted at the converter input and output. A separate order is not required in this case.

L13
Main contactor (for currents < 800 A)

The SINAMICS G150 drive converter cabinet units are designed as standard without a line contactor. Option **L13** is needed if a switching element is required for disconnecting the cabinet from the supply (needed for EMERGENCY STOP). The contactor is energized and powered inside the converter.

Terminal -X50:	Meaning
4	Checkback contact (NO contact) Contactor closed
5	Checkback contact (NC contact) Contactor closed
6	Root

L15
Sinusoidal filter

Sinusoidal filters are available in the voltage range from 380 V to 480 V for a converter output up to 200 kW.

The sinusoidal filter at the converter output delivers practically sinusoidal voltages on the motor so that standard motors can be used without special cables and without any power reduction. Standard cables can be used. The maximum permitted motor incoming cable length is 300 m.

Note: The pulse frequency of the converter must be increased when used in conjunction with the **L15** option. This reduces the power available at the converter output (derating factor 0.88). The control factor for the output voltage drops to around 90%. It should be noted that the reduced voltage at the motor terminals compared to the rated motor voltage means that the motor switches to field weakening mode earlier.

L19
Connection for external auxiliary equipment

An outgoing circuit fused at max. 10 A for external auxiliary equipment (for example, separately driven motor fan).

The voltage is tapped at the converter input and, therefore, has the same level as the supply voltage.

The outgoing circuit can be controlled internally by the converter or externally.

Terminal -X155:	Meaning	Range
1	L1	AC 380 V to 690 V
2	L2	AC 380 V to 690 V
3	L3	AC 380 V to 690 V
11	Contactor control	AC 230 V
12	Contactor control	AC 230 V
13	Circuit-breaker checkback	AC 230 V/0.5 A; DC 24 V/2 A
14	Circuit-breaker checkback	AC 230 V/0.5 A; DC 24 V/2 A
15	Contactor checkback	AC 230 V/6 A
16	Contactor checkback	AC 230 V/6 A
PE	PE	

L22
Without line reactor

If the converter is powered via a separate transformer, or if the ratio between the line short-circuit power at the point of connection and the converter's rated output is low, the line reactor supplied as standard may be omitted for converters < 500 kW (see Engineering information). This line reactor will be needed, however, if a line filter is used (**L00** option).

L23
Line reactor u_K = 2%

Converters up to 500 kW contain the line reactor as standard. For converter outputs > 500 kW, the line reactor (u_K = 2%) is available as an option since, in this output range, the converters are often connected to a medium-voltage supply system via transformers that are matched to the converter output.

Options (continued)

L26
Main control switch (incl. fuses or circuit-breakers)

Up to 800 A, a switch-disconnector with externally mounted fuses is offered as the main control switch. At currents above 800 A a circuit-breaker is fitted rather than a switch-disconnector. The circuit-breaker is energized 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	Root

L45
EMERGENCY STOP button in the cabinet door

The EMERGENCY STOP button with protective collar is fitted in the converter cabinet door and its contacts are connected to the terminal block. The 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 EMERGENCY STOP button in cabinet door
2	Checkback contact of EMERGENCY STOP button in cabinet door
3	Checkback contact of EMERGENCY STOP button in cabinet door *)
4	Checkback contact of EMERGENCY STOP button in cabinet door *)

*) Used inside the converter with options **L57** to **L60**

L50
Cabinet illumination with service socket

One universal lamp with an integrated service socket is installed for each cabinet element.

The power supply (on terminal board -X390) for the cabinet illumination and socket must be provided externally and fused at max. 10 A. The cabinet illumination is switched on manually via a switch or automatically by an integrated motion detector. The mode is switch-selected.

Terminal -X390:	Meaning
1	L1 (230 V AC)
2	N
3	PE

L55
Anti-condensation heating for cabinet

The anti-condensation heating is recommended at low ambient temperatures and high levels of humidity to prevent condensation. One 100 W heater is fitted for each cabinet panel (two heaters are fitted for each panel in the case of cabinet panel widths from 800 mm to 1200 mm).

The power supply to the heater (110 V to 230 V AC, on terminal board -X240) must be provided externally and fused at max. 16 A.

Terminal -X240:	Meaning
1	L1 (110 V to 230 V AC)
2	N
3	PE

L57
EMERGENCY STOP category 0 (230 V AC or 24 V DC)

EMERGENCY STOP category 0 for uncontrolled stop to EN 60 204.

The function includes voltage disconnection of the converter via the line contactor with bypassing of the microprocessor controller by means of a safety combination according to EN 60 204-1. The motor coasts in the process. When delivered, the button circuit is preset to 230 V AC. Jumpers must be set when using 24 V DC.

Attention: The **L57** option always assumes that the converter can be electrically isolated from the supply; i.e. the **L13** option for converter currents ≤ 800 A and the **L26** option for converter currents > 800 A.

Terminal -X120:	Meaning
7	Looping in EMERGENCY STOP button from system side; remove jumper 7-8!
8	Looping in EMERGENCY STOP button from system 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 "Triggering safety combination"
18	Checkback "Triggering safety combination"

L59
EMERGENCY STOP category 1 (230 V AC)

EMERGENCY STOP category 1 for controlled stop to EN 60 204.

The function includes rapid shutdown of the drive via fast stop using a ramp-down ramp to be parameterized by the user. This is followed by voltage disconnection as described for the EMERGENCY STOP category 0.

A braking unit may be necessary to achieve the required shutdown times.

Attention: The **L59** option always assumes that the converter can be electrically isolated from the supply; i.e. the **L13** option for converter currents ≤ 800 A and the **L26** option for converter currents > 800 A.

Terminal -X120:	Meaning
7	Looping in EMERGENCY STOP button from system side; remove jumper 7–8!
8	Looping in EMERGENCY STOP button from system 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 "Triggering safety combination"
18	Checkback "Triggering safety combination"

Options (continued)

L60
EMERGENCY STOP category 1 (24 V DC)

EMERGENCY STOP category 1 for controlled stop to EN 60 204.

The function includes rapid shutdown of the drive via fast stop using a ramp-down ramp to be parameterized by the user. This is followed by voltage disconnection as described for the EMERGENCY STOP category 0.

A braking unit may be necessary to achieve the required shutdown times.

Attention: The **L60** option always assumes that the converter can be electrically insulated from the supply; i.e. the **L13** option for converter currents ≤ 800 A and the **L26** option for converter currents > 800 A.

Terminal -X120:	Meaning
7	Looping in EMERGENCY STOP button from system side; remove jumper 7–8!
8	Looping in EMERGENCY STOP button from system 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 "Triggering safety combination"
18	Checkback "Triggering safety combination"

L61, L62
Braking units

It may be necessary to use braking units for drives that allow regenerative braking.

The braking unit comprises two components: a braking module fitted in the converter cabinet, and a braking resistor which must be provided 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 external braking resistor. A max. cable length of 50 m is permissible between the braking module and the braking resistor. It is therefore possible to release the heat outside the converter room.

The braking resistor is connected to terminal block -X5 on the drive converter cabinet unit:

Terminal -X5:	Meaning
1	Connection of braking resistor
2	Connection of braking resistor

Option	Braking power P_{20}	Drive converter cabinet units 380 V to 480 V	Drive converter cabinet units 660 V to 690 V
L61	100 kW	110 kW to 132 kW	75 kW to 132 kW
L62	200 kW	160 kW to 560 kW	160 kW to 800 kW

P_{20}: Permitted output for a period of 20 s, cycle time 90 s

If greater braking powers are required in addition to the braking units listed here, then braking units may be connected in parallel for greater converter outputs. In this case, a braking module is assigned to each braking resistor. Braking units may be connected in parallel upon request.

L83
Thermistor motor protection unit (alarm)

Thermistor motor protection unit (with PTB approval) for PTC thermistor sensors (type A) for alarm. The power supply for the thermistor motor protection unit and the evaluation is provided within the converter.

Terminal -F127:	Meaning
T1	Connection of sensor loop
T2	Connection of sensor loop

L84
Thermistor motor protection unit (switch-off)

Thermistor motor protection unit (with PTB approval) for PTC thermistor (type A) for switch-off. The power supply for the thermistor motor protection unit and the evaluation is provided within the converter.

Terminal -F125:	Meaning
T1	Connection of sensor loop
T2	Connection of sensor loop

L86
PT100 evaluation unit

The PT100 evaluation unit can monitor up to 6 sensors. The sensors can be connected using a 2-wire or 3-wire system. The limit values can be programmed by the user for each channel.

In the factory setting, the measuring channels are divided into two groups of three channels. With motors, for example, three PT100 can, therefore, be monitored in the stator windings and two PT100 in the motor bearings. Channels that are not used can be suppressed using appropriate parameter settings.

The output relays are integrated into the internal fault and switch-off sequence of the converter. The signals can also be picked up by the customer via two spare fault signaling relays. Two user-programmable analog outputs are also available (0/4 to 20 mA or 0/2 to 10 V) for integration in a higher-level controller.

Terminal -A1-A140:	Meaning
T11 to T13	PT100; sensor 1; group 1
T21 to T23	PT100; sensor 2; group 1
T31 to T33	PT100; sensor 3; group 1
T41 to T43	PT100; sensor 1; group 2
T51 to T53	PT100; sensor 2; group 2
T61 to T63	PT100; sensor 3; group 2
The sensors can be connected to the PT100 evaluation unit using using a two-wire or three-wire system. In a two-wire system, inputs Tx1 and Tx3 must be used. In a three-wire system, input Tx2 must also be connected (x = 1, 2, ..., 6)	
51, 52, 54	Relay output Limit for group 1 reached; (changeover contact)
61, 62, 64	Relay output Limit for group 2 reached; (changeover contact)
Ground (OUT1)	Analog output OUT1; sensor group 1
U1 (OUT1)	Analog output OUT1; sensor group 1
I1 (OUT1)	Analog output OUT1; sensor group 1
Ground (OUT2)	Analog output OUT2; sensor group 2
U2 (OUT2)	Analog output OUT2; sensor group 2
I2 (OUT2)	Analog output OUT2; sensor group 2

Options (continued)

L87
Insulation monitoring

An insulation monitor must be used if the converter is operated on an isolated-neutral system. This device monitors the complete electrically connected circuit for insulation faults.

An alarm is output in the event of a fault.

Attention: Only **one** insulation monitor can be used in an electrically connected network.

The response concept in the event of an earth fault in the isolated-neutral system can vary, so output relays are available for linking to a system-side control. It is also possible to integrate the outputs into the converter monitoring on the plant side.

Terminal -A1- A101:	Meaning
11	Alarm relay ALARM 1
12	Alarm relay ALARM 1
14	Alarm relay ALARM 1
21	Alarm relay ALARM 2
22	Alarm relay ALARM 2
24	Alarm relay ALARM 2
M+	External kΩ display 0 µA to 400 µA
M-	External kΩ display 0 µA to 400 µA
R1	External reset key (NC contact or wire jumper otherwise the fault code is not stored)
R2	External reset key (NC contact or wire jumper)
T1	External test button
T2	External test button

M06
Plinth 100 mm high, RAL 7022

The additional cabinet plinth allows larger bending radii for cables (cable inlet from below) and the routing of them within the plinth.

The cabinet plinth is always colored RAL 7022. A special color is not possible. It is delivered completely fitted with the cabinet. The height of the operator panel changes accordingly.

M07
Cable connection area 200 mm high, RAL 7035

The cable connection area is made of stable sheet steel and increases the flexibility for the cable connection (inlet from below) and allows routing of cables within the connection area. It is delivered completely fitted with the cabinet. The height of the operator panel changes accordingly.

Attention: The cable connection area is colored RAL 7035 as standard. If a special color is requested for the cabinet (Order code **Y09**), the cable connection area is also painted in this color.

M13
Line connection from above

The control cabinet is provided with an additional hood in the case of a power supply from above. The connection straps for the power cables, the clamping bar for mechanically securing the cables, an EMC shield bus and a PE busbar are located within the hood.

The cabinet height is then increased by 405 mm. The busbars for the connection from above are delivered completely fitted. For transport reasons, the hoods are delivered separately and must be fitted on site. Crane transport assemblies (option **M90**) can still be used. However, these must be removed on site in order to fit the hoods. Use of rope spreaders should be considered in the case of small crane hook heights.

A non-drilled mounting plate made of aluminium (5 mm thick) should be provided on the top of the hood for feeding in the cables. Depending on the number of cables and the cable cross-sections used, holes must be provided in this mounting plate for attaching cable glands for feeding in the cables on the plant side.

Note: The control cables are still connected from below. With the **M13** option, the standard line connection from below is not used.

The hoods have IP21 degree of protection. Additional plastic ventilation grilles and filter pads are provided in combination with the **M23** and **M54** options.

Attention: The hoods are colored RAL 7035 as standard. If a special color is requested for the cabinet (order code **Y09**), the hoods are also painted in this color. Ventilation grilles used with IP23 and IP54 degrees of protection are colored RAL 7035 and cannot be painted.

The covers used with the **M60** option are included in the scope of delivery.

M21
Degree of protection IP21

Cabinet version in IP20, but with additional top cover or canopy. The cabinet height is then increased by 250 mm.

For transport reasons, the top covers or canopies are delivered separately and must be fitted on site.

Attention: The top covers or canopies are colored RAL 7035 as standard. If a special color is requested for the cabinet (Order code **Y09**), the top covers or canopies are also painted in this color.

M23
Degree of protection IP23

Drive converter cabinet units with IP23 degree of protection are supplied with additional hoods and plastic ventilation grilles in the air inlet and outlet. The cabinet height is then increased by 400 mm. The covers used with the **M60** option are included in the scope of delivery.

For transport reasons, the hoods are delivered separately and must be fitted on site.

Attention: The hoods are colored RAL 7035 as standard. If a special color is requested for the cabinet (order code **Y09**), the hoods are also painted in this color. The molded plastic parts e.g. ventilation grilles) are colored RAL 7035 and cannot be painted.

Options (continued)

M54
IP54 degree of protection

Drive converter cabinet units with degree of protection IP54 are supplied with additional hoods, plastic ventilation grilles, and a filter medium in the air inlet and outlet. The cabinet height is then increased by 400 mm. The covers used with the **M60** option are included in the scope of delivery. Maintenance of the filters must be carried out according to the local ambient conditions.

For transport reasons, the hoods are delivered separately and must be fitted on site.

Attention: With IP54 degree of protection, the derating factors for the output current must be observed.

Attention: The hoods are colored RAL 7035 as standard. If a special color is requested for the cabinet (order code **Y09**), the hoods are also painted in this color. The molded plastic parts e.g. ventilation grilles) are colored RAL 7035 and cannot be painted.

M60
Additional shock protection

The drive converter cabinet units are designed as standard according to BGV A2. The **M60** option provides additional covers (outside normal arm's reach) in the vicinity of the AC rails and above the power section (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).

M70
EMC shield bus (cable connection from below)

The EMC shield bus is used to connect shielded power cables for power supply and motor infeed. The EMC shield bus is supplied as standard with the **L00** option (line filter).

M75
PE busbar (cable connection from below)

The PE busbar is used to run the PE conductor for the supply and motor infeed cables.

This can be ordered as an option for converters with low output and currents $I < 700$ A. The PE busbar is supplied as standard for output currents $I > 700$ A or groups of cabinets consisting of several cabinet panels.

M78
Motor connection from above

The control cabinet is provided with an additional hood for a motor connection from above. The connection straps for the power cables, the clamping bar for mechanically securing the cables, an EMC shield bus, and a PE busbar are located within the hood.

The cabinet height is then increased by 405 mm. The busbars for the connection from above are delivered completely fitted. For transport reasons, the hoods are delivered separately and must be fitted on site. Crane transport assemblies (option **M90**) can still be used. However, these must be removed on site in order to fit the hoods. Use of rope spreaders should be considered in the case of small crane hook heights.

A non-drilled mounting plate made of aluminum (5 mm thick) should be provided on the top of the hood for feeding in the cables. Depending on the number of cables and the cable cross-sections used, holes must be provided in this mounting plate for attaching cable glands for feeding in the cables on the plant side.

Note: The control cables are still connected from below. With the **M78** option, the standard motor connection from below is not used.

The hoods have IP21 degree of protection. Additional plastic ventilation grilles and filter pads are provided in combination with the **M23** and **M54** options.

Attention: The hoods are colored RAL 7035 as standard. If a special color is requested for the cabinet (order code **Y09**), the hoods are also painted in this color. Ventilation grilles used with IP23 and IP54 degrees of protection are colored RAL 7035 and cannot be painted.

The covers used with the **M60** option are included in the scope of delivery.

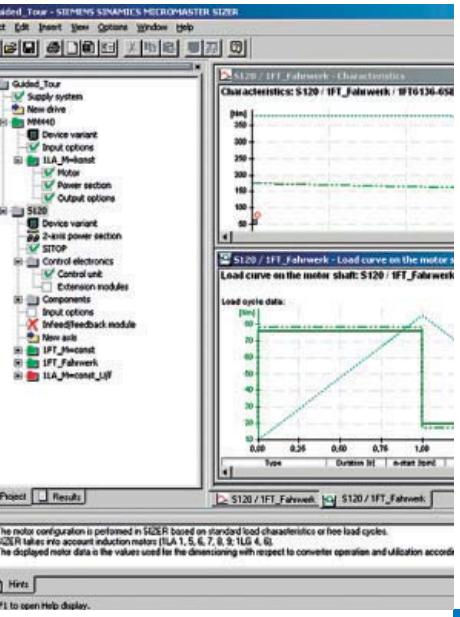
M90
Top-mounted crane transport assembly for cabinets

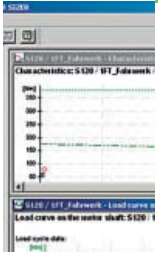
In the case of single cabinets up to a width of 600 mm, the crane transport assembly has transport eye bolts. With a cabinet width of 800 mm or more, transport rails are used.

Y09
Special cabinet paint finish

The drive converter cabinet units are colored RAL 7035 as standard. The special color must be specified in plain text when ordering. All RAL colors can be selected which are available as powdered coatings. If options such as cable connection area (Order code **M07**), top covers or canopies (Order code **M21**), hoods (Order codes **M23/M54**) or cable connection from above (Order codes **M13/M78**) are required for the drive converter cabinet units, these are provided in the ordered cabinet color. The molded plastic parts e.g. ventilation grilles) are colored RAL 7035 and cannot be painted.

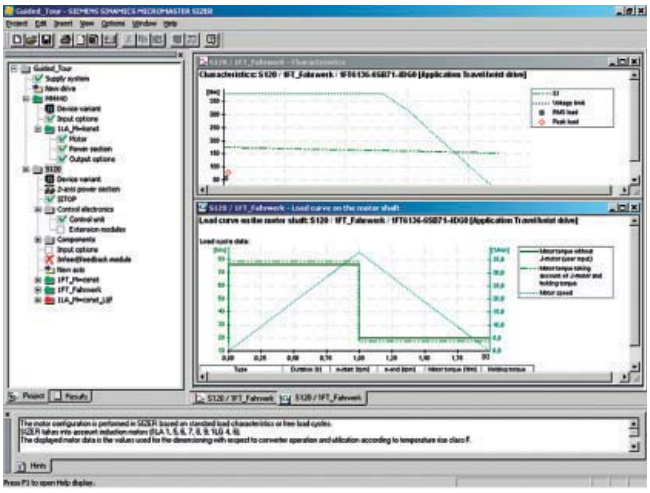
4 Engineering information





SIZER configuration tool

Overview



The SIZER PC tool provides an easy-to-use means of configuring the SINAMICS and MICROMASTER 4 drive family. It provides technical support when sizing the hardware and firmware components required for a drive task. SIZER supports the complete configuration of the drive system, from simple individual drives to complex multi-axis applications.

SIZER supports all stages of the configuration in the form of a workflow, which comprises the following stages:

- Selection of the line supply
- Dimensioning of the motor(s)
- Calculation of the drive components
- Selecting the required accessories
- Selection of the line-side and motor-side power options.

When SIZER was being developed, particular importance was placed on high usability and a universal, function-based approach to the drive task. The extensive user guidance makes using the tool easy. Status information keeps you continually informed of the progress of the configuration process.

The SIZER user interface is available in German and English.

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 supports:

- The configuration of a number of drive devices
- The copying/pasting/editing of existing drives that have already been configured.

The configuration process produces the following results:

- A parts list of the components required
- Technical data
- Characteristics
- Location diagram and dimension drawings

These results are displayed in a results tree and can be printed out for documentation purposes.

User support is provided by the technological online help menu, which provides the following information:

- Detailed technical data
- Information about the drives and their components
- Decision-making criteria for the selection of components

Minimum hardware and software requirements

PG or PC with Pentium™ II 400 MHz (Windows™ NT/2000), Pentium™ III 500 MHz (Windows™ XP)

256 MB RAM

At least 600 MB of free hard disk space

An additional 100 MB of free hard disk space on Windows system drive

Monitor resolution 1024×768 pixels

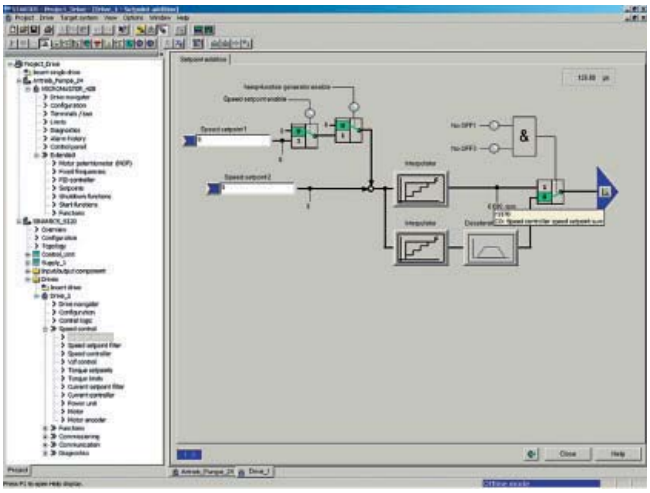
Windows™ NT 4.0 SP5, 2000 SP2, XP Professional SP1

Microsoft Internet Explorer 5.5 SP2

Selection and ordering data

	Order No.
SINAMICS MICROMASTER SIZER configuration tool German/English	**6SL3070-0AA00-0AG0**

Overview



The easy-to-use STARTER drive/commissioning software can be used to:

- Start up
- Optimize and
- Diagnostics.

This software can be operated either as a standalone PC application or can be integrated into the SCOUT engineering system (SIMOTION). The basic functions and handling are the same in both cases.

In addition to the SINAMICS drives, the current version of STARTER also supports MICROMASTER 4 drives.

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

First-time users are supported by solution-based dialog menu, with a standard graphical display, maximizing clarity when setting the drive parameters.

First commissioning is guided by wizards, which make all the basic settings in the drive. This enables a drive to be up and running after only setting a small number of parameters within the drive configuration process.

The individual settings required are made using graphics-based parameterization screen forms, which also display the mode of operation.

Examples of individual settings that can be made include:

- Terminals
- Bus interface
- Setpoint channel (e.g. fixed setpoints)
- Speed control (e.g. ramp-function generator, limits)
- BICO interconnections
- Diagnostics

Experts can gain rapid access to the individual parameters via the Expert List, and do not have to navigate dialogs.

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

- Self-optimization
- Trace

Diagnostics functions provide information about:

- Control/status words
- Parameter status
- Operating conditions
- Communication states

Performance

- Easy to use: Only a small number of settings need to be made for successful first commissioning: axis turning
- Solution-based dialog-based user guidance simplifies commissioning
- Self-optimization functions reduce manual effort for optimization
- The built-in trace function provides optimum support during commissioning, optimization and troubleshooting.

Minimum hardware and software requirements

PG or PC with Pentium™ II 400 MHz (Windows™ NT/2000), Pentium™ III 500 MHz (Windows™ XP)

256 MB RAM

Monitor resolution 1024×768 pixels

Windows™ NT 4.0 SP6, 2000 SP3, XP Professional SP1

Microsoft Internet Explorer 5.01

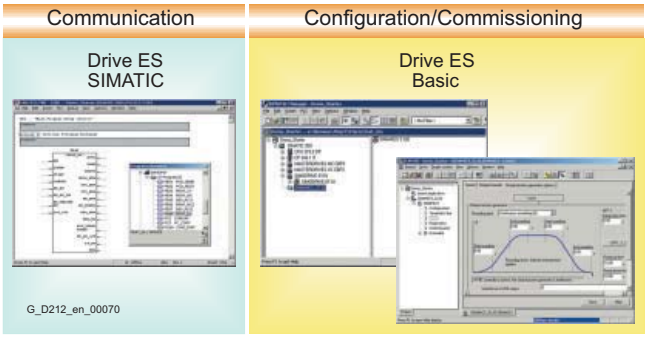
Selection and ordering data

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

4

Drive ES engineering system

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. The STEP 7 Manager user interface provides the basis for this procedure.

Various software packages are available for SINAMICS G and SINAMICS S:

- **Drive ES Basic**
  For first-time users to the world of Totally Integrated Automation and the option for routing beyond network limits and the use of the SIMATIC teleservice.
  Drive ES Basic is the basic software program for setting the parameters of all drives online and offline.
  Drive ES Basic enables both the automation system and the drives to be handled via the SIMATIC Manager user interface.
  Drive ES Basic is the starting point for common data archiving of complete projects and for extending the use of the SIMATIC teleservice to drives. Drive ES Basic provides the configuration tools for the new motion control functions of slave-to-slave communication, equidistance and isochronous operation with PROFIBUS DP.
- **Drive ES SIMATIC**
  Simply parameterize the STEP 7 communication instead of programming.
  In order to use Drive ES SIMATIC, STEP 7 must be installed. A SIMATIC block library is supplied for simple and reliable programming of the PROFIBUS interface on the SIMATIC CPU for the drives. There is no separate time-consuming programming of the exchange of data between the SIMATIC CPU and the drive.
  For Drive ES users need to remember is:
  Copy - Adapt - Download - Ready.
  Customized, fully-developed function blocks from the library are transferred into a user-specific project.
  Frequently required functions are set to run in program format:
  - Read out complete diagnostics buffer automatically from the drive
  - Download complete parameter set automatically from the SIMATIC CPU to the drive, e.g. in the event of a device being replaced
  - Load part parameter sets (e.g. in the event of a recipe or product replacement) automatically from the SIMATIC-CPU
  - Read back, i.e. update, complete parameterization or part parameter sets from the drive to the SIMATIC-CPU
- **Drive ES PCS 7**
  Integrates drives with the PROFIBUS interface into the SIMATIC PCS 7 process control system.
  Drive ES PCS 7 can only be used with SIMATIC PCS 7 Version 5.0 and later. 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.

For further information please visit us on the Internet at:

http://www.siemens.com/drivesolutions

Selection and ordering data

	Order No.
Drive ES Basic V 5.3 • Configuration software for integrating drives into Totally Integrated Automation • Requirement: STEP 7 V 5.1 and higher, SP 3 • Supply format: CD-ROM de, en, fr, es, it with electronic documentation	
Single license	**6SW1700-5JA00-3AA0**
Multi-user license, 60 x	**6SW1700-5JA00-3AA1**
Update service for single-user license	**6SW1700-0JA00-0AB2**
Update service for multi-user license	**6SW1700-0JA00-1AB2**
Upgrade from V 5.x to V 5.3	**6SW1700-5JA00-3AA4**
Drive ES SIMATC V 5.3 • Function block library for SIMATIC for the parameterization of communication with the drives • Requirement: STEP 7 V 5.1 and higher, SP 3 • Supply format: CD-ROM de, en, fr, es, it with electronic documentation	
Single-user license incl. 1 x runtime license	**6SW1700-5JC00-3AA0**
Runtime license	**6SW1700-5JC00-1AC0**
Update service for single-user license	**6SW1700-0JC00-0AB2**
Upgrade from V 5.x to V 5.3	**6SW1700-5JC00-3AA4**
Drive ES PCS 7 V 6.0 • Function block library for PCS 7 for the integration of drives • Requirement: PCS 7 V 6.0 and higher • Supply format: CD-ROM de, en, fr, es, it with electronic documentation	
Single-user license incl. 1 x runtime license	**6SW1700-6JD00-0AA0**
Runtime license	**6SW1700-5JD00-1AC0**
Update service for single-user license	**6SW1700-0JD00-0AB2**
Upgrade from V 5.x to V 6.x	**6SW1700-6JD00-0AA4**

Overview

SINAMICS G130 drive converter chassis units provide machine builders and plant constructors with a modular drive system that can be tailored to specific applications.

SINAMICS G130 drive converter chassis units consist of two modular, stand-alone components:

- Power module and
- Control unit

They may be located separately from one another or combined in a single unit. The power module contains a slot for the control unit. On the 315 kW unit of voltage range 660 V - 690 V, this is the left-hand side wall. On all other units, the slot is in the power module.

The power modules are supplied with a DRIVE-CLiQ cable for communication and the cable for the 24 V supply to the control unit. This requires the control unit to be installed in the power module. If the two units are in a separate location, the cables should be ordered in the appropriate lengths.

The CU320 control unit is part of the control unit kit, which also includes a CompactFlash card and the documentation on CD-ROM. This will reduce the ordering required.

Predefined interfaces, via terminal block or PROFIBUS, make commissioning and control of the drive much easier. The interfaces of the CU320 control unit can be supplemented with additional modules, such as the withdrawable TB30 terminal board of the TM31 terminal module.

If further customer interfaces are needed to communicate with the drive, an external 24 V supply should be provided.

The following flow chart shows how to select the correct converter components (see page 4/6).

Rated data and continuous operation of converters for drives with low demands on control performance

SINAMICS G130 drive converter chassis units are designed for applications with low demands on dynamic response and control accuracy, offering no possibility of regenerative feedback.

They are designed for motorized operation at the supply voltages specified in the selection tables. These values take account of voltage fluctuations within the defined tolerances.

The currents specified in the selection and ordering data are available across the entire frequency/speed setting range.

As far as the rated currents are concerned, the units are dimensioned for continuous operation with the specified rated output currents. The values are based on 6-pole Siemens standard motors.

EMERGENCY STOP functions

The EMERGENCY STOP function may be essential for certain drive applications. According to EN 60 204, an EMERGENCY STOP must be designed as a stop of category 0 or as a stop of category 1.

They are defined as follows:

Stop of category 0:

Uncontrolled shutdown by immediately switching off the power supply. Motor coasts. This corresponds to immediate stopping of the inverter, in association with intrinsically-safe disconnection of the main contactors or - for greater outputs - of the circuit-breaker.

Stop of category 1:

Controlled shutdown, where the power supply is retained until standstill has been reached. This can be implemented by means of a rapid stop in association with intrinsically-safe disconnection of the main contactors or the circuit-breaker.

Comment:

Only a stop of category 0 is sensible for converters that do not have braking facilities. An EMERGENCY STOP with a stop of category 1 generally requires a braking facility (braking unit or converter with regenerative feedback).

The category must be selected using a risk evaluation for the drive.

To achieve this, the drives can be roughly divided into the following groups:

Case A:

Drives that are quickly braked to zero speed by the connected load when they are shut down.

Typical example: Pumps.
For these, an EMERGENCY STOP with category 0 is sufficient.

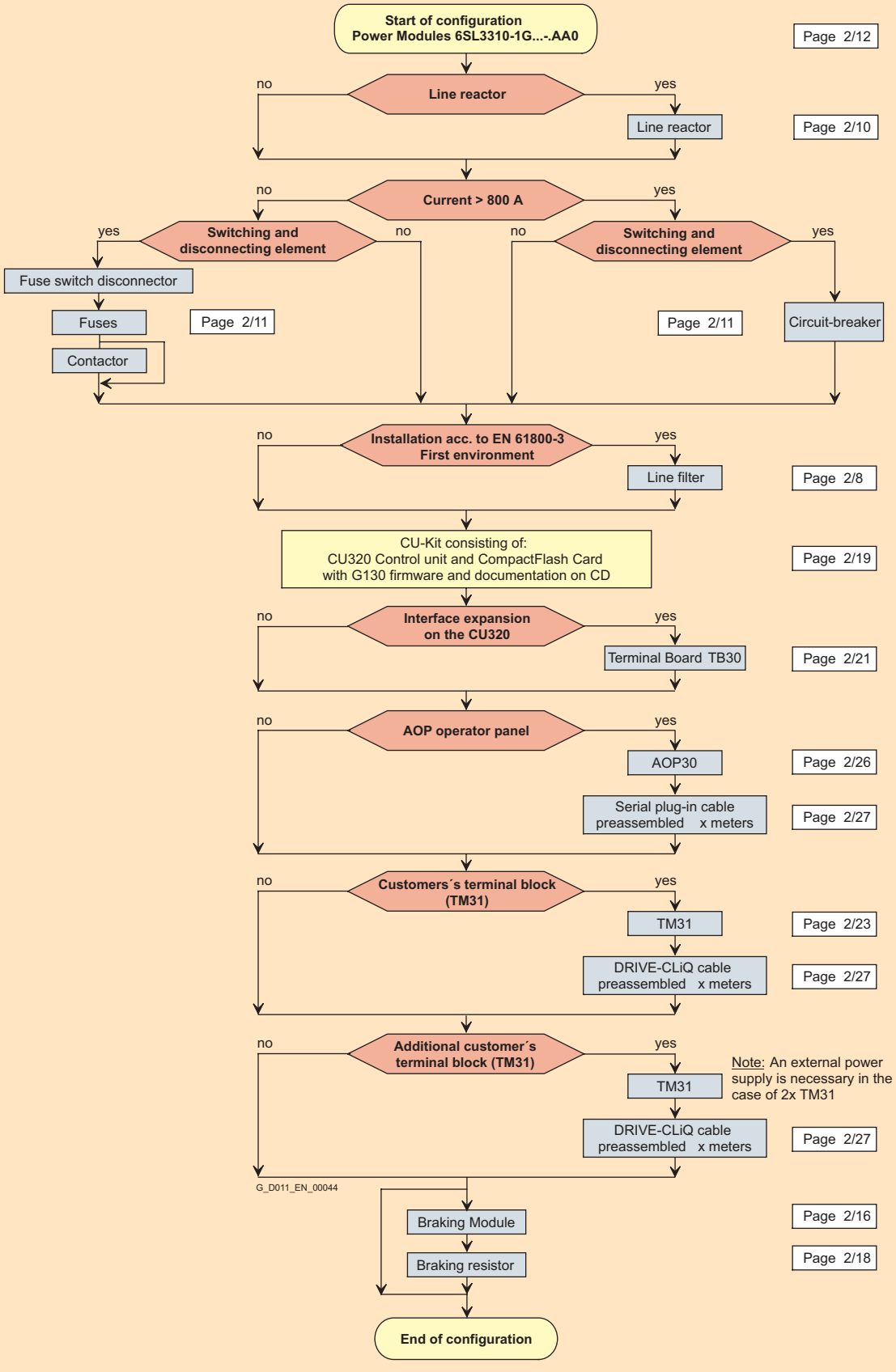
Case B:

Drives with larger rotating masses that are braked to zero speed by the connected load when they are shut down.

Typical example: Fans.
For these, an EMERGENCY STOP with category 0 is sufficient if the coasting time can be tolerated. On the other hand, if stopping is required within a specific time when an EMERGENCY STOP occurs, it may be necessary to provide an EMERGENCY STOP according to category 1. This may require a braking facility even if this is not necessary for the actual drive application.

Dimensioning and selection information

Overview (continued)



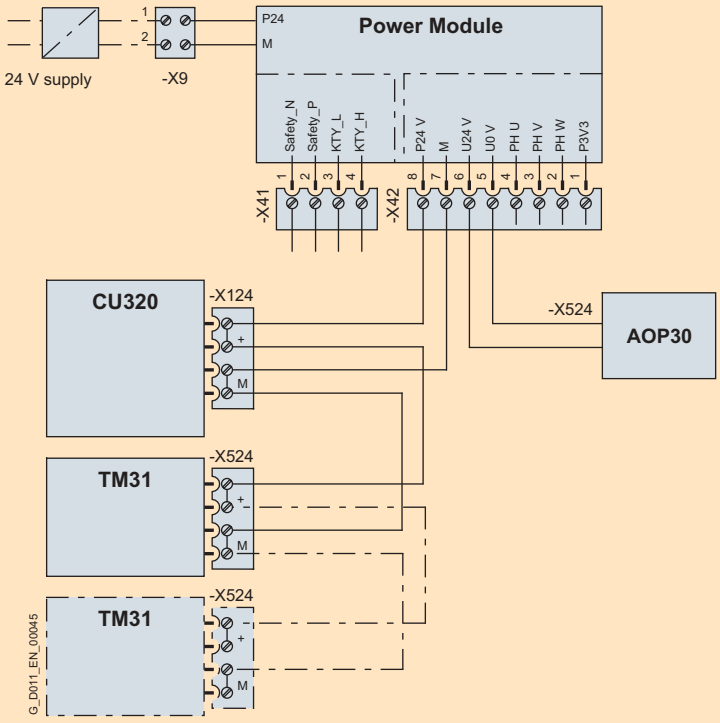
Overview (continued)

Integration of the various consumers into the 24 V supply

The maximum output currents of the power module should be observed. If these are exceeded by the connected consumers, then an external 24 V supply should be provided.

The power module supplies the following currents at its output terminals (without an external 24 V supply):

Terminal block	Max. output current	Comment
-X42 Pin 5 and 6	350 mA	Sufficient to supply the AOP30 with < 200 mA
-X42 Pin 7 and 8	2000 mA	Current demand of the CU320 control unit is approximately 800 mA, ignoring the assignment of the slot and the control unit's digital outputs. Current demand of the TM31 terminal module is approximately 500 mA, ignoring the digital outputs.



Customer's terminal blocks

Overview

The following factory settings are provided to simplify configuring the customer interface and commissioning. The interfaces can also be assigned as required.

- The converter is controlled **via the PROFIBUS interface that is supplied as standard**. The digital inputs/outputs of the control unit are used to integrate external alarms/fault messages and control signals.

Terminal block on CU320 control unit	Factory default	Comment
-X122		
DI0	Free	
DI1	Free	
DI2	Free	
DI3	Acknowledge fault	
M1		
M1		
DI/DO8	Inverter enable (operation)	
DI/DO9	No fault	
M		
DI/DO10	P24	Preset as output
DI/DO11	External alarm [1])	Low active
M		
-X132		
DI4	OFF 2 [1])	
DI5	OFF 3 [1])	Ramp-down on the fast stop ramp, only of relevance in conjunction with the braking module
DI6	External fault [1])	
DI7	Free	
M		
DI/DO12	Error message acknowledgement, braking module	Output is used (preassigned) in conjunction with the braking module
DI/DO13	P24	Preset as output
M		
DI/DO14	P24	Preset as output
DI/DO15	P24	Preset as output
M		

The preassignments are indicated by underlining for the bidirectional inputs/outputs.

1) A jumper should be inserted here if these inputs are not used.

Overview (continued)

- The converter is only controlled **via the digital inputs/outputs of the control unit which are supplied as standard.**

Terminal block on CU320 control unit	Factory default	Comment
-X122		
DI0	ON/OFF 1	
DI1	Increase setpoint / fixed setpoint 0	Parameters can be set in the software to determine whether operation is via motorized digital potentiometer or fixed setpoint.
DI2	Decrease setpoint / fixed setpoint 1	
DI3	Acknowledge fault	
M1		
M1		
DI/DO8	Inverter enable (operation)	
DI/DO9	No fault	
M		
DI/DO10	P24	Preset as output
DI/DO11	External alarm [1])	Low active
M		
-X132		
DI4	OFF 2 [1])	Immediate pulse block, motor coasts
DI5	OFF 3 [1])	Ramp-down on the fast stop ramp, only of relevance in conjunction with the braking module
DI6	External fault 1 [1])	
DI7	Free	
M		
DI/DO12	Error message acknowledgement, braking module	Output is used (reserved) in conjunction with the braking module
DI/DO13	P24	Preset as output
M		
DI/DO14	P24	Preset as output
DI/DO15	P24	Preset as output
M		

The preassignments are indicated by underlining for the bidirectional inputs/outputs.

1) A jumper should be inserted here if these inputs are not used.

Customer's terminal blocks

Overview (continued)

- The converter is controlled **via the PROFIBUS interface that is supplied as standard**. The digital inputs/outputs of the control unit and the optional **TM31** customer interface are used to integrate external alarms/fault messages and control signals.

Terminal block on CU320 control unit	Factory default	Comment
-X122		
DI0	Free	
DI1	Free	
DI2	Free	
DI3	Free	
M1		
M1		
DI/DO8	Free	Preset as output
DI/DO9	Free	Preset as output
M		
DI/DO10	Free	Preset as output
DI/DO11	Free	Preset as output
M		
-X132		
DI4	Free	
DI5	Free	
DI6	Free	
DI7	Free	
M		
DI/DO12	Error message acknowledgement, braking module	Output is used (reserved) in conjunction with the braking module
DI/DO13	Free	Preset as output
M		
DI/DO14	Free	Preset as output
DI/DO15	Free	Preset as output
M		

The preassignments are indicated by underlining for the bidirectional inputs/outputs.

Overview (continued)

Terminal block on TM31 terminal module	Factory default	Comment
-X520	Optocoupler inputs connected to common potential	
DI0	Free	
DI1	Free	
DI2	Free	
DI3	Acknowledge fault	
-X530	Optocoupler inputs connected to common potential	
DI4	OFF 2 [1])	Immediate pulse block, motor coasts
DI5	OFF 3 [1])	Ramp-down on the fast stop ramp, only of relevance in conjunction with the braking module
DI6	External fault [1])	
DI7	Free	
-X541	Bidirectional inputs/outputs	
DI/DO8	Ready to start message	
DI/DO9	Free	Preset as input
DI/DO10	Free	Preset as input
DI/DO11	External alarm [1])	Preset as input
-X542	Relay outputs (changeover contact)	
DO0	Inverter enable (operation)	
DO1	No fault in converter checkback	
-X521	Analog inputs, differential	
AI0+	Free	
AI0-		
AI1+	Free	
AI1-		
-X522	Analog outputs	
AO 0V+		The outputs are set to 0-10 V at the factory.
AO 0V-	Actual speed analog output	
AO 0C+		
AO 1V+		The outputs are set to 0-10 V at the factory.
AO 1V-	Actual motor current analog output	
AO 1C+		
-X522	Thermistor protection	
+Temp		Input for KTY84 temperature sensor or PTC thermistor
-Temp		

The preassignments are indicated by underlining for the bidirectional inputs/outputs.

1) A jumper should be inserted here if these inputs are not used.

4

Customer's terminal blocks

Overview (continued)

- The converter is controlled only **via the digital inputs/outputs or analog inputs/outputs** of the optional **TM31** customer interface.

Terminal block on CU320 control unit	Factory default	Comment
-X122		
DI0	Free	
DI1	Free	
DI2	Free	
DI3	Free	
M1		
M1		
DI/DO8	Free	Preset as output
DI/DO9	Free	Preset as output
M		
DI/DO10	Free	Preset as output
DI/DO11	Free	Preset as output
M		
-X132		
DI4	Free	
DI5	Free	
DI6	Free	
DI7	Free	
M		
DI/DO12	Error message acknowledgement, braking module	Output is used (reserved) in conjunction with the braking module
DI/DO13	Free	Preset as output
M		
DI/DO14	Free	Preset as output
DI/DO15	Free	Preset as output
M		

The preassignments are indicated by underlining for the bidirectional inputs/outputs.

Overview (continued)

Terminal block on TM31 terminal module	Factory default	Comment
-X520	Optocoupler inputs connected to common potential	
DI0	ON/OFF 1	
DI1	Increase setpoint / fixed setpoint 0	Parameters can be set in the software to determine whether operation is via motorized digital potentiometer or fixed setpoint.
DI2	Decrease setpoint / fixed setpoint 1	
DI3	Acknowledge fault	
-X530	Optocoupler inputs connected to common potential	
DI4	OFF 2 [1])	Immediate pulse block, motor coasts
DI5	OFF 3 [1])	Ramp-down on the fast stop ramp, only of relevance in conjunction with the braking module
DI6	External fault [1])	
DI7		
-X541	Bidirectional inputs/outputs	
DI/DO8	Ready to start message	
DI/DO9	Free	Preset as input
DI/DO10	Free	Preset as input
DI/DO11	External alarm [1])	Preset as input
-X542	Relay outputs (changeover contact)	
DO0	Inverter enable (operation)	
DO1	No fault in converter checkback	
-X521	Analog inputs, differential	
AI0+	Analog input for setting speed setpoint	The inputs are set to 10 V at the factory.
AI0-		
AI1+	Analog input reserved	The inputs are set to 10 V at the factory.
AI1-		
-X522	Analog outputs	
AO 0V+		The outputs are set to 0-10 V at the factory.
AO 0V-	Actual speed analog output	
AO 0C+		
AO 1V+		The outputs are set to 0-10 V at the factory.
AO 1V-	Actual motor current analog output	
AO 1C+		
-X522	Thermistor protection	
+Temp		Input for KTY84 temperature sensor or PTC thermistor
-Temp		

The preassignments are indicated by underlining for the bidirectional inputs/outputs.

1) A jumper should be inserted here if these inputs are not used.

- The converter is controlled and operated only **via the optional AOP30 operator panel**.
  The digital inputs/outputs of the CU320 control unit are not used.

Line-side components

Overview

Line fuses

The combined fuses (3NE1.) for line and semiconductor protection are recommended to protect the converter. These fuses are specially adapted to the requirements of the input rectifier's semiconductors to be protected.

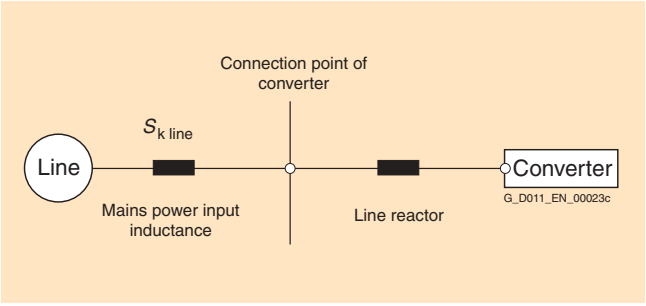
- Superfast
- Adapted to the limit current integral of the semiconductor
- Low arc voltage
- Improved current limiting (lower let-through values)

See Accessories for order numbers and assignments of these fuses. Please refer to Engineering Information, order no. E20001-A700-P302, for the description and technical data of the fuses.

Line reactor

A line reactor is needed for high system fault levels, partly to protect the actual converter against excessive harmonic currents, and thus against overload, and partly to limit the system perturbation to the permitted values. The harmonic currents are limited by the complete inductance comprising the line reactor and mains power input inductance. Line reactors can be omitted if the line infeed inductance is increased sufficiently, i.e. the value of RSC must be sufficiently small.

RSC=Relative Short-Circuit power: Ratio of short-circuit power $S_{k\ line}$ at the supply connection point to fundamental apparent output S_{conv} of the connected converters (to EN 50 178/VDE 0160).



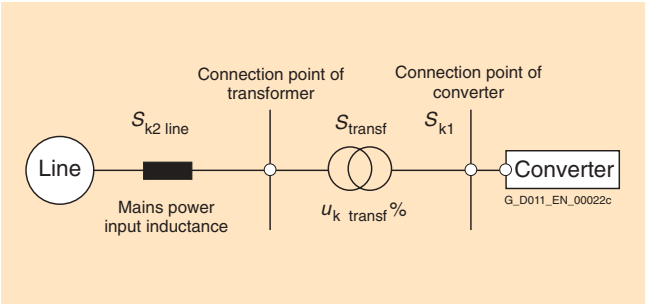
The following applies for SINAMICS G130 drive converter cabinet units:

Output	Line reactor can be omitted	Line reactor required
kW	for RSC	for RSC
< 200	≤ 43	> 43
200 to 500	≤ 33	> 33
> 500	≤ 20	> 20

In practice, the line configuration on which individual converters operate is often not known, i.e. the line short circuit power at the connection point of the converter is not known, so it is recommended that a line reactor always be connected in series with the converter.

The line reactor can only be omitted if the values for RSC are lower than those shown in the above table. This is the case when, as shown in the following figure, the converter is connected to the line through a transformer with the appropriate rating.

Attention: A line reactor is always needed, however, if a line filter is used.



In this case, the line short-circuit power S_{k1} at the connection point of the converter is approximately:

$$S_{k1} = S_{transf} / (u_{k\ transf} + S_{transf} / S_{k2\ line})$$

Symbol	Meaning
S_{transf}	Rated output of transformer
$u_{k\ transf}$	Per-unit impedance of transformer
$S_{k2\ line}$	Short-circuit power of higher-level voltage

Line filters

The SINAMICS G130 drive converter chassis units have as standard an integral line filter to limit emitted interference and thus conform to the limits for category C3 defined in the product standard EN 61 800-3.

With the optional line filter, the converters are suitable for use in the first environment (category C2), in which case the instructions of the EMC directives should be followed.

If installed correctly and the installation instructions are followed, they may thus be used in the first environment as defined in EN 61 800-3.

The line filter may only be used on grounded supplies (TN supplies).

Overview

Braking units

Braking units are used when regenerative energy occurs occasionally and briefly, for example when the brake is applied to the drive (emergency stop). The braking units comprise a braking module and a load resistor, which must be attached externally.

Braking units with braking powers of 200 kW are available for the SINAMICS G130 drive converter chassis units. For higher braking powers, braking units can be connected in parallel for larger converters (on request).

A thermal contact, which can be integrated into the converter's alarm and shutdown sequence, is installed in the braking resistor for monitoring.

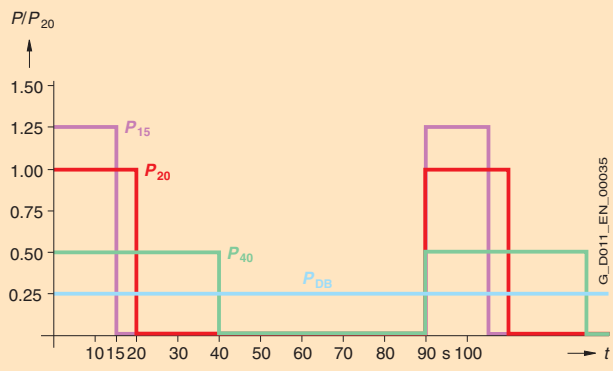
Determining the required braking units and braking resistors

- For periodic duty cycles with a load duration of ≤ 90 s, the mean braking power value within this duty cycle must be determined. The relevant period should be used as the time base.
- For periodic duty cycles with a load duration of ≥ 90 s or for sporadic braking operations, a 90 s time segment in which the greatest mean value occurs should be selected. A 90 s period should be set as the time base.

When selecting the braking units (braking module and braking resistor), consider both the mean braking power value and the required peak braking power.

Basic data

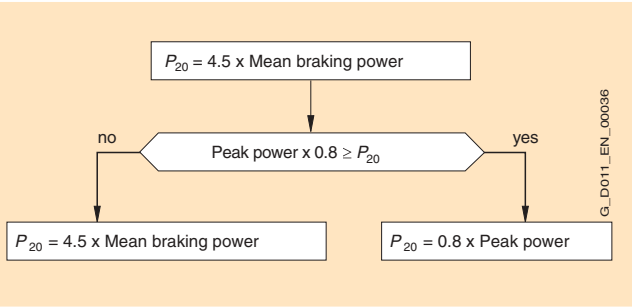
	Supply voltage	
	380 V to 480 V	**660 V to 690 V**
SINAMICS G130 drive converter chassis units Power module	315 kW to 560 kW	315 kW to 800 kW
Braking module Continuous power P_{DB}	50 kW	50 kW
Braking module Power P_{40}	100 kW	100 kW
Braking module Rated power P_{20}	200 kW	200 kW
Braking module Peak power P_{15}	250 kW	250 kW
Braking resistor R_B	2,2 Ω ±7.5%	4,9 Ω ±7.5%
Max. current	378 A	255 A



P_{DB} = Permanent braking power
P_{15} = 5 x P_{DB} = Output which is permissible every 90 s for 15 s
P_{20} = 4 x P_{DB} = Output which is permissible every 90 s for 20 s
P_{40} = 2 x P_{DB} = Output which is permissible every 90 s for 40 s

Load diagram

Calculating the P_{20} power



To reduce the voltage stress on the motor and converter, the response threshold at which the braking unit is activated and the DC link voltage generated can be reduced. For example, the DC link voltage for the converters in the voltage range from 380 V to 480 V can be reduced from 774 V to 673 V. This also reduces the possible peak power. A factor of 1.06, rather than a factor of 0.8 should be used.

The ON/OFF states of the braking module are controlled by a 2-point controller. The respective response thresholds are shown in the following table:

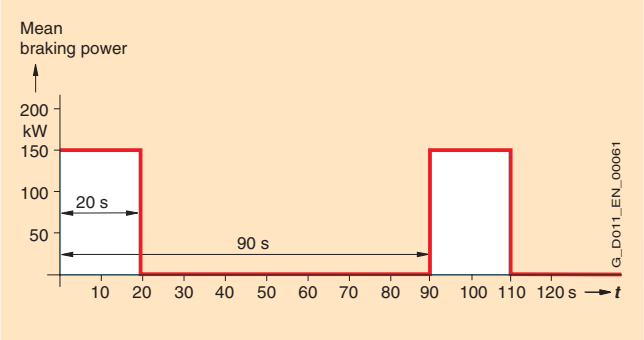
Converter voltage range	Braking unit response threshold
380 V to 480 V	774 V (673 V)
660 V to 690 V	1158 V (1070 V)

Components in the DC link

Overview (continued)

Example

The design of the braking module and braking resistor is to be defined for a 450 kW power module.



The mean braking power is calculated as follows:

Mean braking power = 150 kW x 20 s / 90 s = 33.3 kW

P_{20} = 4.5 x 33.3 kW = 150 kW

Peak power = 0.8 x 150 kW = 120 kW

Result:

The mean braking power is the determining factor in the configuration of the braking module and braking resistor, i.e. a braking unit ≥ 150 kW should be provided.

The 200 kW braking unit should be selected.

When the response threshold is reduced, the required braking power P_{20} is calculated as follows:

Mean braking power = 150 kW x 20 s / 90 s = 33.3 kW

P_{20} = 4.5 x 33.3 kW = 150 kW

Peak power = 1.06 x 150 kW = 159 kW

Result:

The peak power to be generated is the determining factor in the configuration of the braking module and braking resistor, i.e. a braking unit ≥ 159 kW should be provided.

The 200 kW braking unit should be selected.

Overview

Rated data and continuous operation of converters for drives with low demands on control performance

SINAMICS G150 converter cabinet units are designed for applications with low demands on dynamic response and control accuracy, offering no possibility of regenerative feedback.

They are designed for motorized operation at the supply voltages specified in the selection tables. These values take account of voltage fluctuations within the defined tolerances.

The currents specified in the selection and ordering data are available across the entire frequency/speed setting range.

As far as the rated currents are concerned, the units are dimensioned for continuous operation with the specified rated output currents. The values are based on 6-pole Siemens standard motors.

Degrees of protection of the drive converter cabinet units

The EN 60 529 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 penetration of solid foreign matter (shock protection)
- Protection of the equipment against the penetration 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 of the drive converter cabinet unit	First digit (protection against accidental contact and solid matter)	Second digit (protection of the equipment against the penetration of water)
IP20	Protected against solid matter, diameter ≥ 12.5 mm	No water protection
IP21	Protected against solid matter, diameter ≥ 12.5 mm	Protected against drip water. Vertically falling drip water must not have a harmful effect
IP23	Protected against solid matter, diameter ≥ 12.5 mm	Protected against spray water. Water sprayed on both sides of the vertical at an angle of up to 60° must not have a harmful effect
IP54	Dust protected. Entry of dust is not totally prevented, but the entry of dust is not allowed in such quantities that the operation of equipment or the safety will be impaired.	Protected against water from a hose. Water from a hose which is directed on the enclosure must not have a harmful effect.

EMERGENCY STOP functions

The EMERGENCY STOP function may be essential for certain drive applications. According to EN 60 204, an EMERGENCY STOP must be designed as a stop of category 0 or as a stop of category 1.

They are defined as follows:

Stop of category 0:

Uncontrolled shutdown by immediately switching off the power supply. Motor coasts. This corresponds to immediate stopping of the inverter, in association with intrinsically-safe disconnection of the main contactors or - for greater outputs - of the circuit-breaker.

Stop of category 1:

Controlled shutdown, where the power supply is retained until standstill is reached. This can be implemented by means of a rapid stop in association with intrinsically-safe disconnection of the main contactors or the circuit-breaker.

Comment:

Only a stop of category 0 is sensible for converters that do not have braking facilities. An EMERGENCY STOP with a stop of category 1 generally requires a braking facility (braking unit or converter with regenerative feedback).

The category must be selected using a risk evaluation for the drive.

To achieve this, the drives can be roughly divided into the following groups:

Case A:

Drives that are quickly braked to zero speed by the connected load when they are shut down.

Typical example: Pumps.
For these, an EMERGENCY STOP with category 0 is sufficient.

Case B:

Drives with larger rotating masses that are braked to zero speed by the connected load when they are shut down.

Typical example: Fans.
For these, an EMERGENCY STOP with category 0 is sufficient if the coasting time can be tolerated. On the other hand, if stopping is required within a specified time when an EMERGENCY STOP occurs, it may be necessary to provide an EMERGENCY STOP according to category 1. This may require a braking facility even if it is not needed for the actual drive application.

Customer's terminal block

Overview

The following factory settings are provided to simplify configuring the customer interface and commissioning. The interfaces can also be assigned as required.

Terminal block on TM31 terminal module	Factory default	Comment
-X520	Optocoupler inputs connected to common potential	
DI0	ON/OFF 1	
DI1	Increase setpoint / fixed setpoint 0	Parameters can be set in the software to determine whether operation is via motorized digital potentiometer or fixed setpoint.
DI2	Decrease setpoint / fixed setpoint 1	
DI3	Acknowledge fault	
-X530	Optocoupler inputs connected to common potential	
DI4	Inverter enable [1])	Converter is at standby and waiting for the enable signal
DI5	OFF 3 [1])	Ramp-down on the fast stop ramp, only of relevance in conjunction with the braking module
DI6	External fault [1])	
DI7		
-X541	Bidirectional inputs/outputs	
DI/DO8	Ready to start message	
DI/DO9	Free	Preset as input
DI/DO10	Free	Preset as input
DI/DO11	Free	Preset as input
-X542	Relay outputs (changeover contact)	
DO 0	Inverter enable (operation)	
DO 1	No fault in converter checkback	
-X521	Analog inputs, differential	
AI0+	Analog input for setting speed setpoint	The inputs are set to 0-20 mA at the factory.
AI0-		
AI1+	Analog input reserved	The inputs are set to 0-20 mA at the factory.
AI1-		
-X522	Analog outputs	
AO 0V+		The outputs are set to 0-20 mA at the factory.
AO 0V-	Actual speed analog output	
AO 0C+		
AO 1V+		The outputs are set to 0-20 mA at the factory.
AO 1V-	Actual motor current analog output	
AO 1C+		
-X522	Thermistor protection	
+Temp		Input for KTY84 temperature sensor or PTC thermistor
-Temp		

The preassignments are indicated by underlining for the bidirectional inputs/outputs.

1) A jumper should be inserted here if these inputs are not used.

Overview

The following table shows the recommended or maximum permissible cable connections on the power supply and motor sides.

The recommended cross-sections are based on the listed fuses and with single routing of the three-wire cables at an ambient temperature of 40 °C.

In the case of different conditions (cable routing, cable grouping, ambient temperature), the planning instructions for routing the cables must be taken into account.

Output	Converter	Wght.	Line connection					Motor connection					Cabinet earthing	
		(standard version)	Recommended cross-section		Maximum conductor cross-section		Mounting screw M12	Recommended cross-section		Maximum conductor cross-section		Mounting screw M12	Mounting screw M12	Comment
kW	Type 6SL3710- ...	kg	DIN VDE mm²	AWG/ MCM	DIN VDE mm²	AWG/ MCM	(No. of holes)	DIN VDE mm²	AWG/ MCM	DIN VDE mm²	AWG/ MCM	(No. of holes)	(No. of holes)	
Version A, 380 V to 480 V														
110	-1GE32-1AA0	320	2x70	2x(000)	4x240	4x600	(2)	2x70	2x(000)	2x150	2x(400)	(2)	(2)	
132	-1GE32-6AA0	320	2x95	2x(4/0)	4x240	4x600	(2)	2x95	2x(4/0)	2x150	2x(400)	(2)	(2)	
160	-1GE33-1AA0	390	2x120	2x(300)	4x240	4x600	(2)	2x120	2x(300)	2x150	2x(400)	(2)	(2)	
200	-1GE33-8AA0	480	2x120	2x(300)	4x240	4x600	(2)	2x120	2x(300)	2x150	2x(400)	(2)	(2)	
250	-1GE35-0AA0	480	2x185	2x(500)	4x240	4x600	(2)	2x185	2x(500)	2x240	2x(600)	(2)	(2)	
315	-1GE36-1AA0	860	2x240	2x(600)	4x240	4x600	(2)	2x240	2x(600)	4x240	4x(600)	(2)	(2)	
400	-1GE37-5AA0	865	2x300	2x(800)	4x240	4x600	(2)	2x300	2x(800)	4x240	4x(600)	(2)	(10)	Cu rail
450	-1GE38-4AA0	1075	4x150	4x(400)	8x240	8x600	(4)	4x150	4x(400)	4x240	4x(600)	(2)	(16)	Cu rail
560	-1GE41-0AA0	1360	4x185	4x(500)	8x240	8x600	(4)	4x185	4x(500)	6x240	6x(600)	(3)	(18)	Cu rail
Version A, 660 V to 690 V														
75	-1GH28-5AA0	320	50	(00)	4x240	4x600	(2)	50	(00)	2x70	2x(000)	(2)	(2)	
90	-1GH31-0AA0	320	50	(00)	4x240	4x600	(2)	50	(00)	2x150	2x(400)	(2)	(2)	
110	-1GH31-2AA0	320	70	(000)	4x240	4x600	(2)	70	(000)	2x150	2x(400)	(2)	(2)	
132	-1GH31-5AA0	320	95	(4/0)	4x240	4x600	(2)	95	(4/0)	2x150	2x(400)	(2)	(2)	
160	-1GH31-8AA0	390	120	(300)	4x240	4x600	(2)	120	(300)	2x150	2x(400)	(2)	(2)	
200	-1GH32-2AA0	390	2x70	2x(000)	4x240	4x600	(2)	2x70	2x(000)	2x150	2x(400)	(2)	(2)	
250	-1GH32-6AA0	390	2x95	2x(4/0)	4x240	4x600	(2)	2x95	2x(4/0)	2x185	2x(500)	(2)	(2)	
315	-1GH33-3AA0	390	2x120	2x(300)	4x240	4x600	(2)	2x120	2x(300)	2x240	2x(600)	(2)	(2)	
400	-1GH34-1AA0	860	2x185	2x(500)	4x240	4x600	(2)	2x185	2x(500)	4x240	4x600	(2)	(2)	
450	-1GH34-7AA0	860	2x185	2x(500)	4x240	4x600	(2)	2x185	2x(500)	4x240	4x600	(2)	(2)	
560	-1GH35-8AA0	860	2x240	2x(600)	4x240	4x600	(2)	2x240	2x(600)	4x240	4x600	(2)	(2)	
710	-1GH37-4AA0	1320	3x185	3x(500)	8x240	8x600	(4)	3x185	3x(500)	6x240	6x600	(3)	(18)	Cu rail
800	-1GH38-1AA0	1360	4x150	4x(400)	8x240	8x600	(4)	4x150	4x(400)	6x240	6x600	(3)	(18)	Cu rail
Version C, 380 V to 480 V														
110	-1GE32-1CA0	225	2x70	2x(000)	2x240	2x600	(1)	2x70	2x(000)	2x150	2x(400)	(1)	(2)	
132	-1GE32-6CA0	225	2x95	2x(4/0)	2x240	2x600	(1)	2x95	2x(4/0)	2x150	2x(400)	(1)	(2)	
160	-1GE33-1CA0	300	2x120	2x(300)	2x240	2x600	(1)	2x120	2x(300)	2x150	2x(400)	(1)	(2)	
200	-1GE33-8CA0	300	2x120	2x(300)	2x240	2x600	(1)	2x120	2x(300)	2x150	2x(400)	(1)	(2)	
250	-1GE35-0CA0	300	2x185	2x(500)	2x240	2x600	(1)	2x185	2x(500)	2x240	2x(600)	(1)	(2)	
315	-1GE36-1CA0	670	2x240	2x(600)	8x240	8x600	(4)	2x240	2x(600)	8x240	8x(600)	(4)	(2)	
400	-1GE37-5CA0	670	2x300	2x(800)	8x240	8x600	(4)	2x300	2x(800)	8x240	8x(600)	(4)	(8)	Cu rail
450	-1GE38-4CA0	670	4x150	4x(400)	8x240	8x600	(4)	4x150	4x(400)	8x240	8x(600)	(4)	(8)	Cu rail
560	-1GE41-0CA0	980	4x185	4x(500)	8x240	8x600	(4)	4x185	4x(500)	8x240	8x(600)	(4)	(10)	Cu rail
Version C, 660 V to 690 V														
75	-1GH28-5CA0	225	50	(00)	2x240	2x600	(1)	50	(00)	2x70	2x(000)	(1)	(2)	
90	-1GH31-0CA0	225	50	(00)	2x240	2x600	(1)	50	(00)	2x150	2x(400)	(1)	(2)	
110	-1GH31-2CA0	225	70	(000)	2x240	2x600	(1)	70	(000)	2x150	2x(400)	(1)	(2)	
132	-1GH31-5CA0	225	95	(4/0)	2x240	2x600	(1)	95	(4/0)	2x150	2x(400)	(1)	(2)	
160	-1GH31-8CA0	300	120	(300)	2x240	2x600	(1)	120	(300)	2x150	2x(400)	(1)	(2)	
200	-1GH32-2CA0	300	2x70	2x(000)	2x240	2x600	(1)	2x70	2x(000)	2x150	2x(400)	(1)	(2)	
250	-1GH32-6CA0	300	2x95	2x(4/0)	2x240	2x600	(1)	2x95	2x(4/0)	2x185	2x(500)	(1)	(2)	
315	-1GH33-3CA0	300	2x120	2x(300)	4x240	4x600	(1)	2x120	2x(300)	2x240	2x(600)	(1)	(2)	
400	-1GH34-1CA0	670	2x185	2x(500)	4x240	4x600	(2)	2x185	2x(500)	4x240	4x600	(2)	(2)	
450	-1GH34-7CA0	670	2x185	2x(500)	4x240	4x600	(2)	2x185	2x(500)	4x240	4x600	(2)	(2)	
560	-1GH35-8CA0	670	2x240	2x(600)	4x240	4x600	(2)	2x240	2x(600)	4x240	4x600	(2)	(2)	
710	-1GH37-4CA0	940	3x185	3x(500)	8x240	8x600	(4)	3x185	3x(500)	6x240	6x600	(3)	(18)	Cu rail
800	-1GH38-1CA0	980	4x150	4x(400)	8x240	8x600	(4)	4x150	4x(400)	6x240	6x600	(3)	(18)	Cu rail

Conductor cross-sections and terminals

Overview

Required cable cross-sections for line and motor connections

It is always recommendable to use 3-wire three-phase cables or to connect several cables of this type in parallel. There are two main reasons for this:

- In this manner, the high IP55 degree of protection or better can be achieved for the motor terminal box without any problems because the cables are introduced into the terminal box via screwed glands and the number of possible glands is limited by the geometry of the terminal box. Single cables are less suitable.
- With three-phase cables, the summed ampere-turns over the cable outer diameter is equal to zero and they can be routed in (conductive, metal) cable ducts or racks without any noticeable currents (earth current or leakage current) being induced in these conductive, metal connections. The danger of induced leakage currents and thus of increased cable sheath losses is greater for single cables .

The cable cross-section required depends on the current transmitted in the cable. The permissible current load on cables is defined e.g. in DIN VDE 0298 Part 2 / DIN VDE 0276-1000. It depends partly on the ambient conditions such as temperature and partly on the type of routing. When laid singly, the cables are cooled relatively well. Where there are several cables routed together, they can heat each other up, and thus receive much poorer ventilation. In this context, please refer to the applicable reduction factors for these boundary conditions in DIN VDE 0298 Part 2 / DIN VDE 0276-1000. With an ambient temperature of 40 °C, the cross-sections of copper cables can be based on the following table.

Cross-section of 3-wire cables	With single routing	With multiple routing on a common cable rack
mm^2	A	A
50	138	95
70	176	121
95	212	146
120	245	169
150	282	194
185	323	222
240	380	261
300	418	289

Current loading according to DIN VDE 0298 Part 2 at 40 °C

With higher currents, cables must be connected in parallel.

Earthing

Required PE conductor cross-sections:

The PE conductor must be dimensioned taking into account the following data:

- In the event of an earth fault, no impermissibly high contact voltages may occur (< AC 50 V or < DC 120 V, EN 50 178 Section 5.3.2.2, IEC 60 364, IEC 60 543) as a result of voltage drops of the earth fault current on the PE conductor.
- The earth fault current flowing in the PE conductor in the event of an earth fault must not place an impermissible load on the PE conductor.
- If it is possible in the event of a fault according to EN 50 178 Section 8.3.3.4 that continuous currents can flow via the PE conductor, the cross-section of the PE conductor must be dimensioned according to this continuous current.
- The cross-section of the PE conductor must be selected according to EN 60 2041, EN 60 439-1, IEC 60 364.

Cross-section of outer conductor	Minimum cross-section of external PE conductor
Up to 16 mm^2	At least cross-section of outer conductor
16 mm^2 to 35 mm^2	16 mm^2
Above 35 mm^2	At least half the cross-section of outer conductor

- Switchgear and motors are usually earthed separately with a local earth electrode. With this constellation, the earth fault current flows via the parallel earth connections and is divided. With this earthing, no impermissible contact voltages can occur, despite the PE conductor cross-sections used in the above table. From our experience with different earthing configurations, however, we recommend that the earth wire from the motor should be routed directly back to the converter. For EMC reasons and to prevent shaft currents, symmetrical motor cables and not four-wire cables should be used here. The earth connection (PE) 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 earth conductors.
- By means of their fast closed-loop control, the converters limit the load current (motor and earth fault currents) to an rms value corresponding to the rated current. Because of this, we recommend use of a PE conductor cross-section that is analogous to the outer conductor cross-section for earthing the control cabinet.

Overview

Line fuses

The combined fuses (3NE1.) for line and semiconductor protection are recommended to protect the converter. These fuses are specially adapted to the requirements of the input rectifier's semiconductors to be protected.

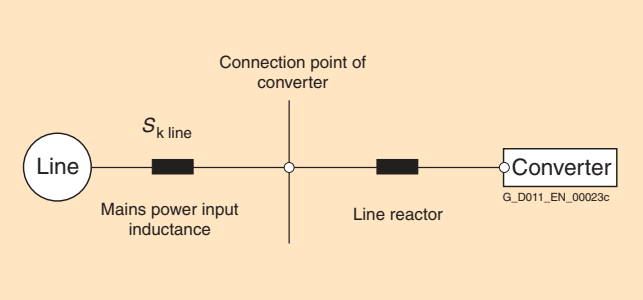
- Superfast
- Adapted to the limit current integral of the semiconductor
- Low arc voltage
- Improved current limiting (lower let-through values)

See Accessories for order numbers and assignments of these fuses. Please refer to Engineering Information, order no. E20001-A700-P302, for the description and technical data of the fuses.

Line reactor

A line reactor is needed for high system fault levels, partly to protect the actual converter against excessive harmonic currents, and thus against overload, and partly to limit the system perturbation to the permitted values. The harmonic currents are limited by the complete inductance comprising the line reactor and mains power input inductance. Line reactors can be omitted if the line infeed inductance is increased sufficiently, i.e. the value of RSC must be sufficiently small.

RSC=Relative Short-Circuit power: Ratio of short-circuit power $S_{k\,line}$ at the supply connection point to fundamental apparent output S_{conv} of the connected converters (to EN 50 178/VDE 0160).

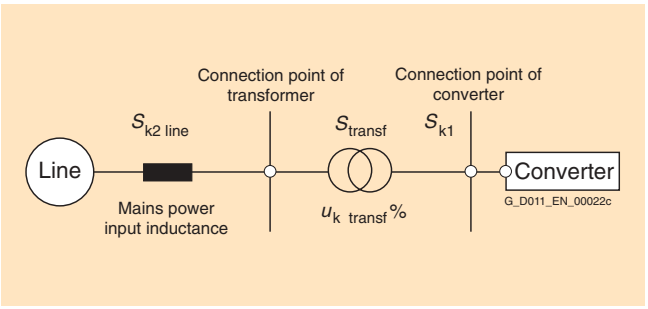


The following applies for SINAMICS G150 drive converter cabinet units:

Output	Line reactor can be omitted		Line reactor required	
kW	for RSC	Order code (option)	for RSC	Order code (option)
< 200	≤ 43	**L22**	> 43	-
200 to 500	≤ 33	**L22**	> 33	-
> 500	≤ 20	-	> 20	**L23**

In practice, the line configuration on which individual converters operate is often not known, i.e. the line short circuit power at the connection point of the converter is not known, so it is recommended that a line reactor always be connected in series with the converter. For this reason, the drive converter cabinet units up to an output of 500 kW are always equipped as standard with a 2% line reactor.

The line reactor can only be omitted (**L22** option) if the values for RSC are lower than those shown in the above table. This is the case when, as shown in the following figure, the converter is connected to the line through a transformer with the appropriate rating.



In this case, the line short-circuit power S_{k1} at the connection point of the converter is approximately:

$$S_{k1} = S_{transf} / (u_{k\,transf} + S_{transf} / S_{k2\,line})$$

Symbol	Meaning
S_{transf}	Rated output of transformer
$u_{k\,transf}$	Per-unit impedance of transformer
$S_{k2\,line}$	Short-circuit power of higher-level voltage

Large output converters should ideally be connected to medium-voltage supplies via transformers in view of the system perturbation, so cabinet units over 500 kW have no line reactors as standard.

A line reactor (**L23** option) is always required, however, if

- for cabinet units > 500 kW, the RSC ratio is > 20 or
- a line filter is used.

Line filters

The SINAMICS G150 drive converter cabinet units have as standard an integral line filter to limit emitted interference and thus conform to the limits for category C3 defined in the product standard EN 61 800-3.

With the optional line filter, the converters are suitable for use in the first environment (category C2), in which case the instructions of the EMC directives should be followed.

If installed correctly and the installation instructions are followed, they may thus be used in the first environment as defined in EN 61 800-3.

The line filter may only be used on grounded supplies (TN supplies).

Components in the DC link

Overview

Braking units

Braking units are used when regenerative energy occurs occasionally and briefly, for example when the brake is applied to the drive (emergency stop). The braking units comprise a braking module and a load resistor, which must be attached externally.

There are two braking units available for the SINAMICS G150 drive converter cabinet units with braking powers of 100 kW and 200 kW that cover a wide range. For higher braking powers, braking units can be connected in parallel for larger converters (on request).

A thermal contact, which can be integrated into the converter's alarm and shutdown sequence, is installed in the braking resistor for monitoring.

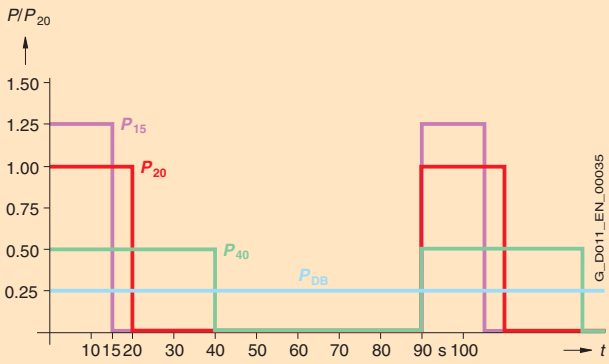
Determining the required braking units and braking resistors

- For periodic duty cycles with a load duration of ≤ 90 s, the mean braking power value within this duty cycle must be determined. The relevant period should be used as the time base.
- For periodic duty cycles with a load duration of ≥ 90 s or for sporadic braking operations, a 90 s time segment in which the greatest mean value occurs should be selected. A 90 s period should be set as the time base.

When selecting the braking units (braking module and braking resistor), consider both the mean braking power value and the required peak braking power.

Basic data

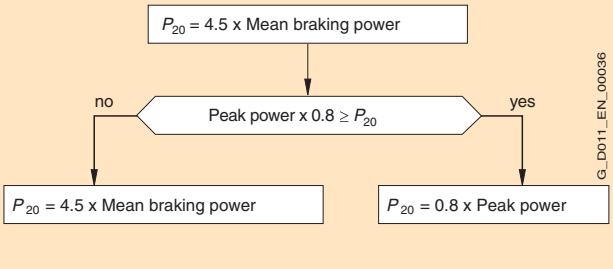
	Supply voltage			
	380 V to 480 V	**380 V to 480 V**	**660 V to 690 V**	**660 V to 690 V**
SINAMICS G150 Drive Converter Cabinet Units	110 kW to 132 kW	160 kW to 570 kW	75 kW to 132 kW	160 kW to 800 kW
Braking module Continuous power P_{DB}	25 kW	50 kW	25 kW	50 kW
Braking module Power P_{40}	50 kW	100 kW	50 kW	100 kW
Braking module Rated power P_{20}	100 kW	200 kW	100 kW	200 kW
Braking module Peak power P_{15}	125 kW	250 kW	125 kW	250 kW
Braking resistor R_B	4,4 Ω ±7.5%	2,2 Ω ±7.5%	4,4 Ω ±7.5%	2,2 Ω ±7.5%
Max. current	189 A	378 A	127 A	255 A



P_{DB} = Permanent braking power
P_{15} = 5 x P_{DB} = Output which is permissible every 90 s for 15 s
P_{20} = 4 x P_{DB} = Output which is permissible every 90 s for 20 s
P_{40} = 2 x P_{DB} = Output which is permissible every 90 s for 40 s

Load diagram

Calculating the P_{20} power



To reduce the voltage stress on the motor and converter, the response threshold at which the braking unit is activated and the DC link voltage generated can be reduced. For example, the DC link voltage for the converters in the voltage range from 380 V to 480 V can be reduced from 774 V to 673 V. This also reduces the possible peak power. A factor of 1.06, rather than a factor of 0.8 should be used.

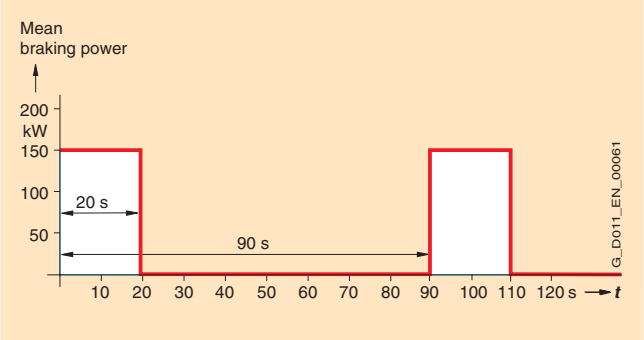
The ON/OFF states of the braking module are controlled by a 2-point controller. The respective response thresholds are shown in the following table:

Converter voltage range	Braking unit response threshold
380 V to 480 V	774 V (673 V)
660 V to 690 V	1158 V (1070 V)

Overview (continued)

Example

The design of the braking unit is to be defined for a 132 kW drive converter cabinet unit.



The mean braking power is calculated as follows:

Mean braking power = 90 kW x 17 s / 90 s = 17.0 kW

P_{20} = 4.5 x 17.0 kW = 76.5 kW

Peak power = 0.8 x 90 kW = 72.0 kW

Result:

The mean braking power is the determining factor in the configuration of the braking module and braking resistor, i.e. a braking unit ≥ 76.5 kW should be provided.

The 100 kW braking unit should be selected.

When the response threshold is reduced, the required braking power P_{20} is calculated as follows:

Mean braking power = 90 kW x 17 s / 90 s = 17.0 kW

P_{20} = 4.5 x 17.0 kW = 76.5 kW

Peak power = 1.06 x 90 kW = 95.4 kW

Result:

The peak power to be generated is the determining factor in the configuration of the braking module and braking resistor, i.e. a braking unit ≥ 95.4 kW should be provided.

The 100 kW braking unit should be selected.

Dimensioning drives

Overview

Drives with quadratic load torque

Drives with a quadratic load torque ($M \sim n^2$), such as used for pumps and fans, require the full torque at the rated speed.

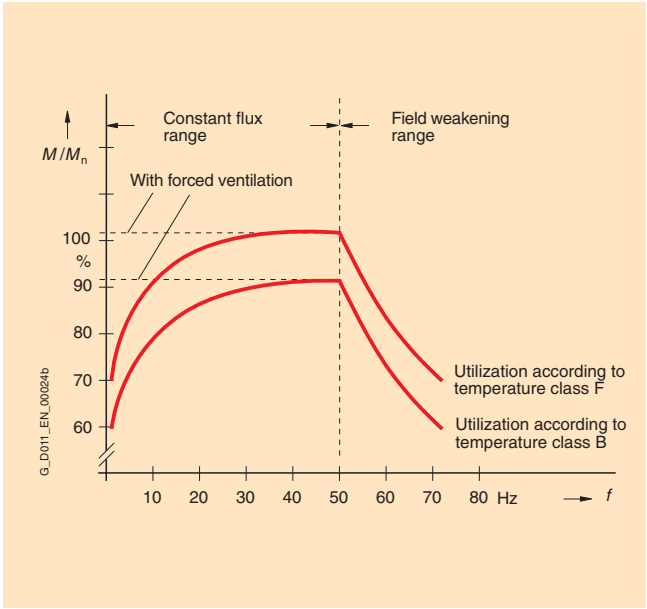
Increased starting torques or high load surges do not usually occur. It is therefore unnecessary to provide a higher overload capability for the converter.

The following applies to selection of a suitable converter for drives with a quadratic load torque:

The rated current of the converter must be at least as large as the motor current at full torque in the required load point.

If 1LG4/1LG6 and 1LA8 standard motors are used, these motors can be loaded with the full rated power, even in converter mode. They are then utilized to full advantage according to temperature class F. However, if the motors may only be utilized according to temperature class B, the motor output must be reduced by 10%.

Selection of suitable motors and converters for a specific application is supported by the SIZER configuration program.



Typical curve for the permissible torque for self-ventilated motors (e.g. 1LA) with a rated frequency of 50 Hz

Drives with constant load torque

The 1LG4/1LG6 and 1LA8 self-ventilated motors cannot provide their full rated torques throughout the entire speed range in continuous operation. The continuous permissible torque decreases as the speed decreases because of the reduced cooling effect (see diagram).

Depending on the speed range, the torque - and thus the power - must be reduced for the self-ventilated motors.

In the case of 1PQ8 and 1PQ4 forced-ventilated motors, it is not necessary to reduce the output, or only by a relatively small amount, depending on the speed range.

For frequencies above the rated frequency f_n (50 Hz in the diagram), the motors are driven in the field weakening range. The usable torque is reduced in this case by approx. f_n/f, and the output remains constant. An adequate distance of ≥ 30% must be maintained with respect to the breakdown torque, especially in control modes with *V/f* characteristics. This interval is reduced by $(f_n/f)^2$.

The selected base load current of the converter should therefore be at least as great as the motor current at full torque at the required load point.

Selection of suitable motors and converters for a specific application is supported by the SIZER configuration program.

Rated current – permissible and non-permissible motor/converter combinations

Motor rated current greater than converter rated current:

If a motor is used whose rated current is greater than the rated converter current, this means that the motor can only be operated at partial load. The following limit must be observed:

The maximum possible converter current (overload current) should be greater than or equal to the rated current of the connected motor.

If this dimensioning instruction is not observed, current peaks which can either lead to switching-off or can cause a continuous reduction in output by the internal protection circuit can occur as a result of the low leakage inductance of larger motors.

Rated motor current much smaller than converter rated current:

The rated motor current for the sensorless vector control used must be at least ¼ of the rated converter current. With smaller motor currents, operation using the *V/f* control mode is possible.

Overview

It is generally recommendable to use the standard Siemens motors 1LA and 1LG.

With regard to the voltage stress, the standard insulation of the motors is designed such that operation on the converter is possible without limitation at voltages of $U \leq 500$ V.

Catalog M 11 contains more detailed data on the 1LG4/1LG6 and 1LA8 motors.

Self-ventilated motors with IP55 degree of protection (1LG4/1LG6 and 1LA8)

1LG4/1LG6 motors

1LA8 motors

The 1LG4/1LG6 and 1LA8 motors are self-ventilated motors with IP55 degree of protection.

Both the internal and external fan (which are fitted in each motor) have a fixed connection to the shaft.

The cooling effect is therefore directly dependent on the motor speed.

Other motors

In addition to the 1LA and 1LG motors, the 1PH7/1PL6 compact asynchronous motors can also be used. These are recommended for:

- Large speed range with high maximum speeds
- Limited mounting space.

1PH7/1PL6 motors are 1 to 2 shaft heights smaller than comparable standard asynchronous motors with the same rated output.

Encoder evaluation in conjunction with the G150 drive converter cabinet units is not possible.

Mains connection voltages > 500 V for 1LA/1LG motors

The standard insulation of the 1LA and 1LG motors is designed such that converter fed operation without limitation is only possible at supply voltages of 500 V +10%. At higher voltages, the motors require greater insulation resistance.

1LA8/1PQ8 and 1LG6 motors are also available with a higher insulation resistance for converter fed operation with voltages up to 690 V, no filters are required in this case. These motors are identified by an "M" as the 10th digit of the Order No. (e.g. 1LA8315-2P**M**).

With the reinforced insulating system, there is less space in the grooves for the same number of windings compared to the normal version, which slightly reduces the rated output of these motors.

For higher torque requirements, 1LA4 self-ventilated motors or 1PQ4 forced-ventilated motors (degree of protection IP55) from the H-compact II series are available for the upper output range.

Motor protection

A motor protection function can be implemented using the I^2t detection present in the converter software.

If precise motor protection is required, this can be achieved by detecting the temperature directly using KTY84 sensors or PTC thermistors in the motor winding.

When using the KTY84 sensor, the **A23** motor option should be specified when ordering 1LA8 and 1LG4/1LG6 motors. With 1PH7 and 1PL6 motors, the sensors are fitted as standard.

If PTC thermistors are required, the **A11** or **A12** motor option should be specified when ordering the 1LG4/1LG6 motors. With 1LA8/1PQ8 motors, the sensors are fitted as standard.

The KTY84 sensor and PTC thermistor can be evaluated by connection
- to the customer's terminal block in the drive converter (SINAMICS G150)
- to the -X41 terminal of the power module (SINAMICS G130).

PT100 temperature sensors (resistance thermometers) are alternatively possible for the 1LA8 and 1LG4/1LG6 motors for monitoring the motor winding temperature. When ordering the motor, either the **A60** (3 x PT100) or the **A61** (6 x PT100) option should be selected.

A separate evaluation unit is available (option **L86**) for evaluation of the PT100 temperature sensors in the SINAMICS G150 drive converter cabinet unit.

With 1MJ flameproof motors, the PTC thermistors and release mechanisms (options **L83** and **L84** in SINAMICS G150 drive converter cabinet units) approved by the PTB are absolutely essential.

Overview (continued)

Bearing currents

A high clock frequency of the output voltage is required to provide the motor with currents which are as sinusoidal as possible (smooth running, oscillation torque, additional losses). The resulting steep voltage pulses cause capacitive charge reversal currents in the existing capacities (motor cables and windings). This physical effect is particularly evident with larger motors. The circuit may be closed via the bearings and the high-frequency capacitive current pulses may destroy the bearings in a worst-case scenario. To avoid this risk, it is recommended that the bearings at the non-drive-end of the motor are isolated in the case of converter-fed motors.

The isolated bearing is standard for all 1LA8 motors that are designated for converter operation.

An isolated bearing on the non-drive end is available as an option for motors of the 1LG4/1LG6 series starting at frame size 280 (Order code **L27**).

An additional measure for reducing the bearing currents even further is to use a motor reactor, shielded motor cables and good earthing of the motor housing. It is recommended to route the earth cable from the motor directly to the converter.

Since these processes involve high frequencies, asymmetry in the circuits must be kept to a minimum. Only symmetrical multi-core motor cables must be used (do not use single or four-conductor cables!). The ground connection (protective conductor, PE) must be arranged symmetrically in the motor cable to prevent shaft currents with base frequencies. The symmetry of the PE conductor is achieved with a conductor that surrounds all the phase conductors or a cable in which the three phase conductors and three ground conductors are arranged symmetrically.

Operation with and without feedback of the actual speed value

The control range of the drive must be taken into account with regard to the speed accuracy.

If the speed control range is above 5% of the rated speed, the control accuracy of the sensorless vector control is approx. 0.2 x f_{slip}. Taking into account the slip values of standard motors in the output range from 75 kW to 800 kW, this results in a speed accuracy of <0.2%. In the speed control range below 5% of the rated speed, the control accuracy is approximately that of the slip frequency of the motor, i.e. approx. 1%.

The SINAMICS G130/G150 drive converters can be operated with or without feedback of the actual speed value.

Use of encoders to measure the actual speed value of the motor is recommended with:

- High dynamic response and torque accuracy requirements
- Very high speed accuracy
- Observation of a defined torque with speeds below 5% of the rated motor speed.

Operation of motors with flameproof enclosure "d"

Siemens asynchronous motors of the 1MJ series can be operated as explosion-proof motors with flameproof enclosure EEx de IIC connected either to the line supply or the converter.

In accordance with the test guidelines, the motors of the 1MJ series must be equipped with PTC thermistors.

If 1MJ motors are connected to converters, their maximum permissible torque must be reduced, **depending on the load characteristic** when utilized according to temperature class B just like the motors of the 1LA series with the same output.

1MJ motors have a terminal box with the "increased safety" type of protection EEx e II as standard.

Detailed motor data can be found in Catalog M 11.

Services and documentation

5

Training

Overview

Training is decisive for your success

SITRAIN ® – Siemens Training for Automation and Industrial Solutions – provides you with comprehensive support when solving your tasks.

Training by the market leader in automation, plant installation and plant support enables you to make your decisions with certainty and full command. 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.

All in all, this represents an enormous gain for your company: Shortened startup times, optimized plant components, faster troubleshooting, reduced down times. In other words, increased profits and lower costs.

Top trainers

Our trainers know their topics in practice, and possess comprehensive didactic experience. Course developers have a direct wire to product development, and directly pass on their knowledge to the trainers.

Practical experience

The practical experience of our trainers makes it possible for them to pass on theoretical matter in a plausible manner. But since it is known that all theory is drab, we attach great importance to practical exercises which can comprise up to half of 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. You feel absolutely certain when trained in this manner.

Wide variety

With a total of approx. 300 local attendance courses, we train the complete range of A&D products and a large portion of the system solutions from I&S. Telecourses, teach-yourself software and seminars presented on the Web supplement our classical range of courses.

Close to customer

We are only a short distance away. You can find us approx. 60 times in Germany, and worldwide in 62 countries. 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 is understood to be the 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. Furthermore, SITRAIN utilizes supported online training for live instruction on the Internet at agreed times.

The right mixture is the solution. Therefore blended learning can convey complex topics well, and train networked thinking. Additional effect: reduced traveling costs and periods of absence through training sequences independent of location and time.

The international training portal

For further information please visit us at:

http://www.siemens.com/sitrain

All training facilities at a glance: search in the worldwide range of courses at leisure, call up all course dates online, utilize the daily updated display of vacant course spaces - and register directly.

Or let us advise you personally:

Course office, Infoline Germany
Tel.: 01805-23 56 11
Fax: 01805-23 56 12

... and request our latest training catalog on:

	Language	Order No.
Catalog ITC (paper version)	German	**E86060-K6850-A101-B4**
Dates and Price List including CD-ROM	German	**E86060-P6850-A101-C8**
SITRAINonCD Interactive course information system on CD-ROM	German/ English	**E86060-D6850-A100-C1-7400**
Overview of training worldwide	German/ English	**E86060-K6899-A101-B4-7600**

Design

SINAMICS G150/G130/S150 courses

Here you will find an overview of the training courses available for the SINAMICS G150/G130/S150.

The courses are modular in design and are intended for a variety of target groups as well as individual customer requirements.

The system overview will acquaint decision-makers and sales personnel with the system very quickly.

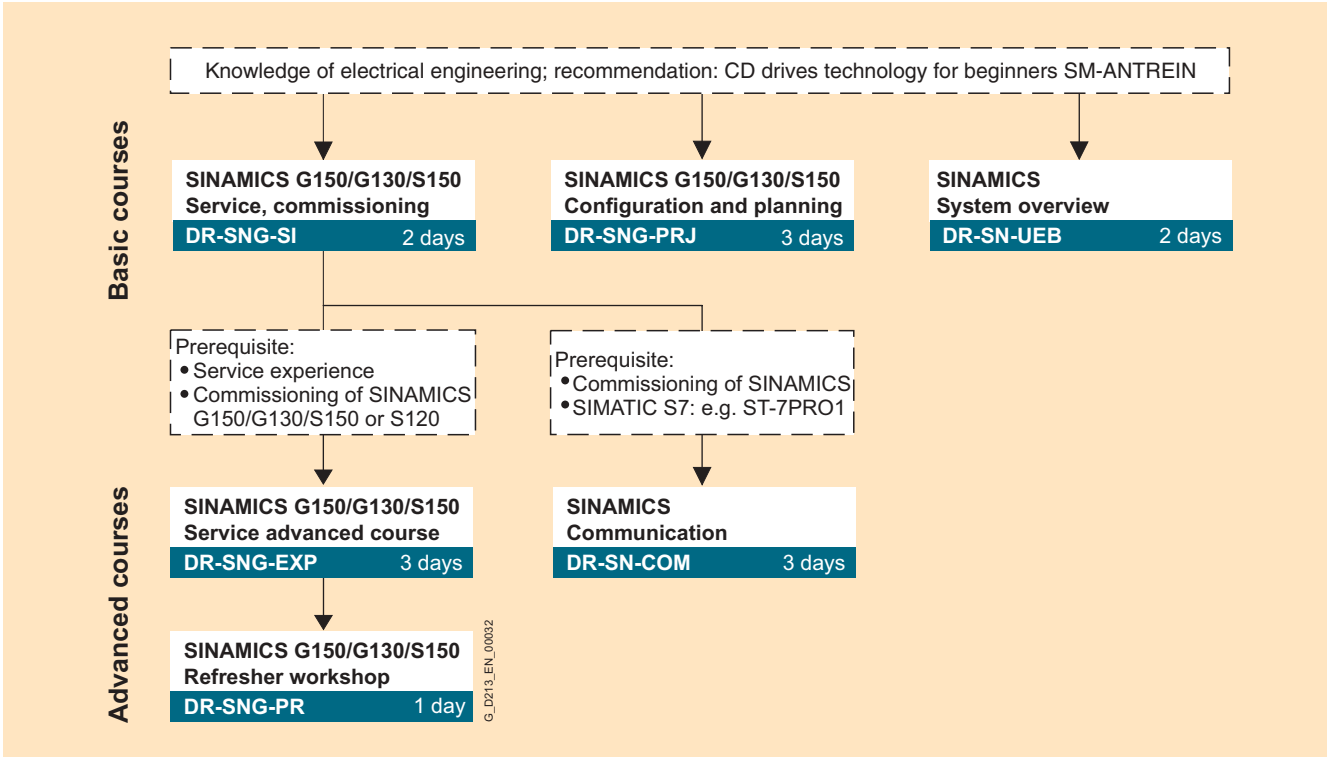
The configuration and planning course provides all the information you need to size the drive system.

The basic and advanced courses are sure to provide all the technical knowledge service engineers will need for servicing/starting up motion control applications, communication and cabinet-mounted units.

All modules contain as many practical exercises as possible, in order to enable intensive and direct training on the drive system and with the tools in small groups.

Title	Target group						Duration	Course code
	Decision-makers, sales personnel	Project managers, members of project teams	Engineers, programmers	Start-up engineers, configuring engineers	Service personnel	Maintenance personnel		
Basic courses								
SINAMICS System overview	X	X					2 days	DR-SN-UEB
SINAMICS G150/G130/S150 Configuration and planning	X	X	X	X			3 days	DR-SNG-PRJ
SINAMICS G150/G130/S150 Service and commissioning			X	X	X	X	2 days	DR-SNG-SI
SINAMICS G150/G130/S150 Service advanced course			X	X	X	X	3 days	DR-SNG-EXP
SINAMICS G150/G130/S150 Refresher workshop			X	X	X	X	1 day	DR-SNG-PR
Advanced course								
SINAMICS Communication			X	X	X		3 days	DR-SN-COM

SINAMICS G150/G130/S150 learning path



Training

Function

SINAMICS system overview (2 days) DR-SN-UEB

Description/learning target

This course has been specially designed for sales employees and decision-makers who wish to attain a rapid overview of the SINAMICS drive concept and its position in the existing Siemens drive environment.

The system overview is supplemented by an introduction to the fundamentals of motor and converter technology.

The SIZER configuration tool and the STARTER commissioning tool are presented and explained using short exercises.

Target group

Decision-makers and sales personnel

Content

- SINAMICS system overview
- Position with respect to existing drive systems
- Fundamentals of converter engineering and motors
- SIZER configuration tool
- STARTER commissioning tool
- Simple start-up of a drive
- Practical exercises using the training case

SINAMICS G150/G130/S150 configuration and planning course (3 days) DR-SNG-PRJ

Description/learning target

The course is appropriate for design engineers, planning engineers and sales employees who plan the SINAMICS G150/G130/S150 chassis and cabinet units.

Training covers the fundamental physical relationships for the design of a drive system.

Using the self-explanatory SIZER configuration tool, different applications of SINAMICS cabinet units are calculated, and consolidated using exercises on PCs.

Control functions are explained, and their associated conditions described.

The various options for SINAMICS cabinet and chassis units are also presented to permit derivation of their application.

Target group

Planning engineers, design engineers

Content

- SINAMICS system overview
- Physical fundamentals for drive calculation
- Configuration of the SINAMICS G150/G130/S150 cabinet components and their explanation:
  power supplies, EMC, EMERGENCY STOP, interfaces
- SIZER configuration tool with example exercises for various applications
- Technical documentation: catalogs, engineering information, instruction manuals, ...
- Open-loop and closed-loop control functions
- Simple startup using the AOP30 operator panel.

SINAMICS G150/G130/S150 servicing and commissioning course (2 days) DR-SNG-SI

Description/learning target

The SINAMICS G150/G130/S150 cabinet and chassis units are simple to start up and service and require no special knowledge of drive engineering. The course is appropriate for commissioning engineers and servicing personnel.

Training covers the technical knowledge for startup and servicing using the AOP30 operator panel and the STARTER tool, as well as handling of the CompactFlash card.

An overview is provided on software functions, parameter structure and function diagrams. Practical exercises on the SINAMICS G150/G130 chassis and cabinet units, with the AOP30 cabinet operator panel and the STARTER commissioning tool consolidate the passed-on knowledge.

The DR-SNG-EXP service advanced course is appropriate for gaining deeper knowledge.

Target group

Commissioning engineers, servicing personnel

Content

- Design of the drive system
- Overview of documentation
- Startup and servicing using the AOP30 operator panel and the STARTER commissioning tool
- Overview of software functions, parameters and function diagrams
- Practical exercises for startup and fault diagnostics on the SINAMICS G150/G130 chassis and cabinet units and on an active infeed module.

SINAMICS G150/G130/S150 service advanced course (3 days) DR-SNG-EXP

Description/learning target

The course is primarily appropriate for servicing personnel who support end customers with regard to special design requirements, the elimination of faults, and the replacement of parts on SINAMICS cabinet units.

A prerequisite is knowledge from the basic course DR-SNG-SI or DR-SNS-SI.

Installation in accordance with EMC guidelines is dealt with in addition to practical exercises for diagnostics of the power sections and replacement of spare parts.

Knowledge of the software functions, BICO wiring and controller optimization is further enhanced.

The practical exercises are carried out on SINAMICS G150/G130 chassis and cabinet units, on the AOP30 cabinet operator panel, using the test box for SINAMICS power sections and the STARTER commissioning tool.

Target group

Servicing employees of Siemens AG and OEMs

Content

- Circuit diagrams and installation in accordance with EMC guidelines
- Diagnostics on the power section and replacement of spare parts
- Software functions, BICO wiring and controller optimization
- Servicing and diagnostics using the AOP30 operator panel and the STARTER commissioning tool
- Practical exercises on SINAMICS G150/G130 chassis and cabinet units and on an active infeed module.

Function (continued)

SINAMICS G150/G130/S150 refresher workshop (1 day) DR-SNG-PR

Description/learning target

The course is appropriate for servicing employees who have successfully completed the advanced course DR-SNG-EXP and wish to further their practical abilities on SINAMICS cabinet units. If their attendance of the advanced course was some time previously, they will be informed of new developments and prepared in this manner for an imminent servicing duty.

The independent practical exercises are carried out on SINAMICS G150/G130 chassis and cabinet units, on the SINAMICS S150 simulator, using the test box for SINAMICS power sections and the STARTER commissioning tool.

The trainer will provide instructions and temporary consultation.

Target group

Servicing employees of Siemens AG and OEMs

Content

- Provision of up-to-date information
- Independent practical course on the SINAMICS training equipment
- Consultation possibility.

SINAMICS communication (3 days) DR-SN-COM

Description/learning target

The course is appropriate for programmers and servicing personnel who, as an extension to the DR-SNS-SI course, require further knowledge on the PROFIBUS and RS232 communications interfaces for STARTER and AOP30 as well as I/O terminals.

The focal point is PROFIBUS with the PROFIDrive V3 profile with routing, teleservice, and the functionalities associated with the equidistant bus cycle, isochrone mode with servo applications, and direct OP access. Also described are the libraries of DriveES SIMATIC for cyclic and acyclic data exchange.

Practical exercises on the SINAMICS and SIMATIC S7 training cases with CPU 315-2 DP deepen the knowledge.

Target group

Programmers, commissioning engineers and servicing personnel

Content

- Overview of the PROFIBUS DP, RS232-PPI, CAN interfaces and I/O terminals: function, topology, parameterization
- Fundamentals of PROFIBUS with the PROFIDrive V3 profile
- Basic functions on the PROFIBUS: routing, teleservice and direct access
- PROFIBUS for motion control with: equidistant bus cycle and isochrone mode with servo control
- Cyclic and acyclic data exchange with DriveES SIMATIC components
- Fault diagnostics of the drive via the bus system
- Practical exercises on the SINAMICS S120 and SIMATIC S7 training cases with CPU 315-2 DP.

AOP30 cabinet operator panel training case

Application

This training case is used for the training and promotion of SINAMICS cabinet units.

When used as a stand-alone unit, it is possible to carry out offline demonstrations of commissioning and usability. Online operation is implemented by connecting to a SINAMICS cabinet unit or the SINAMICS S120 training case.

Design

- Cabinet operator panel with power supply connection
- Internal 24 V DC power supply
- Can be set upright for demonstration purposes
- Offline functions
- Online functions with SINAMICS control unit CU320 via RS232 PPI.

Technical data

AOP30 cabinet operator panel training case	
Input voltages	230 V 1 AC
Degree of protection to DIN VDE 0470	IP00

Selection and ordering data

	Order No.
AOP30 cabinet operator panel training case TG-SN-AOP	**6ZB2480-0CA00**

SINAMICS High Power training case

Application

This training case permits online working with the SINAMICS cabinet components and the original software at an office location.

Function

- Online startup with AOP30 and/or STARTER
- Parameterization of a SINAMICS G150/G130/S150 converter
- Testing of PROFIBUS communication using a controller
- Working with the CompactFlash card: data saving, FW updating, ...
- Online work for hotline and servicing in the regions for customer support
- Demonstration and training
- Working with CIB in the repair centers.

Technical data

SINAMICS High Power training case	
Input voltage	230 V 1 AC
Degree of protection to DIN VDE 0470	IP00

Available on request from:
Siemens AG
A&D SE S3 SIDEMO
Würzburger Str. 121
90766 Fürth/Bavaria.
Phone: +49 (0)911-7 50 99 19

In the face of harsh competition you need optimum conditions to keep ahead all the time:
A strong starting position. A sophisticated strategy and team for the necessary support - in every phase.
Service & Support from Siemens provides this support with a complete range of different services for automation and drives.

In every phase: from planning and startup to maintenance and upgrading.

Our specialists know when and where to act to keep the productivity and cost-effectiveness of your system running in top form.

Online Support

The comprehensive information system available around the clock via Internet ranging from Product Support and Service & Support services to Support Tools in the Shop.

http://www.siemens.com/automation/service&support

Technical Support

Competent consulting in technical questions covering a wide range of customer-oriented services for all our products and systems.

Tel.: +49 (0)180 50 50 222
Fax: +49 (0)180 50 50 223
E-Mail:
adsupport@siemens.com

Technical Consulting

Support in the planning and designing of your project from detailed actual-state analysis, target definition and consulting on product and system questions right to the creation of the automation solution. [1])

Configuration and Software Engineering

Support in configuring and developing with customer-oriented services from actual configuration to implementation of the automation project. [1])

Service On Site

With Service On Site we offer services for startup and maintenance, essential for ensuring system availability.

In Germany
0180 50 50 444 [1])

Repairs and Spare Parts

In the operating phase of a machine or automation system we provide a comprehensive repair and spare parts service ensuring the highest degree of operating safety and reliability.

In Germany
0180 50 50 448 [1])

Optimization and Upgrading

To enhance productivity and save costs in your project we offer high-quality services in optimization and upgrading. [1])

Product registration

To guarantee our servicing performance (availability of spare parts, hotline function, readiness of personnel), we offer you product registration for our SINAMICS drive equipment. Feedback on the final destination (installation/operation location) and naming of contact partners allows a servicing response without delay. The feedback can be made either using a feedback form (enclosed with each converter) or via the Internet:

http://www.siemens.com/reg

1) For country-specific telephone numbers go to our Internet site at: http://www.siemens.com/automation/service&support

Services and documentation

Documentation

Overview

The equipment documentation consists of a detailed Instruction Manual with the following sections:

- Description
- Mounting Instructions
- Installation & Start-up Guide
- Function description
- Maintenance instructions
- Spare parts list

as well as equipment-specific dimension drawings, arrangement diagrams, circuit diagrams, terminal diagrams.

Documentation in English/German is supplied as standard with the converter:

- **SINAMICS G130**: Documentation on CD-ROM
  This documentation is available in English/German.
- **SINAMICS G150**: printed documentation
  If one of the languages listed below is required, the corresponding order code should be added when ordering the converter:

Language	Order code
English/French	**D58**
English/Spanish	**D60**
English/Italian	**D80**

A CD-ROM containing the STARTER commissioning tool is supplied as standard with the SINAMICS G130/G150 converters.

Appendix

Siemens contacts worldwide

At

www.siemens.com/automation/partner

you can find details of Siemens contact partners worldwide responsible for particular technologies.

You can obtain in most cases a contact partner for

- Technical Support,
- Spare parts/repairs,
- Service,
- Training,
- Sales or
- Consultation/engineering.

You start by selecting a

- Country,
- Product or
- Sector.

By further specifying the remaining criteria you will find exactly the right contact partner with his/her respective expertise.

A&D in the WWW

A detailed knowledge of the range of products and services available is essential when planning and configuring automation systems. It goes without saying that this information must always be fully up-to-date.

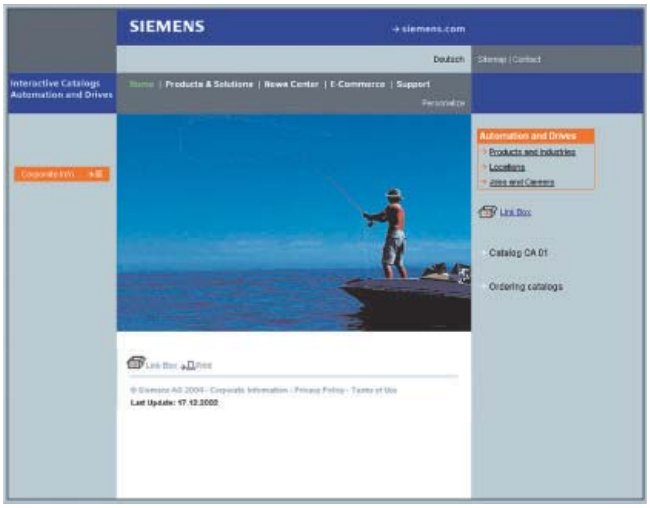
The Siemens Automation and Drives Group (A&D) has therefore built up a comprehensive range of information in the World Wide Web, which offers quick and easy access to all data required.

Under the address

http://www.siemens.com/automation

you will find everything you need to know about products, systems and services.

Product Selection Using the Interactive Catalog



Detailed information together with convenient interactive functions:
The interactive catalog CA 01 covers more than 80,000 products and thus provides a full summary of the Siemens Automation and Drives product base.

Here you will find everything that you need to solve tasks in the fields of automation, switchgear, installation and drives.
All information is linked into a user interface which is easy to work with and intuitive.

After selecting the product of your choice you can order by pressing a button, by fax or by online link.

Information on the interactive catalog can be found in the Internet under

http://www.siemens.com/automation/ca01

or on CD-ROM:

- Automation & Drives CA 01,
  Order No.: E86060-D4001-A110-C2-7600

Easy Shopping with the A&D Mall

The A&D Mall is the virtual department store of Siemens AG in the Internet. Here you have access to a huge range of products presented in electronic catalogs in an informative and attractive way.

Data transfer via EDIFACT allows the whole procedure from selection through ordering to tracking of the order to be carried out online via the Internet.

Numerous functions are available to support you.

For example, powerful search functions make it easy to find the required products, which can be immediately checked for availability. Customer-specific discounts and preparation of quotes can be carried out online as well as order tracking and tracing.

Please visit the A&D Mall on the Internet under:

http://www.siemens.com/automation/mall

Subject index

Order number index

Terms and Conditions of Sale and Delivery

By using this catalog you can acquire hardware and software products described therein from the Siemens AG subject to the following terms. Please note! The scope, the quality and the conditions for supplies and services, including software products, by any Siemens entity having a registered office outside of Germany, shall be subject exclusively to the General Terms and Conditions of the respective Siemens entity.

for customers with a seat or registered office in the Federal Republic of Germany

The General Terms of Payment as well as the General Conditions for the Supply of Products and Services of the Electrical and Electronics Industry shall apply.

For software products, the General License Conditions for Software Products for Automation and Drives for Customers with Seat or registered Office in Germany shall apply.

for customers with a seat or registered office outside of the Federal Republic of Germany

The General Terms of Payment as well as the General Conditions for Supplies of Siemens, Automation and Drives for Customers with a Seat or registered Office outside of Germany shall apply.

For software products, the General License Conditions for Software Products for Automation and Drives for Customers with Seat or registered Office outside of Germany shall apply.

General

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.

In addition to the prices of products which include silver and/or copper, surcharges may be calculated if the respective limits of the notes are exceeded.

Prices are subject to change without prior notice. We will debit the prices valid at the time of delivery.

The dimensions are in mm. 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.

Comprehensive Terms and Conditions of Sale and Delivery are available free of charge from your local Siemens business office under the following Order Nos.:

- 6ZB5310-0KR30-0BA0
  (for customers based in the Federal Republic of Germany)
- 6ZB5310-0KS53-0BA0
  (for customers based outside of the Federal Republic of Germany)

or download them from the Internet:
www.siemens.com/automation/mall
(Germany: A&D Mall Online-Help System)

Export regulations

The products listed in this catalog/price list may be subject to European/German and/or US export regulations.

Therefore, any export requiring a license is subject to approval by the competent authorities.

According to current provisions, the following export regulations must be observed with respect to the products featured in this catalog/price list:

AL	Number of the German Export List. Products marked other than "N" require an export license. In the case of software products, the export designations of the relevant data medium must also be generally adhered to. Goods labeled with an "AL not equal to N" are subject to a European or German export authorization when being exported out of the EU.
ECCN	Export Control Classification Number. Products marked other than "N" are subject to a reexport license to specific countries. In the case of software products, the export designations of the relevant data medium must also be generally adhered to. Goods labeled with an "ECCN not equal to N" are subject to a US re-export authorization.

Even without a label or with an "AL: N" or "ECCN: N", authorization may be required due to the final destination and purpose for which the goods are to be used.

The deciding factors are the AL or ECCN export authorization indicated on order confirmations, delivery notes and invoices.

Errors excepted and subject to change without prior notice.

Responsible for

Technical content:
Siemens AG, A&D LD M PM

General editing:
Siemens AG, A&D PT 5, Erlangen,
Federal Republic of Germany

Siemens AG
Automation & Drives
Large Drives
Postfach 4743
90025 NÜRNBERG
FEDERAL REPUBLIC OF GERMANY

Order No.: **E86060-K5511-A101-A2**
Printed in the Federal Republic of Germany
KG K 0904 8.0 BD 104 En/P422019

Catalogs of the Automation and Drives Group (A&D)

Please send any request to your Siemens representative
Addresses can be found at http://www.siemens.com/automation/partner

	Catalog
Automation and Drives	
Interactive catalog on CD-ROM	
• The Offline Mall of Automation and Drives	CA 01
Automation Systems for Machine Tools	
SINUMERIK & SIMODRIVE	NC 60
Drive Systems	
Variable-Speed Drives	
SINAMICS G130 Drive Converter Chassis Units SINAMICS G150 Drive Converter Cabinet Units	D 11
SINAMICS G110 Inverter Chassis Units	D 11.1
SINAMICS S120 Servo Control Drive System SINAMICS S150 Drive Converter Cabinet Units	D 21.2 D 21.3
DC Motors	DA 12
SIMOREG DC MASTER 6RA70 Digital Chassis Converters	DA 21.1
SIMOREG K 6RA22 Analog Chassis Converters	DA 21.2
SIMOREG DC MASTER 6RM70 Digital Converter Cabinet Units	DA 22
SIMOVERT PM Modular Converter Systems	DA 45
SIEMOSYN Motors	DA 48
MICROMASTER 410/420/430/440 Inverters	DA 51.2
MICROMASTER 411/COMBIMASTER 411	DA 51.3
SIMOVERT MV Medium-Voltage Drives	DA 63
SIMOVERT MASTERDRIVES Vector Control	DA 65.10
SIMOVERT MASTERDRIVES Motion Control	DA 65.11
Synchronous and asynchronous servomotors for SIMOVERT MASTERDRIVES	DA 65.3
SIMODRIVE 611 universal and POSMO	DA 65.4
Low-Voltage Three-Phase-Motors	
Squirrel-Cage Motors, Totally Enclosed, Fan-Cooled	M 11
Automation Systems for Machine Tools SIMODRIVE	NC 60
• Main Spindle Motors	
• Feed Motors	
• Converter Systems SIMODRIVE 611/POSMO	
Drive and Control Components for Hoisting Equipment	HE 1
Electrical Installation Technology	
PDF: ALPHA Small Distribution Boards and Distribution Boards	*ET A1*
PDF: ALPHA Side-by-Side Switchgear Cabinets	*ET A3*
PDF: ALPHA FIX Terminal Blocks	*ET A5*
PDF: BETA Modular Installation Devices	*ET B1*
PDF: DELTA Switches and Outlets	*ET D1*
PDF: GAMMA Building Management Systems	*ET G1*
Factory Automation Sensors	FS 10
Human Machine Interface Systems SIMATIC HMI	ST 80

	Catalog
Industrial Communication for Automation and Drives	IK PI
Low-Voltage Controls and Distribution	
Low-Voltage Switchgear – Controlgear for Industry	LV 10
Power Distribution – Products and Systems for Low-Voltage Power Distribution	LV 30
SIVACON 8PS Busbar Trunking Systems CD, BD01, BD2 up to 1250 A	LV 70
SENTRON WL	NS WL
Motion Control System SIMOTION	PM 10
Process Instrumentation and Analytics	
Field Instruments for Process Automation Measuring Instruments for Pressure, Differential Pressure, Flow, Level and Temperature, Positioners and Liquid Meters	FI 01
PDF: Indicators for panel mounting	*MP 12*
SIREC Recorders and Accessories	MP 20
SIPART, Controllers and Software	MP 31
SIWAREX Weighing Systems	WT 01
Continuous Weighing and Process Protection	WT 02
Gas Analysis Equipment for the Process Industry	PA 10
PDF: Process Analytics, Components for the System Integration	*PA 11*
SIPAN Liquid Analysis	PA 20
SIMATIC Industrial Automation Systems	
SIMATIC PCS Process Control System	ST 45
PDF: SIMATIC S5/505 Automation Systems	*ST 50*
Components for Totally Integrated Automation and Micro Automation	ST 70
SIMATIC PCS 7 Process Control System	ST PCS 7
PDF: Add-ons for the SIMATIC PCS 7 Process Control System	*ST PCS 7.A*
SIMATIC Control Systems	ST DA
SIPOS Electric Actuators	
Electric Rotary, Linear and Part-turn Actuators	MP 35
Electric Rotary Actuators for Nuclear Plants	MP 35.1/.2
Systems Engineering	
Power supplies SITOP power	KT 10.1
System cabling SIMATIC TOP connect	KT 10.2
System Solutions	
Applications and Products for Industry are part of the interactive catalog CA 01	
TELEPERM M Process Control System	
AS 235, AS 235H and AS 235K automation systems	PLT 111
PDF: AS 488/TM automation systems	*PLT 112*
Operating and monitoring with WinCC/TM	PLT 123
CS 275 bus system	PLT 130

PDF: These catalogs are only available as pdf files.

Token fee 5,00 €

Siemens Aktiengesellschaft

Automation and Drives
Large Drives
Postfach 4743
90025 NÜRNBERG
FEDERAL REPUBLIC OF GERMANY

http://www.siemens.com/sinamics

Order No. E86060-K5511-A101-A2-7600