Catalog D 11 · 2006


# 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.:
E86060-K5511-A111-A2 (German)
E86060-K5511-A111-A2-7600 (English)

**SINAMICS S120** D 21.1
Vector Control Drive System

Order No.:
E86060-K5521-A111-A1 (German)
E86060-K5521-A111-A1-7600 (English)

**SINAMICS S120** D 21.2
Servo Control Drive System

Order No.:
E86060-K5521-A121-A1 (German)
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**SINAMICS S150** D 21.3
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75 kW to 1200 kW
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0.55 kW to 2300 kW
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**Low-Voltage Motors** M 11

Order No.:
E86060-K1711-A101-A3 (German)
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**Catalog CA 01** CA 01
The Offline Mall of Automation and Drives
Order No.:
CD-ROM: E86060-D4001-A100-C4 (German)
CD-ROM: E86060-D4001-A110-C4-7600 (English)
DVD: E86060-D4001-A500-C4 (German)
DVD: E86060-D4001-A510-C4-7600 (English)

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## Trademarks



## SINAMICS MICROMASTER SIZER configuration tool

SIZER 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. SIZER will guide you through all stages of the configuration process, from the line supply through the drive components and beyond to the motors.

Motors are configured by means of standardized load characteristics, cyclic drives or free duty cycles. The drive components required (e.g. power units, power supplies) are calculated. The configuration completes the drive system by adding the supplementary components (e.g. Sensor Modules, Terminal Expansion Modules, cables, reactors, filters).

Menu driven 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 where available.

### Minimum hardware and software requirements

PG or PC with Pentium™ II 400 MHz (NT, 2000),
Pentium™ 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 1024 x 768 pixels
Windows™ NT 4.0 SP5, 2000 SP2, XP SP1
Microsoft Internet Explorer 5.5 SP2

### Use

The SINAMICS MICROMASTER SIZER can be used free of charge. A minimal fee is charged for processing CD delivery.

The user interface is available in English and German.

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 · 2006

SINAMICS

Supersedes:
Catalog D 11 · 2004



*The products and systems described in this catalog are produced/distributed in accordance with the requirements of a quality management system which has been certified to DIN EN ISO 9001 and DIN EN ISO 14001 (Certificate Registration No. 002241 QM UM). The certificate is recognized in all IQNet countries.*

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| | | |
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# Welcome to Automation and Drives

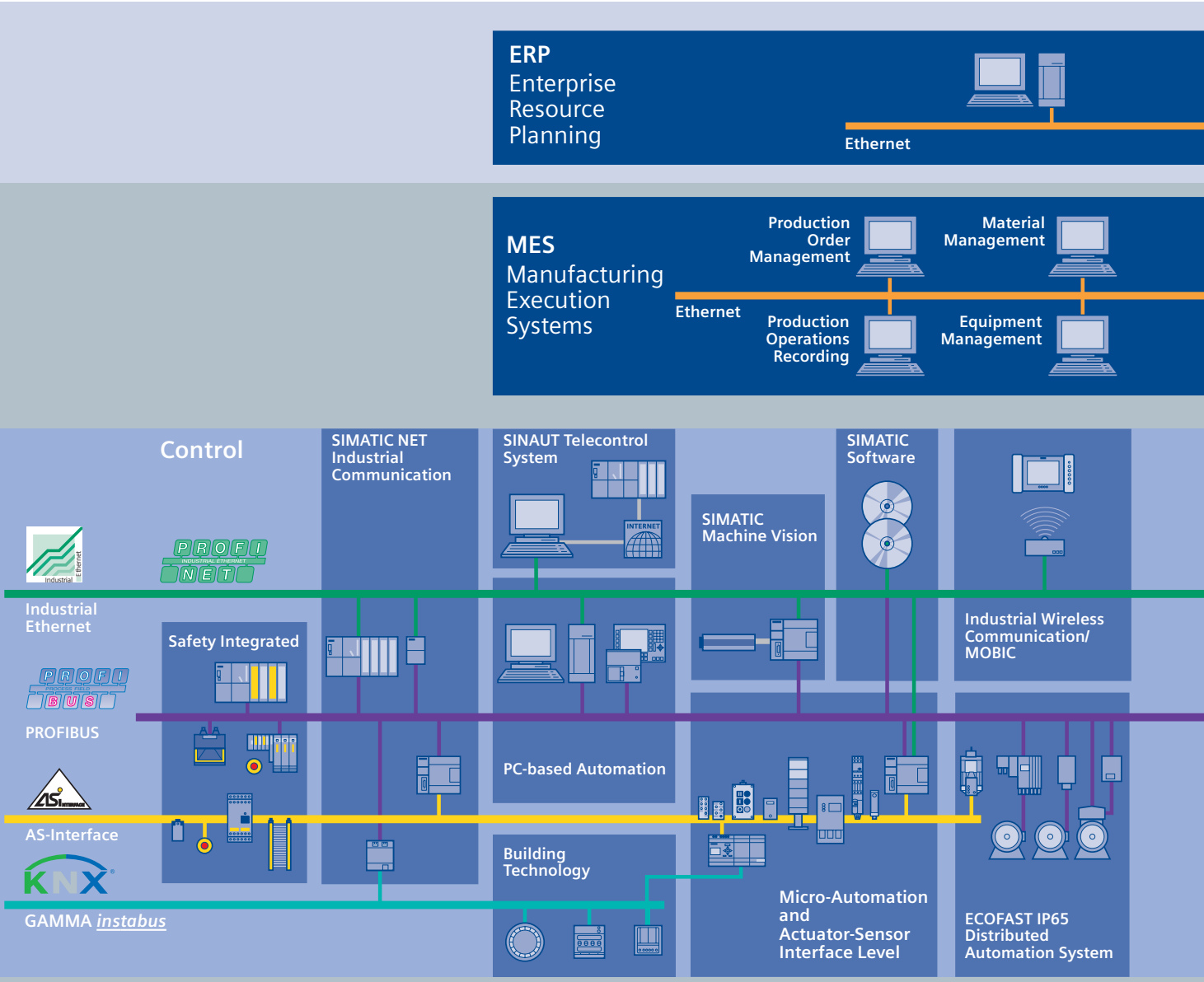
We would like to welcome you to Automation and Drives and our comprehensive range of products, systems, solutions and services for production and process automation and building technology worldwide.

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

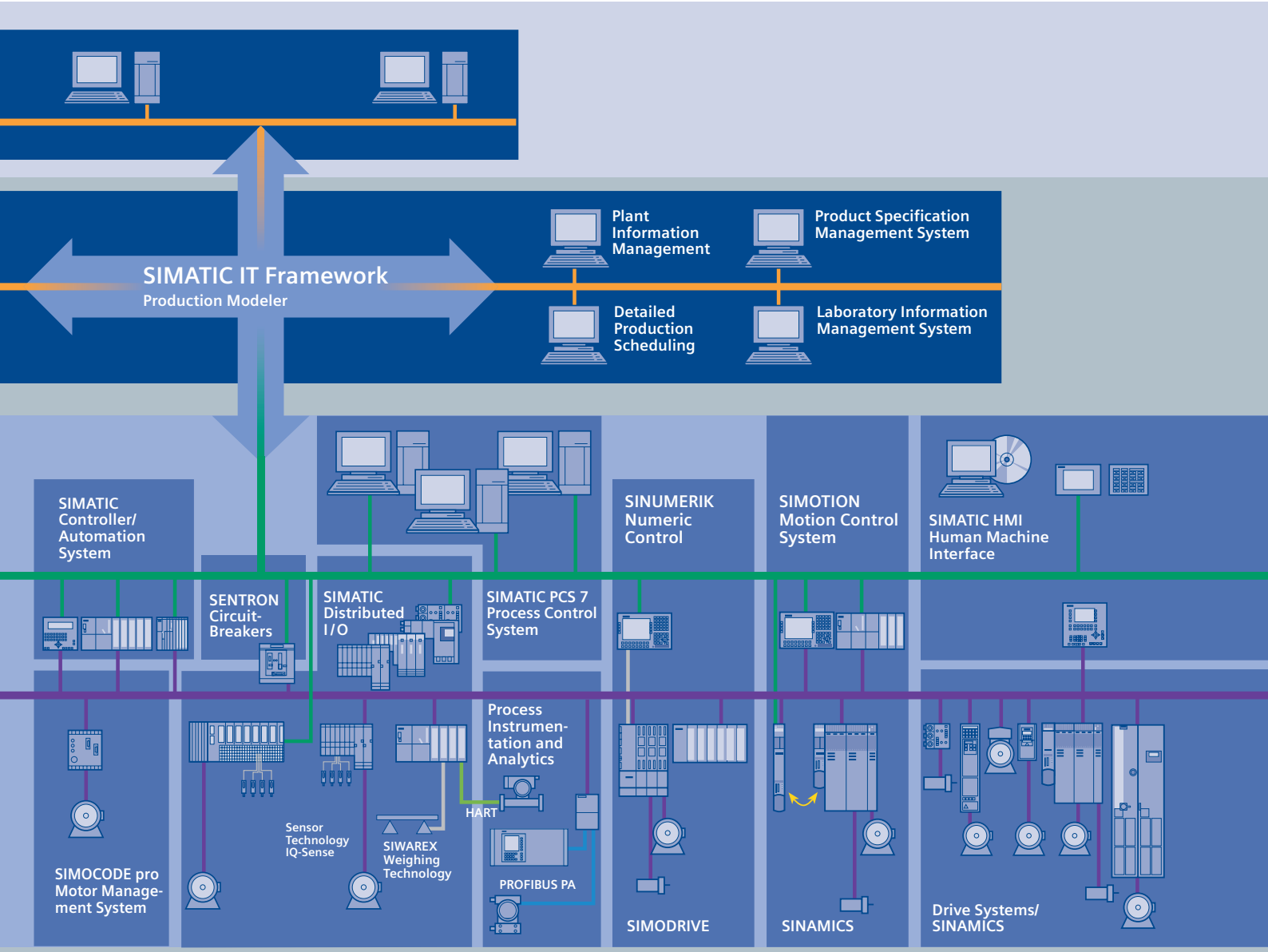
Discover the world of our technology now. If you need more detailed information, please contact one of your regional Siemens partners.
They will be glad to assist you.

# 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.



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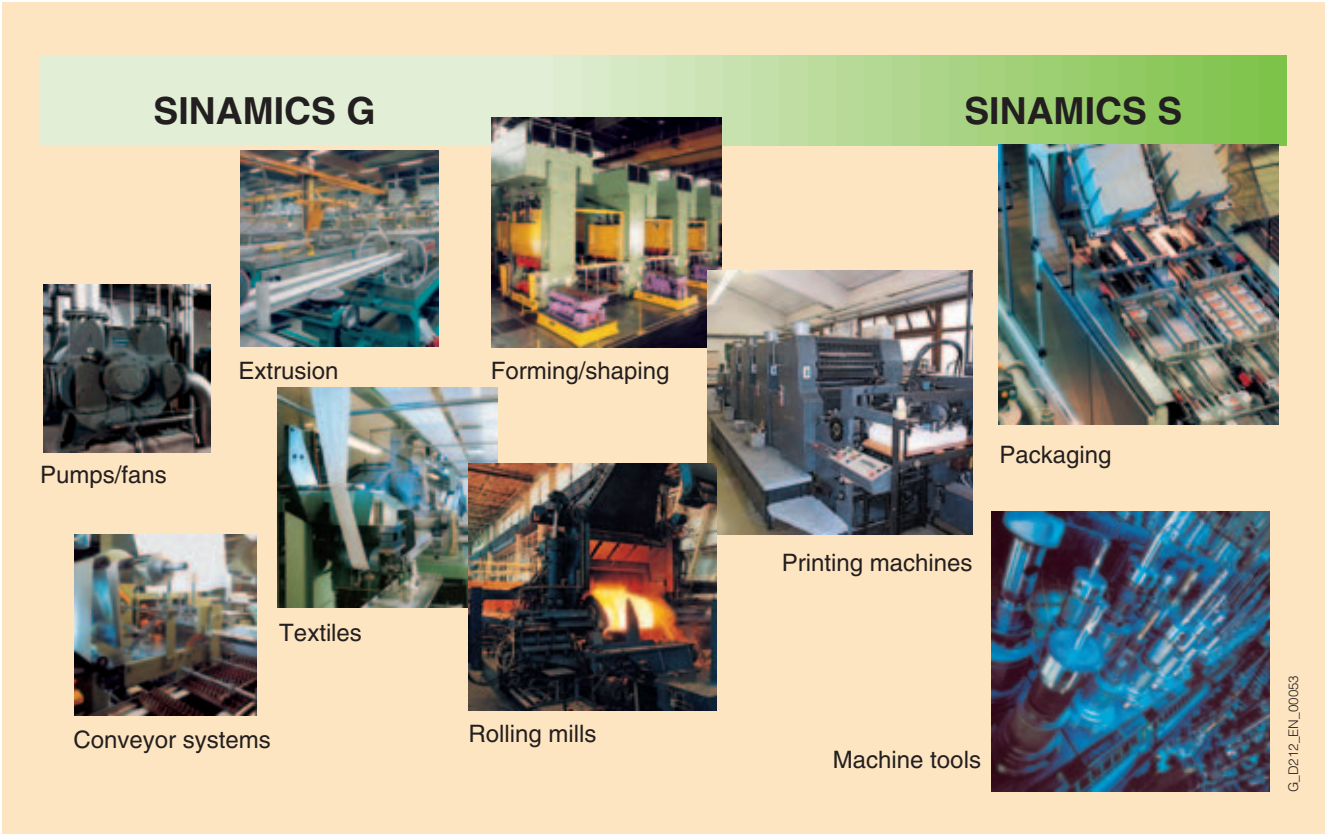
## The SINAMICS drive family




Applications of the SINAMICS drive family

### *Applications*

SINAMICS is the new family of Siemens drives 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*

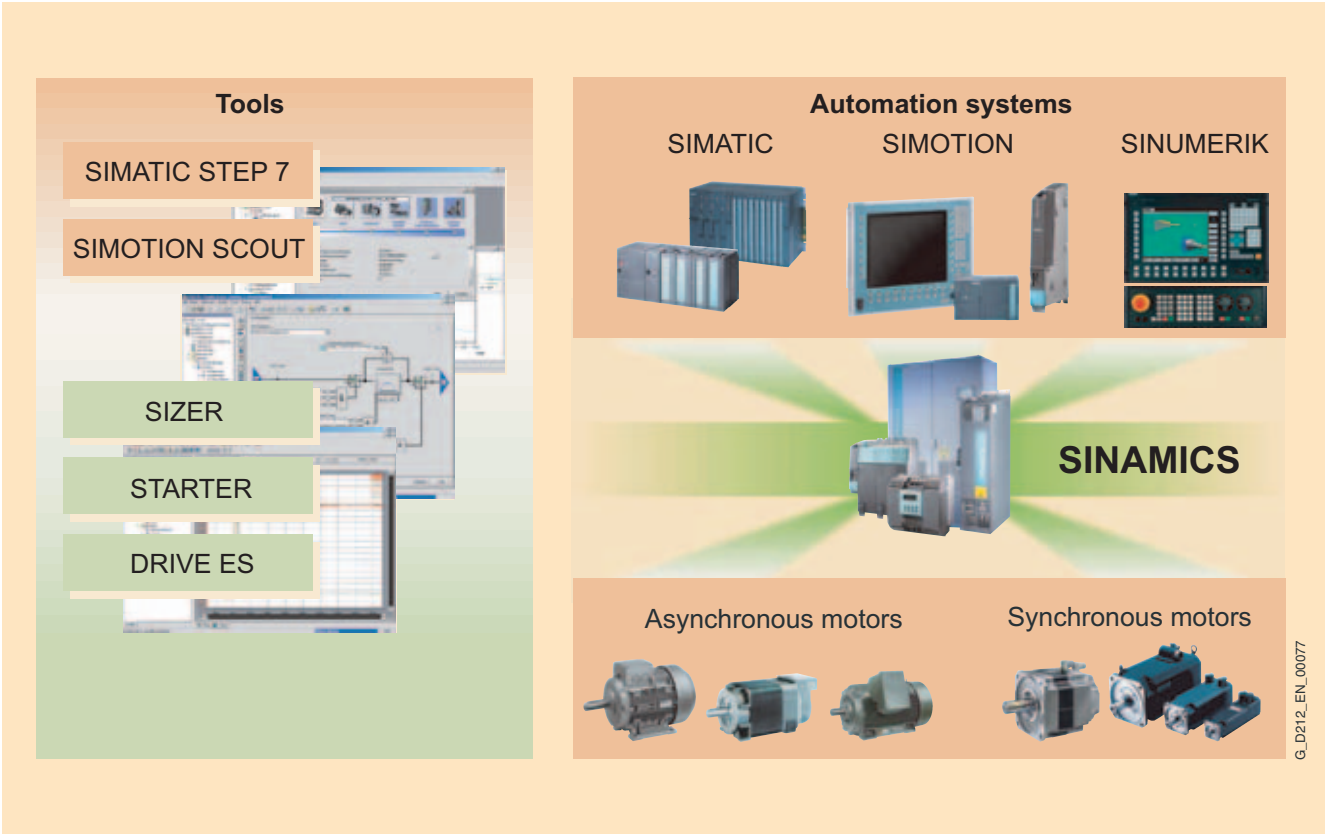
Depending on the application, the SINAMICS range offers the ideal version for any drive task.

- 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 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 the SIMATIC and SIMOTION control system.




SINAMICS as part of the Siemens modular automation system

### *Quality in accordance with DIN EN ISO 9001*

SINAMICS conforms with the most exacting quality requirements. Comprehensive quality assurance measures 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 in accordance with DIN EN ISO 9001.

### *Suitable for global use*

SINAMICS meets the requirements of relevant international standards and regulations – from the EN standards through IEC standards to UL and cULus regulations.

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## The SINAMICS drive family

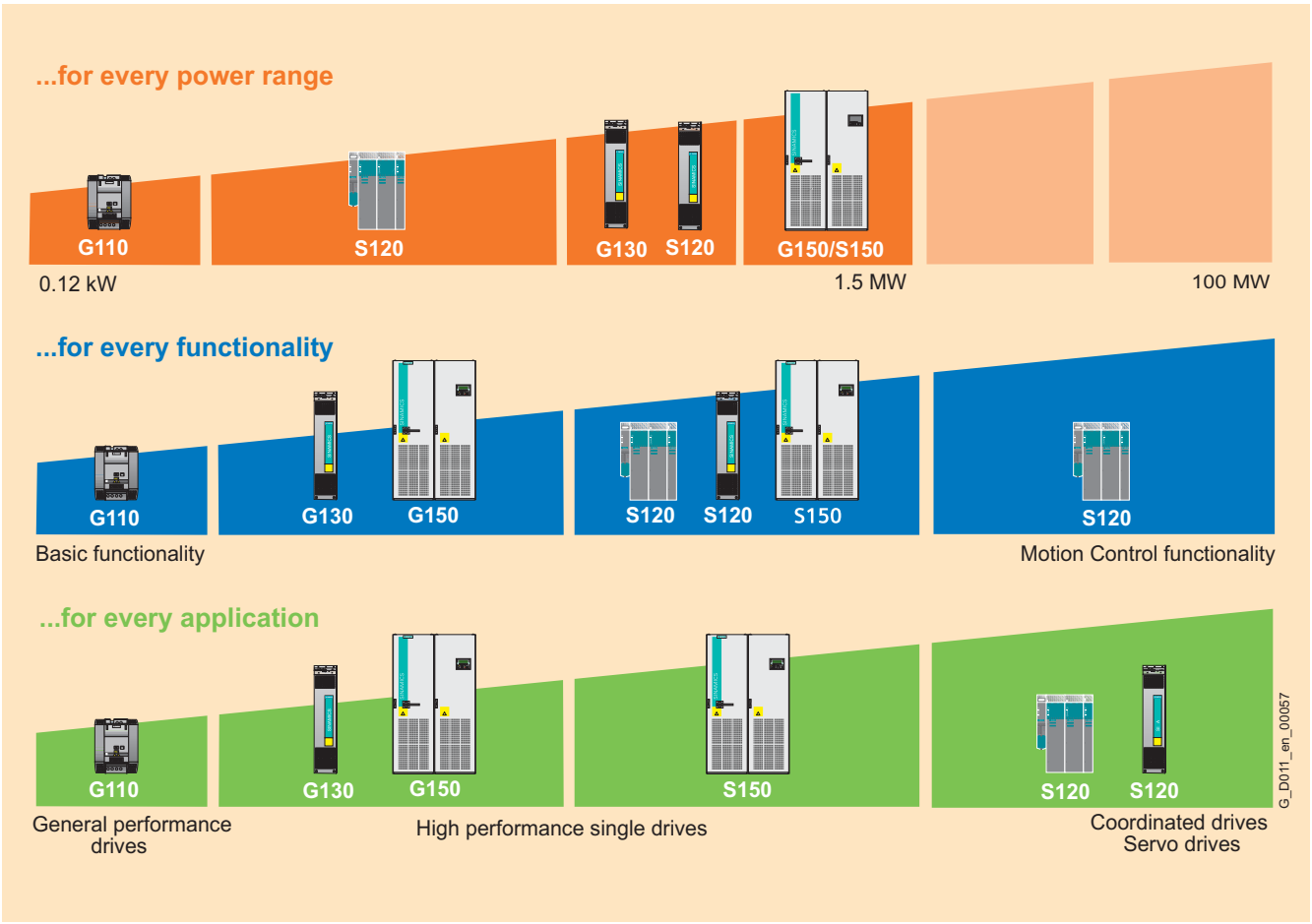
Tailored to the respective areas of application, SINAMICS is divided into the family members:

- SINAMICS G110 – the versatile drive for low power ranges
- SINAMICS G130 and SINAMICS G150 – the universal drive solution for high-performance single drives
- SINAMICS S120 – the flexible, modular drive system for demanding tasks
- SINAMICS S150 – the advanced drive solution for high-performance single drives.

The SINAMICS range is characterized by the following system features:

- uniform functionality based on platform concept
- uniform engineering
- high degree of flexibility and combination
- wide range of performance
- designed for global use
- SINAMICS Safety Integrated
- increased economy and effectivity
- versatile interfacing facilities to host controllers
- Totally Integrated Automation

**SINAMICS ...**



## Members of the SINAMICS drive family

| SINAMICS G110 | SINAMICS G130/G150 | SINAMICS S120 | SINAMICS S150 |
|---|---|---|---|
|  |  |  |  |
| ***The versatile drive for low power ranges*** | ***The universal drive solution for high-performance single drives*** | ***The flexible, modular drive system for complex drive tasks*** | ***The advanced drive solution for high-performance single drives*** |
| **Main applications** | | | |
| • Plant and machines for industrial and commercial applications | • Plant and machines in the process and production industry, water/waste, power stations, oil and gas, petrochemicals, chemical raw materials, paper, cement, stone, steel | • Plant and machines for industrial applications (packaging, plastics, textile, printing, wood, glass, ceramics, presses, paper, lifting equipment, semiconductors, automated assembly and testing equipment, handling) | • Plant and machines in the process and production industry, food, beverages and tobacco, automotive and steel industry, mining/opencast mining, shipbuilding, lifting equipment/conveyors |
| **Application examples** | | | |
| • Pumps and fans<br>• Auxiliary drives<br>• Conveyor belts<br>• Billboards<br>• Door/gate operating mechanisms<br>• Centrifuges | • Pumps and fans<br>• Compressors<br>• Extruders and mixers<br>• Mills | • Motion Control applications (e.g. positioning, synchronous operation, ...)<br>• Technological applications | • Test bay drives<br>• Centrifuges<br>• Elevators and cranes<br>• Cross cutters and shears<br>• Conveyor belts<br>• Presses<br>• Cable winches |
| **Highlights** | | | |
| • Compact<br>• Flexible adaptation to different applications<br>• Simple, fast commissioning<br>• Clear terminal layout<br>• Optimum interaction with SIMATIC and LOGO! | • Space-saving<br>• Low-noise<br>• Simple, fast commissioning<br>• SINAMICS G130: modular components<br>• SINAMICS G150: ready-to-connect cabinet unit<br>• Optimum interaction with SIMATIC | • For universal use<br>• Flexible and modular<br>• Scalable in terms of power, function, number of axes, performance<br>• Simple, fast commissioning, auto-configuration<br>• Innovative system architecture<br>• Wide range of motors<br>• Optimum interaction with SIMOTION and SIMATIC<br>• SINAMICS Safety Integrated | • Four-quadrant operation as standard<br>• High control accuracy and dynamic response<br>• Almost no system perturbation<br>• Tolerant to fluctuations in line voltage<br>• Option of power factor compensation<br>• Simple, fast commissioning<br>• Ready-to-connect cabinet unit<br>• Optimum interaction with SIMATIC |

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# The versatile drive in the low power range

## Overview

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

The converter is available in three frame sizes and covers a power range from 0.12 kW to 3.0 kW for connection to single-phase supplies of 200 V to 240 V.

## 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
  - parameterizable 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 (RS 485)
- 2-/3-wire method (static/pulsed signals) for universal control via digital inputs.

## 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 billboards.

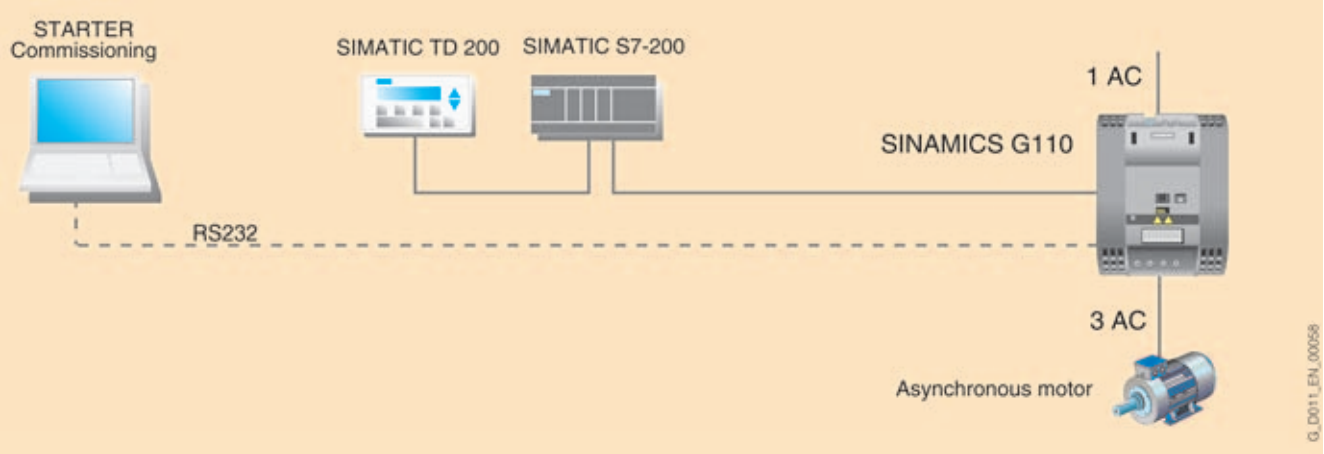
## Design

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

SINAMICS G110 is available with an analog input or an RS 485 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.

## Integration




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

## Technical data

| Electrical data | |
|---|---|
| Line voltages; power 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 ($M \sim n$)<br>*V/f* control, quadratic ($M \sim n^2$)<br>*V/f* control, parameterizable |
| Fixed frequencies | 3, parameterizable |
| Skipped frequency ranges | 1, parameterizable |
| Digital inputs | 3 parameterizable 24 V DC digital inputs |
| Analog input (for analog version) | 1 analog input for setpoints from 0 V to 10 V, scalable or for use as 4th digital input |
| Digital output | 1 24 V DC digital output |
| Communication interface (for USS version) | RS 485 serial interface for use with USS protocol |

| Functions | |
|---|---|
| Software functions | • Automatic restart following interruptions in operation due to a power failure<br>• Smooth connection of the converter to the rotating motor<br>• Parameterizable ramp-up/ramp-down times<br>• Ramp smoothing |
| Protective functions | • Undervoltage<br>• Overvoltage<br>• Ground fault<br>• Short-circuit<br>• Stall prevention<br>• Thermal motor protection $I^2t$<br>• Converter overtemperature<br>• Motor overtemperature |
| Suitable motors | Asynchronous motors |
| **Mechanical data** | |
| Degree of protection | IP20 |
| Cooling method | |
| • 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

# SINAMICS G130/G150

## The universal drive solution for high-performance single drives

### Overview

SINAMICS G130 drive converter chassis units and 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 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.

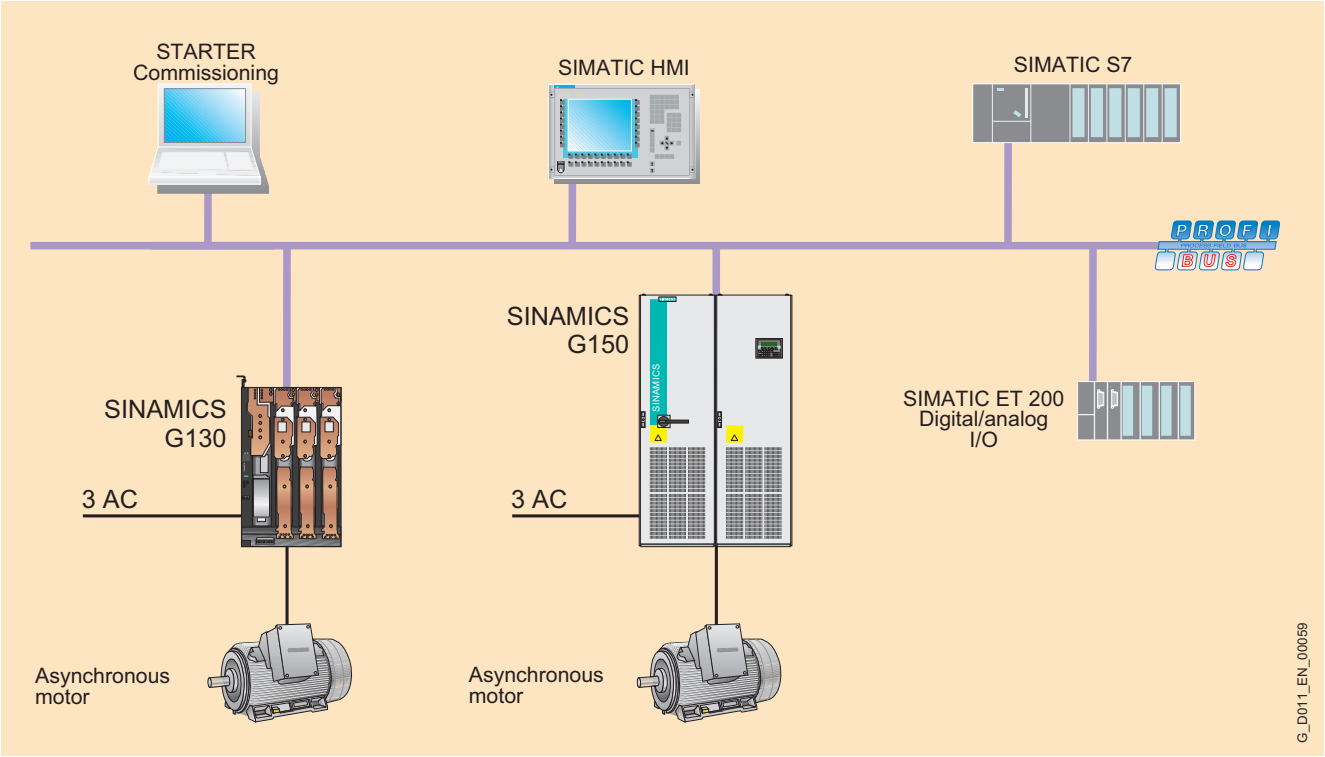
They can be matched to individual requirements by selecting from an extensive range of options.

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. This version is additionally available with power units connected in parallel.
- *Version C*
  is a particularly space-saving version envisaged for applications where the line connection 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

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## Notes

# SINAMICS G130
# Drive converter chassis units

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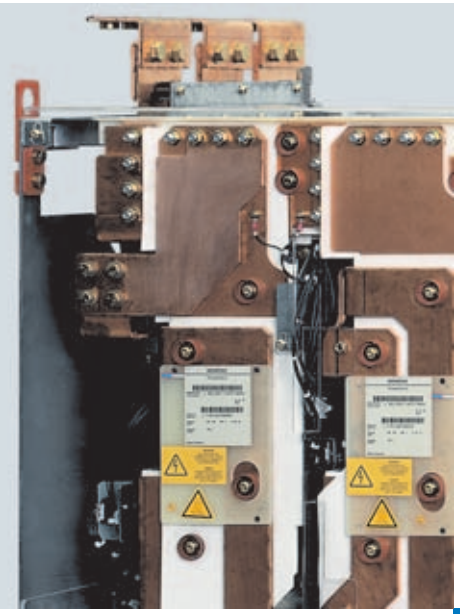


| | |
|---|---|
| **2/2** | **Overview** |
| **2/3** | **Benefits** |
| **2/3** | **Application** |
| **2/3** | **Design** |
| **2/6** | **Function** |
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| 2/6 | Open-loop and closed-loop control functions |
| 2/6 | Software and protection functions |
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| 2/9 | Overload capability |
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| 2/10 | Line filters |
| 2/12 | Line reactors |
| 2/14 | Line harmonics filters |
| 2/16 | Recommended line components |
| **2/17** | **Power Modules** |
| **2/22** | **DC link components** |
| 2/22 | Braking Modules |
| 2/25 | Braking resistors |
| **2/26** | **Load-side power components** |
| 2/26 | Motor reactors |
| 2/28 | dv/dt filter plus VPL |
| **2/30** | **Control Unit Kit** |
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| 2/32 | TB30 Terminal Board |
| 2/34 | TM31 Terminal Module |
| 2/36 | SMC30 Sensor Module Cabinet-Mounted |
| 2/37 | AOP30 advanced operator panel |
| **2/38** | **Connection system MOTION-CONNECT** |
| 2/38 | Signal cables |


## SINAMICS G130 chassis units

### 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 power ranges:

| Line voltage | Power |
|---|---|
| 380 V to 480 V 3 AC | 315 kW to 560 kW |
| 500 V to 600 V 3 AC | 315 kW to 560 kW |
| 660 V to 690 V 3 AC | 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 pre-assembled cables of different lengths, allow a complete converter system to be put together quickly.

A PROFIBUS interface is provided as standard to communicate with the control system. There is also the option to expand the interface using digital and analog inputs and outputs. The TM31 Terminal Module and TB30 Terminal Board are available for this.

## 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 drive converter chassis unit provides 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. In the case of the 315 kW unit in the voltage range 660 V to 690 V, this is the left side panel. On all other units, the slot is in the Power Module.

The Power Modules are supplied with a DRIVE-CLiQ cable for communication and a cable for the 24 V supply to the Control Unit. These cables are pre-assembled for installing the Control Unit 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.

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

Predefined interfaces, via terminal block or PROFIBUS, make the 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 two following figures are helpful when it comes to assembling the required converter components correctly. The first figure shows the structure and the individual components of a SINAMICS G130 drive. The second figure is a flowchart containing the decision and selection criteria required for the individual components.

## 315 kW to 800 kW

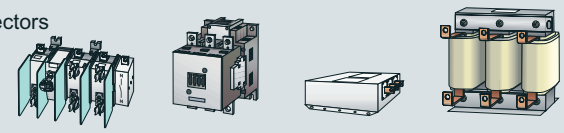
**Design** (continued)

2

### 3 AC supply

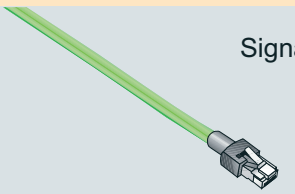
Line-side power components

Switch disconnectors
Line contactors
Line filters
Line reactors



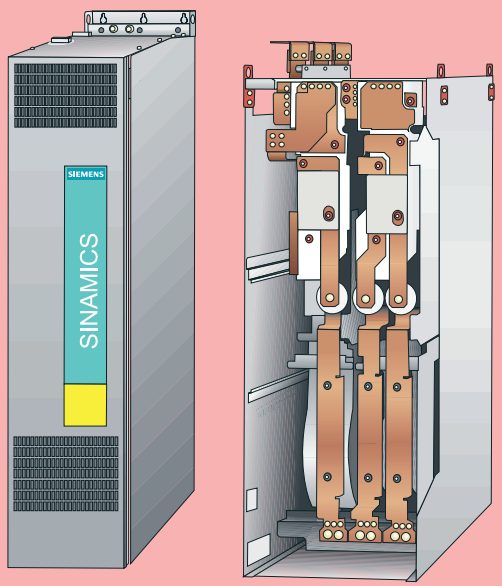
### Connection system

Signal cables



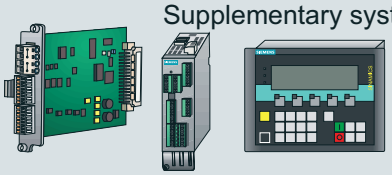
### SINAMICS G130 components

Power Modules




Control Unit Kit

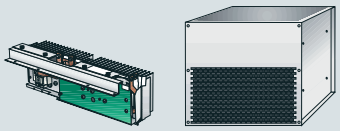
CU320 Control Unit
with CompactFlash card



Supplementary system components

Terminal Board
Terminal Module
Sensor Module

Advanced
Operator Panel

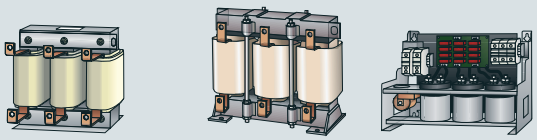


DC link components

Braking Modules
with braking resistors

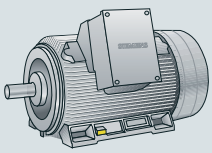
Motor-side power components

Motor reactors
dv/dt-filter plus VPL



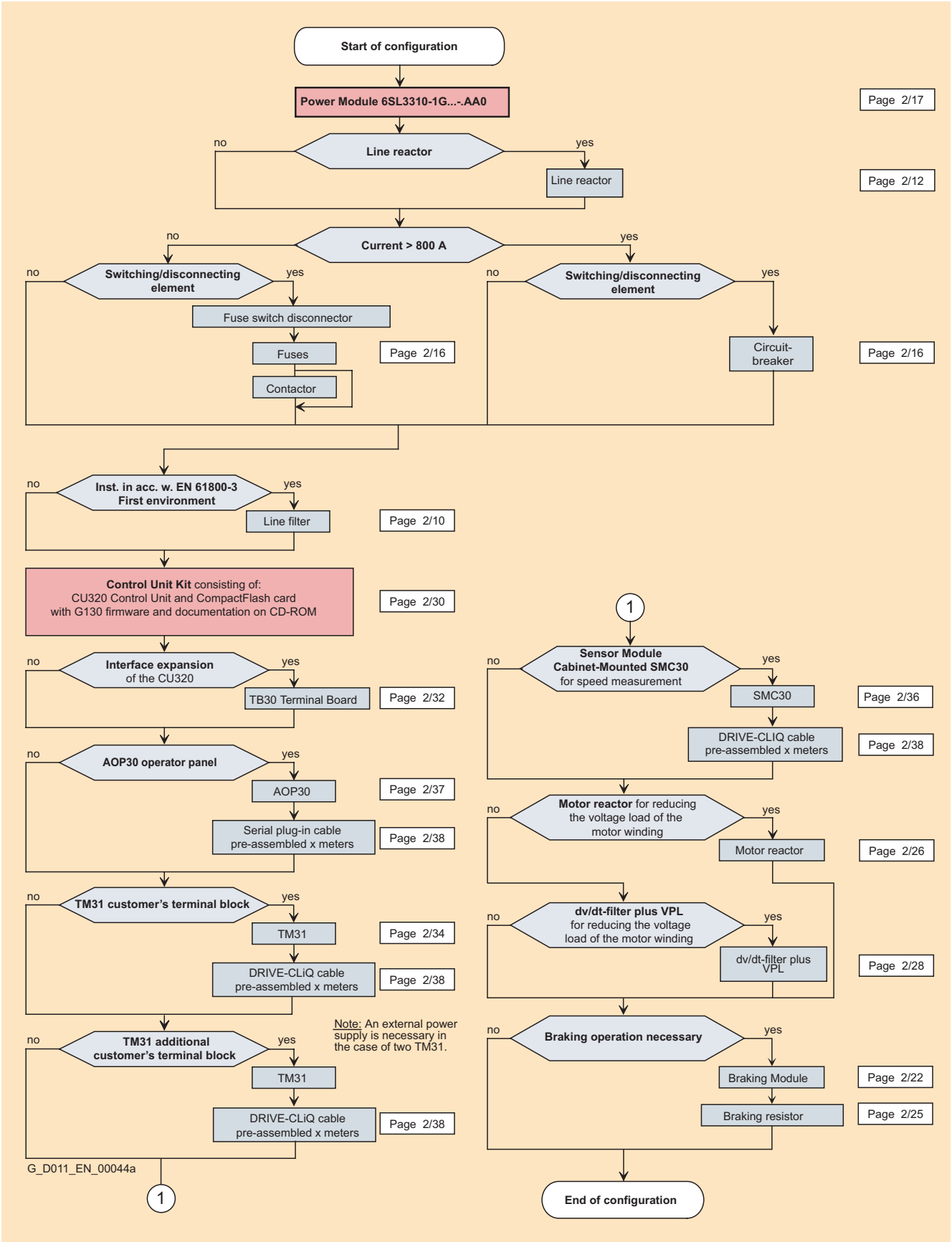
### Motors

Asynchronous motors



G_D011_EN_00060

## Design (continued)



## 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 (→ Configuration).

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

The converter 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 adjustable rounding times in the lower and upper speed ranges, improves the control response and therefore prevents 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)** | Line voltage 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 line voltage 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 bumpless connection of the converter to a rotating motor. |
| **Technology controller** | The technology controller function module allows simple control functions to be implemented, e.g. level control or volumetric flow control. The technology controller is designed as a PID controller, whereby the differentiator can be switched to the control deviation channel or the actual value channel (factory setting). The P, I, and D components can be set separately. |
| **$I^2t$ 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 unit protection** | |
| **Ground fault monitoring on the output side** | A ground fault on the output side is recognized by summation current monitoring, and results in shutdown in grounded networks. |
| **Electronic short-circuit protection on output side** | A short-circuit (e.g. on the converter output terminals, in the motor cable or in the motor's terminal box) is detected on the output side and the converter switches off with a fault. |
| **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 parameterized)

## Technical data

| | | | |
|---|---|---|---|
| **Electrical data** | | | |
| Line voltages and power ranges | • 380 V to 480 V 3 AC, ±10% (-15% < 1 min) 315 kW to 560 kW<br>• 500 V to 600 V 3 AC, ±10% (-15% < 1 min) 315 kW to 560 kW<br>• 660 V to 690 V 3 AC, ±10% (-15% < 1 min) 315 kW to 800 kW | | |
| Supply systems | TN/TT systems or isolated systems (IT systems) | | |
| Line frequency | 47 Hz to 63 Hz | | |
| Output frequency | 0 Hz to 300 Hz (*f* > 100 Hz: derating required) | | |
| 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, parameterizable<br>(in the default setting, 3 fixed setpoints plus 1 minimum speed are selectable using terminal block/PROFIBUS) | | |
| Skipped speed ranges | 4, parameterizable | | |
| 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,<br>for 315 kW/690 V: IP20 | | |
| Protection class [1] | In accordance with EN 50178, Part 1 | | |
| Cooling method | Forced air ventilation | | |
| Sound pressure level $L_{pA}$ (1 m) | ≤ 73 dB at 50 Hz line frequency | | |
| Shock protection | BGV A3 | | |
| **Compliance with standards** | | | |
| Standards | [1] EN 50178<br>[2] EN 60146-1, EN 61800-2, EN 61800-3, EN 60204-1, EN 60529 | | |
| CE marking | In accordance with EMC directive No. 89/336/EC and low voltage directive No. 73/23/EC | | |
| RI suppression | In accordance with EMC product standard for variable-speed drives EN 61800-3,<br>"second environment", "first environment" on request | | |
| | **Storage** | **Transport** | **Operation** |
| **Ambient conditions** | | | |
| Ambient temperature | -25 °C to +55 °C | - 25 °C to +70 °C<br>from -40 °C for 24 hours | 0 °C to +40 °C<br>up to +50 °C, see derating data |
| Relative humidity [2]<br>(non-condensing) | 5% to 95%<br>Corr. to 1K4 to EN 60721-3-1 | 5% to 95%<br>at +40 °C<br>Corr. to 2K3 to EN 60721-3-2 | 5% to 95%<br>Corr. to 3K3 to EN 60721-3-3 |
| Environmental class/harmful chemical substances [2] | Class 1C2 to EN 60721-3-1 | Class 2C2 to EN 60721-3-2 | Class 3C2 to EN 60721-3-3 |
| Organic/biological influences [2] | Class 1B1 to EN 60721-3-1 | Class 2B1 to EN 60721-3-2 | Class 3B1 to EN 60721-3-3 |
| Installation altitude | Up to 2000 m above sea level without derating, > 2000 m, see derating data | | |
| **Strain resistance** | | | |
| Vibratory load [2] | | | |
| - Deflection | 1.5 mm at 5 Hz to 9 Hz | 3.1 mm at 5 Hz to 9 Hz | 0.075 mm at 10 Hz to 58 Hz |
| - Acceleration | 5 $m/s^2$ at > 9 Hz to 200 Hz<br>Corr. to 1M2 to EN 60721-3-1 | 10 $m/s^2$ at > 9 Hz to 200 Hz<br>Corr. to 2M2 to EN 60721-3-2 | 10 $m/s^2$ at > 58 Hz to 200 Hz<br>– |
| Shock load [2] | | | |
| - Acceleration | 40 $m/s^2$ at 22 ms<br>Corr. to 1M2 to EN 60721-3-1 | 100 $m/s^2$ at 11 ms<br>Corr. to 2M2 to EN 60721-3-2 | 100 $m/s^2$ at 11 ms<br>Corr. to 3M4 to EN 60721-3-3 |

Deviations from the defined classes are identified by underlining.

1) The EN standard specified is the European edition of international standard IEC 62103.

2) The EN standards specified are the European editions of the international IEC standards with the same designations.

## 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 depending on 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 in accordance with the following table with **installation altitudes > 2000 m** above sea level.

| Installation altitude above sea level | **Voltage derating** for a rated input voltage of | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| m | 380 V | 400 V | 420 V | 440 V | 460 V | 480 V | 500 V | 525 V | 550 V | 575 V | 600 V | 660 V | 690 V |
| 0-2000 | | | | | | | | | | | | 100% | |
| 2001-2250 | | | | | | 96% | | | | | 97% | | 96% |
| 2251-2500 | | | | | 98% | 94% | | 100% | | 98% | 94% | 98% | 94% |
| 2501-2750 | | 100% | | 98% | 94% | 90% | | | 99% | 95% | 91% | 95% | 90% |
| 2751-3000 | | | | 95% | 91% | 88% | | | 96% | 92% | 88% | 92% | 88% |
| 3001-3250 | | | 97% | 93% | 89% | 85% | | 98% | 93% | 89% | 85% | 89% | 85% |
| 3251-3500 | | 98% | 93% | 89% | 85% | 82% | 99% | 94% | 90% | 86% | 83% | 85% | 82% |
| 3501-3750 | | 95% | 91% | 87% | 83% | 79% | 96% | 91% | 87% | 83% | 80% | – | – |
| 3751-4000 | 96% | 92% | 87% | 83% | 80% | 76% | 92% | 88% | 84% | 80% | 77% | – | – |

Voltage derating depending on installation altitude

## Technical data (continued)

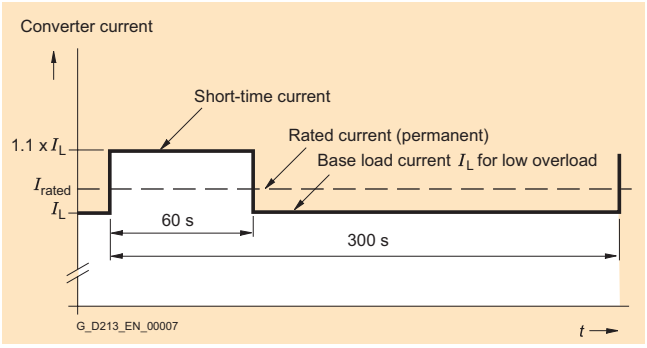
### *Overload capability*

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.

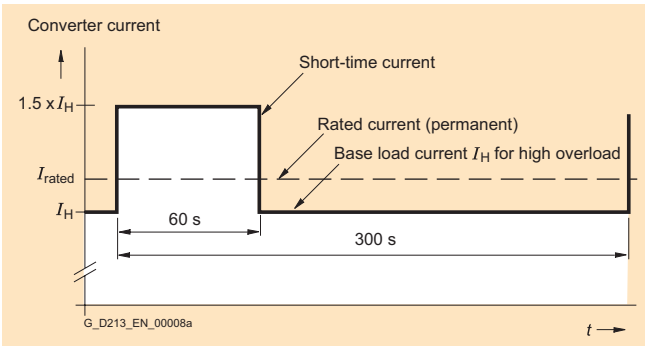
The criterion for overload is that the drive is operated with its base load current before and after the overload occurs, and a load duration of 300 s is assumed here.

The base load current $I_L$ for a low 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.




Low overload




High overload

### *EMC guidelines*

The electromagnetic compatibility describes – in accordance with 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 61800-3. 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 61800-3 defines different limits depending on the location of the drive system, referred to as the first and second environment.

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 61800-3 Ed.2 depending on the location and the power of the drive:

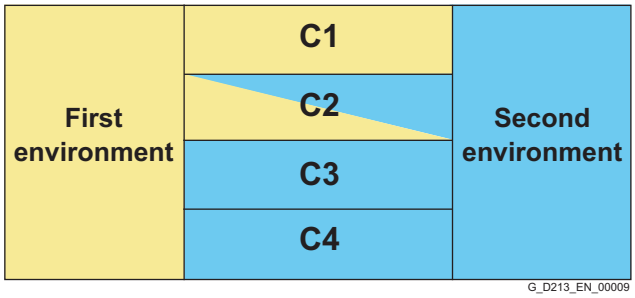
**Category C1:** Drive systems for rated voltages < 1000 V for unlimited use in the first environment.

**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 environment:




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

To limit the **emitted interference**, the SINAMICS G130 drive converter chassis units are equipped as standard with a radio interference suppression filter in accordance with the limits defined in category C3. This means that they meet the requirements for industrial use. Optional filters are available on request for use in the first environment (category C2).

SINAMICS G130 drive converter chassis units fulfill the requirements for **noise immunity** defined in EN 61800-3 for the second environment and consequently also the lower noise immunity values 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.


To reduce emissions, the Power Modules are equipped with a line filter as standard in accordance with the limit values defined in category C3 (second environment). 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 specified in the EN 61800-3 product standard. 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 power of the Power Module | Order No. **Line filter** |
|---|---|---|
| **380 V to 480 V 3 AC** | | |
| 6SL3310-1GE36-1AA0 | 315 kW | **6SL3000-0BE41-2AA0** |
| 6SL3310-1GE37-5AA0 | 400 kW | |
| 6SL3310-1GE38-4AA0 | 450 kW | |
| 6SL3310-1GE41-0AA0 | 560 kW | |
| **500 V to 600 V 3 AC** | | |
| 6SL3310-1GF34-7AA0 | 315 kW | **6SL3000-0BG36-0AA0** |
| 6SL3310-1GF35-8AA0 | 400 kW | **6SL3000-0BG41-2AA0** |
| 6SL3310-1GF37-4AA0 | 500 kW | |
| 6SL3310-1GF38-1AA0 | 560 kW | |
| **660 V to 690 V 3 AC** | | |
| 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

| ***Line voltage 380 V to 480 V 3 AC*** | | **Line filters 6SL3000-0BE41-2AA0** | | | |
|---|---|---|---|---|---|
| Suitable for **Power Module** | | 6SL3310-1GE36-1AA0 | 6SL3310-1GE37-5AA0 | 6SL3310-1GE38-4AA0 | 6SL3310-1GE41-0AA0 |
| Rated power of the Power Module | kW | **315** | **400** | **450** | **560** |
| Rated current | A | 1200 | | | |
| Power loss | kW | 0.137 | | | |
| Line/power connection | | M12 connection lugs | | | |
| PE connection | | On housing with M10 bolts | | | |
| Width | mm | 425 | | | |
| Height | mm | 265 | | | |
| Depth | mm | 145 | | | |
| Weight, approx. | kg | 25.2 | | | |

## Technical data (continued)

| *Line voltage 500 V to 600 V 3 AC* | | **Line filters 6SL3000-0BG36-0AA0** | **6SL3000-0BG41-2AA0** | | |
|---|---|---|---|---|---|
| Suitable for **Power Module** | | 6SL3310-1GF34-7AA0 | 6SL3310-1GF35-8AA0 | 6SL3310-1GF37-4AA0 | 6SL3310-1GF38-1AA0 |
| Rated power of the Power Module | kW | **315** | **400** | **500** | **560** |
| Rated current | A | 600 | 1200 | 1200 | 1200 |
| Power loss | kW | 0.055 | 0.137 | 0.137 | 0.137 |
| Line/power connection | | M10 connection lugs | M12 connection lugs | M12 connection lugs | M12 connection lugs |
| PE connection | | On housing with M10 bolts | | | |
| Width | mm | 400 | 425 | 425 | 425 |
| Height | mm | 265 | | | |
| Depth | mm | 140 | 145 | 145 | 145 |
| Weight, approx. | kg | 19 | 25.2 | 25.2 | 25.2 |

| *Line voltage 660 V to 690 V 3 AC* | | **Line filters 6SL3000-0BG34-4AA0** | | **6SL3000-0BG36-0AA0** | **6SL3000-0BG41-2AA0** | | |
|---|---|---|---|---|---|---|---|
| Suitable for **Power Module** | | 6SL3310-1GH33-3AA0 | 6SL3310-1GH34-1AA0 | 6SL3310-1GH34-7AA0 | 6SL3310-1GH35-8AA0 | 6SL3310-1GH37-4AA0 | 6SL3310-1GH38-1AA0 |
| Rated power of the Power Module | kW | **315** | **400** | **450** | **560** | **710** | **800** |
| Rated current | A | 440 | 440 | 600 | 1200 | 1200 | 1200 |
| Power loss | kW | 0.049 | 0.049 | 0.055 | 0.137 | 0.137 | 0.137 |
| Line/power connection | | M10 connection lugs | M10 connection lugs | M10 connection lugs | M12 connection lugs | M12 connection lugs | M12 connection lugs |
| PE connection | | On housing with M8 bolts | On housing with M8 bolts | On housing with M10 bolts | On housing with M10 bolts | On housing with M10 bolts | On housing with M10 bolts |
| Width | mm | 360 | 360 | 400 | 425 | 425 | 425 |
| Height | mm | 240 | 240 | 265 | 265 | 265 | 265 |
| Depth | mm | 116 | 116 | 140 | 145 | 145 | 145 |
| Weight, approx. | kg | 12.3 | 12.3 | 19 | 25.2 | 25.2 | 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 Configuration).

### Selection and ordering data

| Suitable for Power Module | Rated power of the Power Module | Order No. **Line reactor** |
|---|---|---|
| **380 V to 480 V 3 AC** | | |
| 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** |
| **500 V to 600 V 3 AC** | | |
| 6SL3310-1GF34-7AA0 | 315 kW | **6SL3000-0CH34-8AA0** |
| 6SL3310-1GF35-8AA0 | 400 kW | **6SL3000-0CH36-0AA0** |
| 6SL3310-1GF37-4AA0 | 500 kW | **6SL3000-0CH38-4AA0** |
| 6SL3310-1GF38-1AA0 | 560 kW | |
| **660 V to 690 V 3 AC** | | |
| 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

| ***Line voltage 380 V to 480 V 3 AC*** | | **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 power of the Power Module | kW | **315** | **400** | **450** | **560** |
| $I_{thmax}$ | A | 628 | 773 | 871 | 1022 |
| Nominal inductance $L_{rated}$ | 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 connection lugs | | | |
| Degree of protection | | IP00 | | | |
| Weight, approx. | kg | 41.4 | 51.3 | 63.2 | 69.6 |

| ***Line voltage 500 V to 600 V 3 AC*** | | **Line reactor 6SL3000-0CH34-8AA0** | **6SL3000-0CH36-0AA0** | **6SL3000-0CH38-4AA0** | |
|---|---|---|---|---|---|
| Suitable for **Power Module** | | 6SL3310-1GF34-7AA0 | 6SL3310-1GF35-8AA0 | 6SL3310-1GF37-4AA0 | 6SL3310-1GF38-1AA0 |
| Rated power of the Power Module | kW | **315** | **400** | **500** | **560** |
| $I_{thmax}$ | A | 482 | 597 | 840 | 840 |
| Nominal inductance $L_{rated}$ | µH | 65 | 46 | 40 | 40 |
| Power loss at 50 Hz/60 Hz | kW | 0.371/0.418 | 0.376/0.423 | 0.390/0.416 | 0.480/0.541 |
| Line/power connection | | M12 connection lugs | | | |
| Degree of protection | | IP00 | | | |
| Weight, approx. | kg | 55.6 | 63.8 | 98 | 98 |

| ***Line voltage 660 V to 690 V 3 AC*** | | **Line reactor 6SL3000-0CH33-4AA0** | **6SL3000-0CH34-8AA0** | | **6SL3000-0CH36-0AA0** | **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 power of the Power Module | kW | **315** | **400** | **450** | **560** | **710** | **800** |
| $I_{thmax}$ | A | 342 | 482 | 482 | 597 | 840 | 840 |
| Nominal inductance $L_{rated}$ | µH | 81 | 65 | 65 | 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 connection lugs | M12 connection lugs | M12 connection lugs | M12 connection lugs | M12 connection lugs | M12 connection lugs |
| Degree of protection | | IP00 | | | | | |
| Weight, approx. | kg | 38.9 | 55.6 | 55.6 | 63.8 | 98 | 98 |

## Line-side power components
## Line harmonics filters



### Overview


Line harmonics filters reduce the converters' low-frequency harmonic effects to a level that can otherwise only be achieved using 12-pulse rectifiers.

### Design

Line harmonics filters are supplied as stand-alone components in a rugged housing. They are installed between the customer-end low-voltage distribution unit and the converter. The voltage is disconnected and fused in the customer-end low-voltage switchgear, as is the power supply cable.

### Design (continued)

The line harmonics filters are connected without fans (natural convection). This means that no auxiliary power supply is required.

The line harmonics filters are equipped with a floating thermostatic switch, which can be monitored externally, for the purpose of monitoring thermal overloads (as a result of insufficient cooling air being fed in, for example).

Note: The converter must have a line reactor in order to use a line harmonics filter.

### Selection and ordering data

| Suitable for Power Module | Rated power at 400 V, 500 V and 690 V | Order No. **Line harmonics filter** |
|---|---|---|
| **380 V to 480 V 3 AC** | | |
| 6SL3310-1GE36-1AA0 | 315 kW | **6SL3000-0JE36-1AA0** |
| 6SL3310-1GE37-5AA0 | 400 kW | **6SL3000-0JE38-4AA0** |
| 6SL3310-1GE38-4AA0 | 450 kW | |
| 6SL3310-1GE41-0AA0 | 560 kW | **6SL3000-0JE41-0AA0** |
| **500 V to 600 V 3 AC** | | |
| 6SL3310-1GF34-7AA0 | 315 kW | **6SL3000-0JH34-7AA0** |
| 6SL3310-1GF35-8AA0 | 400 kW | **6SL3000-0JH35-8AA0** |
| 6SL3310-1GF37-4AA0 | 500 kW | **6SL3000-0JH38-1AA0** |
| 6SL3310-1GF38-1AA0 | 560 kW | |
| **660 V to 690 V 3 AC** | | |
| 6SL3310-1GH33-3AA0 | 315 kW | **6SL3000-0JH33-3AA0** |
| 6SL3310-1GH34-1AA0 | 400 kW | **6SL3000-0JH34-7AA0** |
| 6SL3310-1GH34-7AA0 | 450 kW | |
| 6SL3310-1GH35-8AA0 | 560 kW | **6SL3000-0JH35-8AA0** |
| 6SL3310-1GH37-4AA0 | 710 kW | **6SL3000-0JH38-1AA0** |
| 6SL3310-1GH38-1AA0 | 800 kW | |

### Technical data

| ***Line voltage 380 V to 480 V 3 AC*** | | **Line harmonics filters 6SL3000-0JE36-1AA0** | **6SL3000-0JE38-4AA0** | | **6SL3000-0JE41-0AA0** |
|---|---|---|---|---|---|
| Suitable for **Power Module** | Type | 6SL3310-1GE36-1AA0 | 6SL3310-1GE37-5AA0 | 6SL3310-1GE38-4AA0 | 6SL3310-1GE41-0AA0 |
| Rated power at 400 V | kW | **315** | **400** | **450** | **560** |
| Rated current | A | 500 | 700 | 700 | 900 |
| Power loss | kW | 1.0 | 1.5 | 1.5 | 2.0 |
| Max. conductor cross-section | $mm^2$ (DIN VDE) | 4 × 240 | | | |
| | AWG/ MCM (NEC, CEC) | 4 × 500 MCM | | | |
| PE connection | | 3 × M12 fastening holes | | | |
| Degree of protection | | IP21 | | | |
| Width | mm | 600 | 800 | 800 | 1000 |
| Height | mm | 1700 | | | |
| Depth | mm | 540 | | | |
| Weight, approx. | kg | 450 | 600 | 600 | 900 |

## Technical data (continued)

| *Line voltage 500 V to 600 V 3 AC* | | Line harmonics filters 6SL3000-0JH34-7AA0 | 6SL3000-0JH35-8AA0 | 6SL3000-0JH38-1AA0 | |
|---|---|---|---|---|---|
| Suitable for **Power Module** | Type | 6SL3310-1GF34-7AA0 | 6SL3310-1GF35-8AA0 | 6SL3310-1GF37-4AA0 | 6SL3310-1GF38-1AA0 |
| Rated power at 500 V | kW | **315** | **400** | **500** | **560** |
| Rated current | A | 400 | 520 | 710 | 710 |
| Power loss | kW | 1.0 | 1.5 | 2.0 | 2.0 |
| Max. conductor cross-section | $mm^2$ (DIN VDE) | 4 × 240 | | | |
| | AWG/ MCM (NEC, CEC) | 4 × 500 MCM | | | |
| PE connection | | 3 × M12 fastening holes | | | |
| Degree of protection | | IP21 | | | |
| Width | mm | 800 | 1000 | 1000 | 1000 |
| Height | mm | 1700 | | | |
| Depth | mm | 540 | | | |
| Weight, approx. | kg | 600 | 830 | 830 | 830 |

| *Line voltage 660 V to 690 V 3 AC* | | Line harmonics filters 6SL3000-0JH33-3AA0 | 6SL3000-0JH34-7AA0 | | 6SL3000-0JH35-8AA0 | 6SL3000-0JH38-1AA0 | |
|---|---|---|---|---|---|---|---|
| Suitable for **Power Module** | Type | 6SL3310-1GH33-3AA0 | 6SL3310-1GH34-1AA0 | 6SL3310-1GH34-7AA0 | 6SL3310-1GH35-8AA0 | 6SL3310-1GH37-4AA0 | 6SL3310-1GH38-1AA0 |
| Rated power at 690 V | kW | **315** | **400** | **450** | **560** | **710** | **800** |
| Rated current | A | 290 | 400 | 400 | 520 | 710 | 710 |
| Power loss | kW | 0.8 | 1.0 | 1.0 | 1.5 | 2.0 | 2.0 |
| Max. conductor cross-section | $mm^2$ (DIN VDE) | 4 × 240 | | | | | |
| | AWG/ MCM (NEC, CEC) | 4 × 500 MCM | | | | | |
| PE connection | | 3 × M12 fastening holes | | | | | |
| Degree of protection | | IP21 | | | | | |
| Width | mm | 600 | 800 | 800 | 1000 | 1000 | 1000 |
| Height | mm | 1700 | | | | | |
| Depth | mm | 540 | | | | | |
| Weight, approx. | kg | 450 | 600 | 600 | 830 | 830 | 830 |

## Line-side power components
## Recommended line components



### Overview

The table below should be viewed as a recommendation (configuration of input-side components in accordance with IEC standards).

Further information about the main contactors, switch disconnectors, fuses and circuit-breakers specified in the table can be found in Catalog LV 10.

| **Rated power** (at 400 V, 500 V and 690 V) | Rated input current | Suitable for Power Module | **Main contactor** | **Non-withdrawable circuit-breaker** | **Switch-disconnector without handle and shaft** | **Switch-disconnector with handle and shaft** |
|---|---|---|---|---|---|---|
| kW | A | Type 6SL3310-... | Order No. | Order No. | Order No. | Order No. |
| **380 V to 480 V 3 AC** | | | | | | |
| 315 | 629 | 1GE36-1AA0 | **3RT1476-6AP36** | - | **3KL6230-1AB02** | **3KL6230-1EB02** |
| 400 | 775 | 1GE37-5AA0 | **3RT1466-6AP36 (3 x)** | - | **3KL6230-1AB02** | **3KL6230-1EB02** |
| 450 | 873 | 1GE38-4AA0 | - | **3WL1110-2BB34-4AN2** | - | - |
| 560 | 1024 | 1GE41-0AA0 | - | **3WL1112-2BB34-4AN2** | - | - |
| **500 V to 600 V 3 AC** | | | | | | |
| 315 | 483 | 1GF34-7AA0 | **3RT1476-6AP36** | - | **3KL6130-1AB02** | **3KL6130-1EB02** |
| 400 | 598 | 1GF35-8AA0 | **3RT1476-6AP36** | - | **3KL6230-1AB02** | **3KL6230-1EB02** |
| 500 | 764 | 1GF37-4AA0 | **3RT1466-6AP36 (3 x)** | - | **3KL6230-1AB02** | **3KL6230-1EB02** |
| 560 | 842 | 1GF38-1AA0 | - | **3WL1210-4BB34-4AN2** | - | - |
| **660 V to 690 V 3 AC** | | | | | | |
| 315 | 343 | 1GH33-3AA0 | **3RT1466-6AP36** | - | **3KL5730-1AB01** | **3KL5730-1EB01** |
| 400 | 426 | 1GH34-1AA0 | **3RT1476-6AP36** | - | **3KL6130-1AB02** | **3KL6130-1EB02** |
| 450 | 483 | 1GH34-7AA0 | **3RT1476-6AP36** | - | **3KL6130-1AB02** | **3KL6130-1EB02** |
| 560 | 598 | 1GH35-8AA0 | **3RT1476-6AP36** | - | **3KL6230-1AB02** | **3KL6230-1EB02** |
| 710 | 764 | 1GH37-4AA0 | **3RT1466-6AP36 (3 x)** | - | **3KL6230-1AB02** | **3KL6230-1EB02** |
| 800 | 842 | 1GH38-1AA0 | - | **3WL1210-4BB34-4AN2** | - | - |

| **Rated power** (at 400 V, 500 V and 690 V) | Rated input current | Suitable for Power Module | **Cable protection fuse** | | **Cable protection fuse with semiconductor protection** | |
|---|---|---|---|---|---|---|
| kW | A | Type 6SL3310-... | Order No. | Rated current | Order No. | Rated current |
| **380 V to 480 V 3 AC** | | | | | | |
| 315 | 629 | 1GE36-1AA0 | **3NA3475** | 800 A | **3NE1438-2** | 800 A |
| 400 | 775 | 1GE37-5AA0 | **3NA3475** | 800 A | **3NE1448-2** | 850 A |
| 450 | 873 | 1GE38-4AA0 | - | - | - | - |
| 560 | 1024 | 1GE41-0AA0 | - | - | - | - |
| **500 V to 600 V 3 AC** | | | | | | |
| 315 | 483 | 1GF34-7AA0 | **3NA3252-6** | 2 × 315 A | **3NE1435-2** | 560 A |
| 400 | 598 | 1GF35-8AA0 | **3NA3354-6** | 2 × 355 A | **3NE1447-2** | 670 A |
| 500 | 764 | 1GF37-4AA0 | **3NA3365-6** | 2 × 500 A | **3NE1448-2** | 850 A |
| 560 | 842 | 1GF38-1AA0 | - | - | - | - |
| **660 V to 690 V 3 AC** | | | | | | |
| 315 | 343 | 1GH33-3AA0 | **3NA3365-6** | 500 A | **3NE1334-2** | 500 A |
| 400 | 426 | 1GH34-1AA0 | **3NA3365-6** | 500 A | **3NE1334-2** | 500 A |
| 450 | 483 | 1GH34-7AA0 | **3NA3252-6** | 2 × 315 A | **3NE1435-2** | 560 A |
| 560 | 598 | 1GH35-8AA0 | **3NA3354-6** | 2 × 355 A | **3NE1447-2** | 670 A |
| 710 | 764 | 1GH37-4AA0 | **3NA3365-6** | 2 × 500 A | **3NE1448-2** | 850 A |
| 800 | 842 | 1GH38-1AA0 | - | - | - | - |

## 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:

- connection lugs for the line supply
- connection lugs for the motor circuit
- connection lugs for the dv/dt filter plus VPL
- connection for external 24 V supply
- 3 x DRIVE-CLiQ sockets
- 24 V voltage outputs for the supply of the
  - CU320 Control Unit and the
  - AOP30 operator panel
- 1 x temperature sensor input (KTY84-130)
- PE (protective ground) connection.

## Selection and ordering data

| Rated power | | Rated output current | Order No. **Power Module** |
|---|---|---|---|
| | At 60 Hz 460 V or 575 V | | |
| kW | hp | A | |
| **380 V to 480 V 3 AC** | | | |
| 315 | 500 | 605 | **6SL3310-1GE36-1AA0** |
| 400 | 600 | 745 | **6SL3310-1GE37-5AA0** |
| 450 | 600 | 840 | **6SL3310-1GE38-4AA0** |
| 560 | 800 | 985 | **6SL3310-1GE41-0AA0** |
| **500 V to 600 V 3 AC** | | | |
| 315 | 450 | 465 | **6SL3310-1GF34-7AA0** |
| 400 | 500 | 575 | **6SL3310-1GF35-8AA0** |
| 500 | 700 | 735 | **6SL3310-1GF37-4AA0** |
| 560 | 800 | 810 | **6SL3310-1GF38-1AA0** |
| **660 V to 690 V 3 AC** | | | |
| 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** |

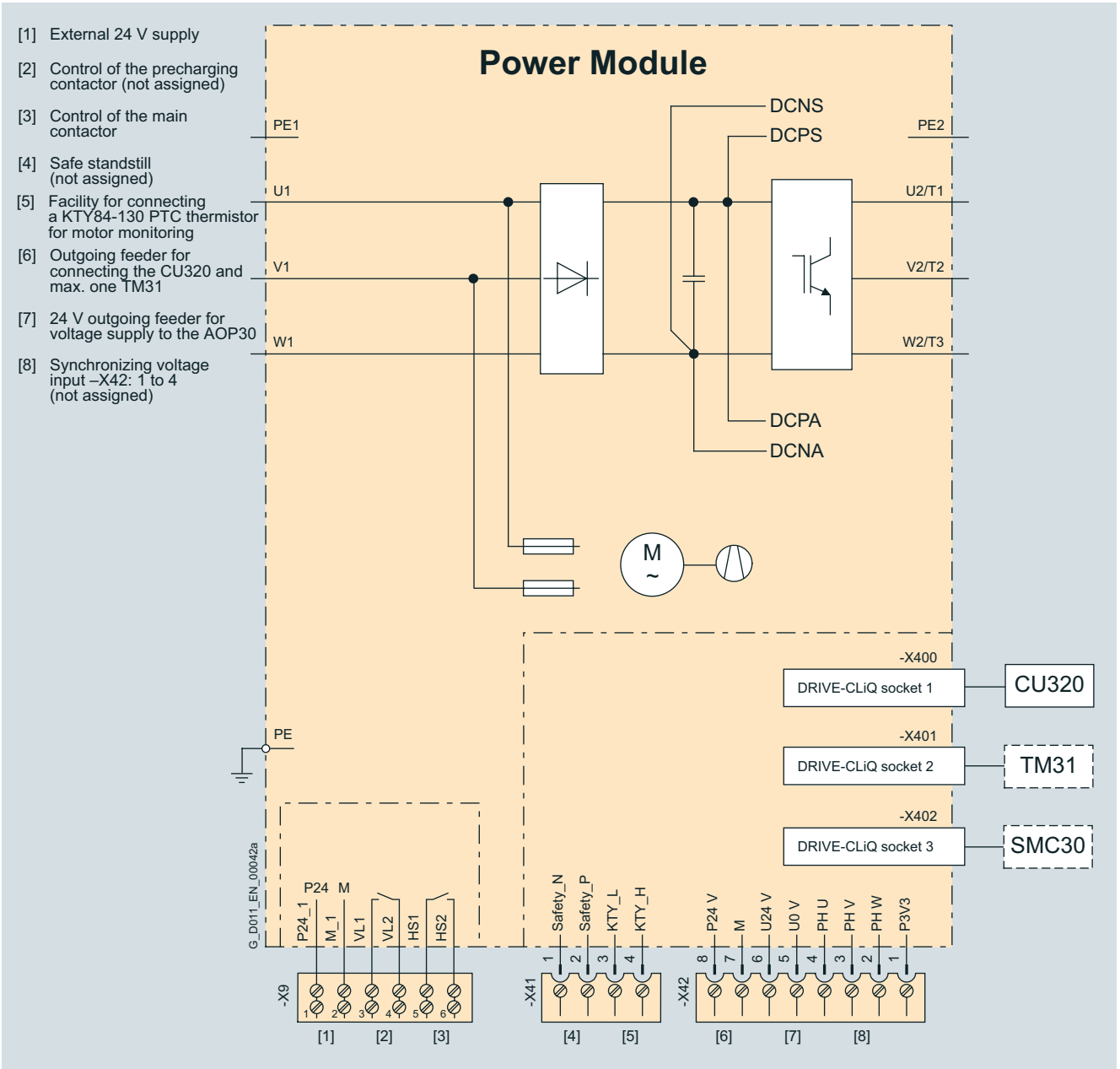
Note: The performance data in hp units are based on the NEC/CEC standards for the North American market.

## Power Modules

### 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 for this is included in the scope of delivery of the Control Unit Kit.

DRIVE-CLiQ cables for establishing connections with other DRIVE-CLiQ devices can be ordered pre-assembled and cut to length as required (→ Signal cables).




Connection diagram for Power Module

## Technical data

| *Line voltage 380 V to 480 V 3 AC* | | 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 power for $I_L$ | kW | **315** | **400** | **450** | **560** |
| Rated power for $I_H$ | kW | 250 | 315 | 400 | 450 |
| Rated power for $I_L$ at 60 Hz 460 V | hp | 500 | 600 | 600 | 800 |
| Rated power for $I_H$ at 60 Hz 460 V | hp | 350 | 500 | 600 | 700 |
| Max. current requirement (at 24 V DC) 3) | A | 1.0 | 1.0 | 1.0 | 1.25 |
| Max. current requirement for fan power supply at 50/60 Hz | A | 3.6/5.3 | 3.6/5.3 | 3.6/5.3 | 7.2/10.6 |
| 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 | | | |
| Sound pressure level $L_{pA}$ (1 m) at 50/60 Hz | dB | 70/73 | 70/73 | 70/73 | 72/75 |
| Line connection U1, V1, W1 | | Flanged connection with M12 screws | | | |
| Motor connection U2/T1, V2/T2, W2/T3 | | Flanged connection with M12 screws | | | |
| Max. cross-section for line and motor connections | $mm^2$ (DIN VDE) | 4 × 240 per connection | 4 × 240 per connection | 4 × 240 per connection | 6 × 240 per connection |
| | AWG/MCM (NEC, CEC) | 4 × 500 MCM per connection | 4 × 500 MCM per connection | 4 × 500 MCM per connection | 6 × 500 MCM per connection |
| PE1/GND or PE2/GND conductor | | M12 mounting screw | | | |
| Max. conductor cross-section for PE1/GND | $mm^2$ (DIN VDE) | 2 × 240 | 2 × 240 | 2 × 240 | 4 × 240 |
| | AWG/MCM (NEC, CEC) | 2 × 500 MCM | 2 × 500 MCM | 2 × 500 MCM | 4 × 500 MCM |
| Max. conductor cross-section for PE2/GND | $mm^2$ (DIN VDE) | 4 × 240 | 4 × 240 | 4 × 240 | 6 × 240 |
| | AWG/MCM (NEC, CEC) | 4 × 500 MCM | 4 × 500 MCM | 4 × 500 MCM | 6 × 500 MCM |
| Width | mm | 503 | 503 | 503 | 909 |
| Height | mm | 1506 | 1506 | 1506 | 1510 |
| Depth | mm | 540 | | | |
| Weight, approx. | kg | 294 | 294 | 294 | 530 |

Note: The performance data in hp units are based on the NEC/CEC standards for the North American market.

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

## Power Modules

### Technical data (continued)

| *Line voltage 500 V to 600 V 3 AC* | | Power Modules 6SL3310-1GF34-7AA0 | 6SL3310-1GF35-8AA0 | 6SL3310-1GF37-4AA0 | 6SL3310-1GF38-1AA0 |
|---|---|---|---|---|---|
| Rated output current $I_{rated}$ | A | 465 | 575 | 735 | 810 |
| Base load current $I_L$ 1) | A | 452 | 560 | 710 | 790 |
| Base load current $I_H$ 2) | A | 416 | 514 | 657 | 724 |
| Rated power for $I_L$ | kW | **315** | **400** | **500** | **560** |
| Rated power for $I_H$ | kW | 250 | 315 | 450 | 500 |
| Rated power for $I_L$ at 60 Hz 575 V | hp | 450 | 500 | 700 | 800 |
| Rated power for $I_H$ at 60 Hz 575 V | hp | 450 | 500 | 600 | 700 |
| Max. current requirement (at 24 V DC) 3) | A | 1.0 | 1.0 | 1.25 | 1.25 |
| Max. current requirement for fan power supply at 50/60 Hz | A | 3.0/4.4 | 3.0/4.4 | 6.0/8.8 | 6.0/8.8 |
| Rated input current 4) | A | 483 | 598 | 764 | 842 |
| Power loss | kW | 7.3 | 8.1 | 12.0 | 13.3 |
| Cooling air requirement | $m^3/s$ | 0.78 | 0.78 | 1.48 | 1.48 |
| Degree of protection | | IP00 | | | |
| Sound pressure level $L_{pA}$ (1 m) at 50/60 Hz | dB | 70/73 | 70/73 | 73/75 | 73/75 |
| Line connection U1, V1, W1 | | Flanged connection with M12 screws | | | |
| Motor connection U2/T1, V2/T2, W2/T3 | | Flanged connection with M12 screws | | | |
| Max. cross-section for line and motor connections | $mm^2$ (DIN VDE) | 4 × 240 per connection | 4 × 240 per connection | 6 × 240 per connection | 6 × 240 per connection |
| | AWG/MCM (NEC, CEC) | 4 × 500 MCM per connection | 4 × 500 MCM per connection | 6 × 500 MCM per connection | 6 × 500 MCM per connection |
| PE1/GND or PE2/GND conductor | | M12 mounting screw | | | |
| Max. conductor cross-section for PE1/GND | $mm^2$ (DIN VDE) | 2 × 240 | 2 × 240 | 4 × 240 | 4 × 240 |
| | AWG/MCM (NEC, CEC) | 2 × 500 MCM | 2 × 500 MCM | 4 × 500 MCM | 4 × 500 MCM |
| Max. conductor cross-section for PE2/GND | $mm^2$ (DIN VDE) | 4 × 240 | 4 × 240 | 6 × 240 | 6 × 240 |
| | AWG/MCM (NEC, CEC) | 4 × 500 MCM | 4 × 500 MCM | 6 × 500 MCM | 6 × 500 MCM |
| Width | mm | 503 | 503 | 909 | 909 |
| Height | mm | 1506 | 1506 | 1510 | 1510 |
| Depth | mm | 540 | | | |
| Weight, approx. | kg | 294 | 294 | 530 | 530 |

Note: The performance data in hp units are based on the NEC/CEC standards for the North American market.

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

## Technical data (continued)

| *Line voltage 660 V to 690 V 3 AC* | | 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 power for $I_L$ | kW | **315** | **400** | **450** | **560** | **710** | **800** |
| Rated power for $I_H$ | kW | 250 | 315 | 400 | 450 | 630 | 710 |
| Max. current requirement (at 24 V DC) 3) | A | 0.9 | 1.0 | 1.0 | 1.0 | 1.25 | 1.25 |
| Max. current requirement for fan power supply at 50/60 Hz | A | 1.1/1.6 | 2.1/3.1 | 2.1/3.1 | 2.1/3.1 | 4.2/6.2 | 4.2/6.2 |
| Rated input current 4) | A | 343 | 426 | 483 | 598 | 764 | 842 |
| 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 |
| Sound pressure level $L_{pA}$ (1 m) at 50/60 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. cross-section for line and motor connections | $mm^2$ (DIN VDE) | 2 × 240 per connection | 4 × 240 per connection | 4 × 240 per connection | 4 × 240 per connection | 6 × 240 per connection | 6 × 240 per connection |
| | AWG/MCM (NEC, CEC) | 2 × 500 MCM per connection | 4 × 500 MCM per connection | 4 × 500 MCM per connection | 4 × 500 MCM per connection | 6 × 500 MCM per connection | 6 × 500 MCM per connection |
| 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 | $mm^2$ (DIN VDE) | 2 × 240 | 2 × 240 | 2 × 240 | 2 × 240 | 4 × 240 | 4 × 240 |
| | AWG/MCM (NEC, CEC) | 2 × 500 MCM | 2 × 500 MCM | 2 × 500 MCM | 2 × 500 MCM | 4 × 500 MCM | 4 × 500 MCM |
| Max. conductor cross-section for PE2/GND | $mm^2$ (DIN VDE) | 2 × 240 | 4 × 240 | 4 × 240 | 4 × 240 | 6 × 240 | 6 × 240 |
| | AWG/MCM (NEC, CEC) | 2 × 500 MCM | 4 × 500 MCM | 4 × 500 MCM | 4 × 500 MCM | 6 × 500 MCM | 6 × 500 MCM |
| Width | mm | 326 | 503 | 503 | 503 | 909 | 909 |
| 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 |

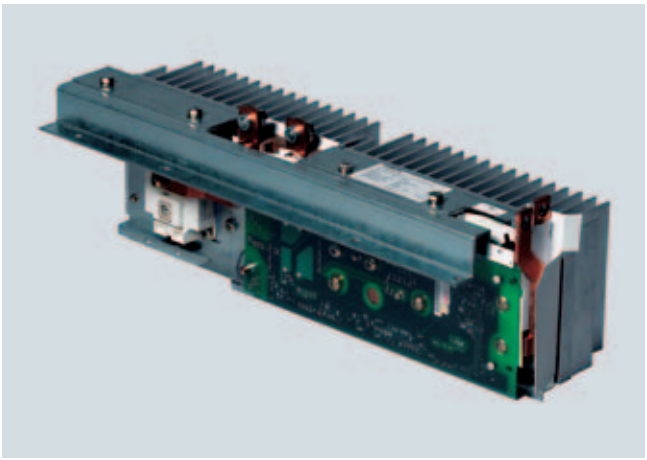
Note: The performance data in hp units are based on the NEC/CEC standards for the North American market.

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

## DC link components
## Braking Modules



### Overview



A Braking Module is required when the drive is to be occasionally braked or shut down in a controlled manner (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 power. 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.

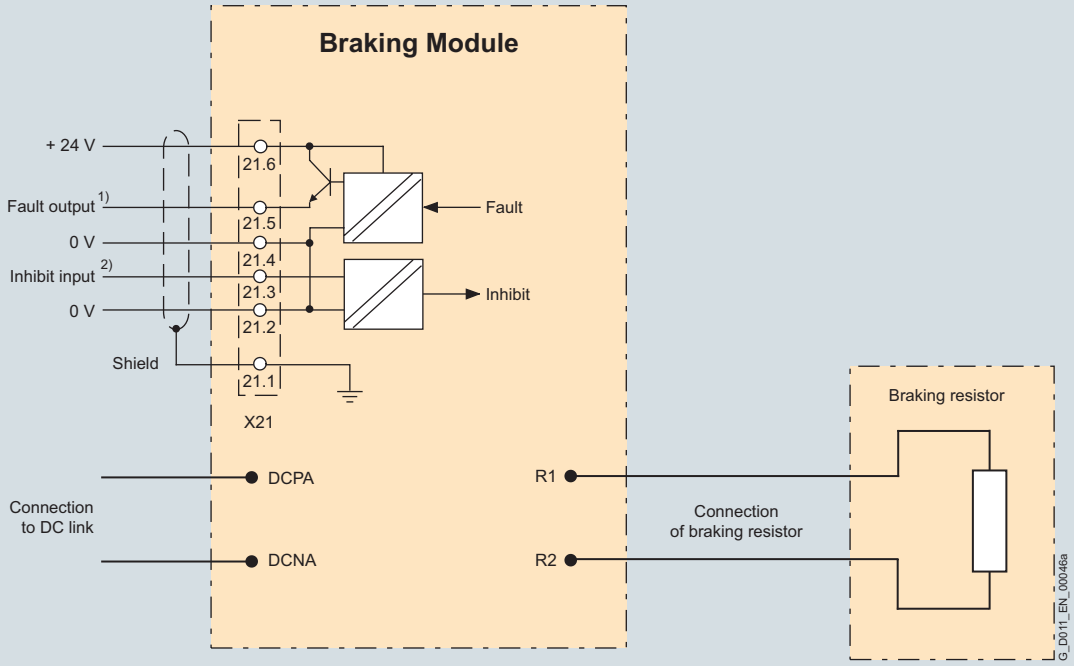
The Braking Module features the following interfaces as standard:

- DC link connection
- braking resistor connection terminal
- 1 digital input (disable Braking Module/acknowledge faults)
- 1 digital output (fault in Braking Module)
- PE (protective ground) connection.

### Selection and ordering data

| Suitable for Power Module | Rated power of the Power Module | Order No. **Braking Module** |
|---|---|---|
| **380 V to 480 V 3 AC** | | |
| 6SL3310-1GE36-1AA0 | 315 kW | **6SL3300-1AE32-5BA0** |
| 6SL3310-1GE37-5AA0 | 400 kW | |
| 6SL3310-1GE38-4AA0 | 450 kW | |
| 6SL3310-1GE41-0AA0 | 560 kW | |
| **500 V to 600 V 3 AC** | | |
| 6SL3310-1GF34-7AA0 | 315 kW | **6SL3300-1AF32-5BA0** |
| 6SL3310-1GF35-8AA0 | 400 kW | |
| 6SL3310-1GF37-4AA0 | 500 kW | |
| 6SL3310-1GF38-1AA0 | 560 kW | |
| **660 V to 690 V 3 AC** | | |
| 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




1) Significance of signals at fault output:
1 = ready for operation
2 = fault

2) Double function of inhibit input:
- inhibit Braking Module by means of high signal
- fault acknowledgement with negative edge high → low

Connection diagram for Braking Module

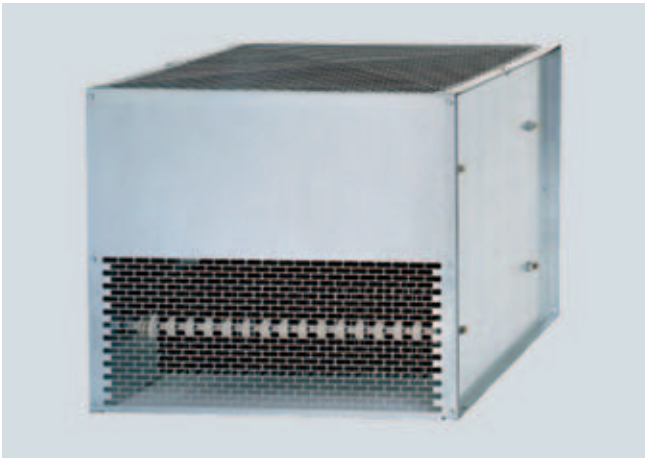
## DC link components
## Braking Modules

### Technical data

| Braking Module | | 6SL3300-1AE32-5BA0 | 6SL3300-1AF32-5BA0 | 6SL3300-1AH32-5AA0 | 6SL3300-1AH32-5BA0 |
|---|---|---|---|---|---|
| *Line voltage of the Power Module* | | *380 V to 480 V 3 AC* | *500 V to 600 V 3 AC* | *660 V to 690 V 3 AC* | *660 V to 690 V 3 AC* |
| $P_{DB}$ rated power | kW | 50 | | | |
| $P_{40}$ power | kW | 100 | | | |
| $P_{20}$ power | kW | 200 | | | |
| $P_{15}$ power | 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 (typ. at 24 V DC) | mA | 10 | | | |
| • Max. connectable cross-section | $mm^2$ | 1.5 | | | |
| Digital output (continued 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 | 306 | 255 | 255 |
| Design in accordance with | | UL and IEC | UL and IEC | IEC | IEC |
| Terminal/R1/R2 | | M8 mounting screw | | | |
| Max. conductor cross-section R1/R2 | $mm^2$ | 50 | | | |
| Width | mm | 152 | 152 | 120 | 152 |
| Height | mm | 140 | 140 | 130 | 140 |
| Depth | mm | 472 | 472 | 500 | 472 |
| Weight, approx. | kg | 7.5 | 7.5 | 7.3 | 7.5 |

| Power | |
|---|---|
| $P_{DB}$ | Rated power (continuous braking power) |
| $P_{40} = 2 \times P_{DB}$ | 40 s power related to a braking interval of 90 s |
| $P_{20} = 4 \times P_{DB}$ | 20 s power related to a braking interval of 90 s |
| $P_{15} = 5 \times P_{DB}$ | 15 s power related to a braking interval of 90 s |

## Overview



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

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

A resistor with 50 kW ($P_{20}$ power: 200 kW) is provided for braking.

Greater power ranges 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** | **6SL3000-1BF32-5AA0** | **6SL3000-1BH32-5AA0** |
|---|---|---|---|---|
| ***Line voltage of the Power Module*** | | ***380 V to 480 V 3 AC*** | ***500 V to 600 V 3 AC*** | ***660 V to 690 V 3 AC*** |
| $P_{DB}$ rated power (continuous braking power) | kW | 50 | | |
| $P_{40}$ power | kW | 100 | | |
| $P_{20}$ power | kW | 200 | | |
| $P_{15}$ power | kW | 250 | | |
| Resistor | Ohm | 2.2 ±7.5% | 3.4 ±7.5% | 4.9 ±7.5% |
| Max. current | A | 378 | 306 | 255 |
| Max. connectable cable cross-section | $mm^2$ | 70 | | |
| Cable gland | | Via M50 cable gland | | |
| Power 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

| Line voltage of the Power Module | Order No. **Braking resistor** |
|---|---|
| 380 V to 480 V 3 AC | **6SL3000-1BE32-5AA0** |
| 500 V to 600 V 3 AC | **6SL3000-1BF32-5AA0** |
| 660 V to 690 V 3 AC | **6SL3000-1BH32-5AA0** |

# Load-side power components
# Motor reactors



## Overview

Motor reactors reduce the voltage load on the motor windings by reducing the voltage gradients on the motor terminals generated when the converter is used. At the same time, the capacitive charge/discharge currents that occur at the converter output when long motor cables are used are reduced. The maximum permissible output frequency when a motor reactor is used is 150 Hz.

The motor reactor must be installed as close as possible to the Power Module.

## Selection and ordering data

| Rated power of the Power Module | Suitable for Power Module | Order No. **Motor reactor** |
|---|---|---|
| **380 V to 480 V 3 AC** | | |
| 315 kW | 6SL3310-1GE36-1AA0 | **6SL3000-2AE36-1AA0** |
| 400 kW | 6SL3310-1GE37-5AA0 | **6SL3000-2AE38-4AA0** |
| 450 kW | 6SL3310-1GE38-4AA0 | |
| 560 kW | 6SL3310-1GE41-0AA0 | **6SL3000-2AE41-0AA0** |
| **500 V to 600 V 3 AC** | | |
| 315 kW | 6SL3310-1GF34-7AA0 | **6SL3000-2AH34-7AA0** |
| 400 kW | 6SL3310-1GF35-8AA0 | **6SL3000-2AH35-8AA0** |
| 500 kW | 6SL3310-1GF37-4AA0 | **6SL3000-2AH38-1AA0** |
| 560 kW | 6SL3310-1GF38-1AA0 | |
| **660 V to 690 V 3 AC** | | |
| 315 kW | 6SL3310-1GH33-3AA0 | **6SL3000-2AH33-6AA0** |
| 400 kW | 6SL3310-1GH34-1AA0 | **6SL3000-2AH34-5AA0** |
| 450 kW | 6SL3310-1GH34-7AA0 | **6SL3000-2AH34-7AA0** |
| 560 kW | 6SL3310-1GH35-8AA0 | **6SL3000-2AH35-8AA0** |
| 710 kW | 6SL3310-1GH37-4AA0 | **6SL3000-2AH38-1AA0** |
| 800 kW | 6SL3310-1GH38-1AA0 | |

## Technical data

| ***Line voltage 380 V to 480 V 3 AC*** | | **Motor reactor** (for pulse frequencies of 4 kHz and 2 kHz) **6SL3000-2AE36-1AA0** | **6SL3000-2AE38-4AA0** | **6SL3000-2AE38-4AA0** | **6SL3000-2AE41-0AA0** |
|---|---|---|---|---|---|
| Suitable for **Power Module** | Type | 6SL3310-1GE36-1AA0 | 6SL3310-1GE37-5AA0 | 6SL3310-1GE38-4AA0 | 6SL3310-1GE41-0AA0 |
| Rated power of the Power Module | kW | 315 | 400 | 450 | 560 |
| Rated current | A | 605 | 745 | 840 | 985 |
| Power loss | kW | 0.9 | 0.83 | 0.943 | 1.062 |
| Line/power connection | | M12 | | | |
| PE connection | | M8 | M10 | M10 | M10 |
| Max. permissible cable length between motor reactor and motor | m | 300 (shielded)<br>450 (unshielded) | | | |
| Degree of protection | | IP00 | | | |
| Width | mm | 410 | | | |
| Height | mm | 392 | | | |
| Depth | mm | 292 | 292 | 292 | 302 |
| Weight, approx. | kg | 130 | 140 | 140 | 146 |

## Technical data (continued)

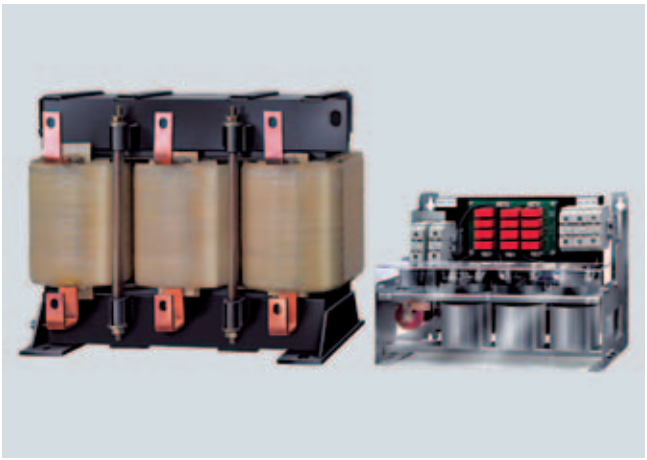
| *Line voltage 500 V to 600 V 3 AC* | | **Motor reactor** (for pulse frequencies of 4 kHz and 2 kHz) | | | |
|---|---|---|---|---|---|
| | | **6SL3000-2AH34-7AA0** | **6SL3000-2AH35-8AA0** | **6SL3000-2AH38-1AA0** | |
| Suitable for **Power Module** | Type | 6SL3310-1GF34-7AA0 | 6SL3310-1GF35-8AA0 | 6SL3310-1GF37-4AA0 | 6SL3310-1GF38-1AA0 |
| Rated power of the Power Module | kW | 315 | 400 | 500 | 560 |
| Rated current | A | 465 | 575 | 735 | 810 |
| Power loss | kW | 0.62 | 0.8 | 0.96 | 1.0 |
| Line/power connection | | M12 | | | |
| PE connection | | M8 | | | |
| Max. permissible cable length between motor reactor and motor | m | 300 (shielded)<br>450 (unshielded) | | | |
| Degree of protection | | IP00 | | | |
| Width | mm | 410 | | | |
| Height | mm | 392 | | | |
| Depth | mm | 292 | 292 | 279 | 279 |
| Weight, approx. | kg | 80 | 80 | 146 | 146 |

| *Line voltage 660 V to 690 V 3 AC* | | **Motor reactor** (for pulse frequencies of 2.5 kHz and 1.25 kHz) | | | | | |
|---|---|---|---|---|---|---|---|
| | | **6SL3000-2AH33-6AA0** | **6SL3000-2AH34-5AA0** | **66SL3000-2AH34-7AA0** | **6SL3000-2AH35-8AA0** | **6SL3000-2AH38-1AA0** | |
| Suitable for **Power Module** | Type | 6SL3310-1GH33-3AA0 | 6SL3310-1GH34-1AA0 | 6SL3310-1GH34-7AA0 | 6SL3310-1GH35-8AA0 | 6SL3310-1GH37-4AA0 | 6SL3310-1GH38-1AA0 |
| Rated power of the Power Module | kW | 315 | 400 | 450 | 560 | 710 | 800 |
| Rated current | A | 330 | 410 | 465 | 575 | 735 | 810 |
| Power loss | kW | 0.45 | 0.545 | 0.62 | 0.8 | 0.96 | 1.0 |
| Line/power connection | | M10 | M12 | M12 | M12 | M12 | M12 |
| PE connection | | M6 | M8 | M8 | M8 | M8 | M8 |
| Max. permissible cable length between motor reactor and motor | m | 300 (shielded)<br>450 (unshielded) | | | | | |
| Degree of protection | | IP00 | | | | | |
| Width | mm | 300 | 350 | 410 | 410 | 410 | 410 |
| Height | mm | 285 | 330 | 392 | 392 | 392 | 392 |
| Depth | mm | 212 | 215 | 292 | 292 | 279 | 279 |
| Weight, approx. | kg | 43 | 56 | 80 | 80 | 146 | 146 |

# Load-side power components
# dv/dt filter plus VPL



## Overview



The dv/dt filter plus VPL consists of two components: the dv/dt reactor and the VPL (**V**oltage **P**eak **L**imiter), which limits voltage peaks and returns the energy to the DC link.

The dv/dt filter plus VPL is to be used for motors for which the voltage endurance of the insulation system is unknown or insufficient. Standard motors of the 1LA5, 1LA6 and 1LA8 series only require them at supply voltages > 500 V +10%.

The dv/dt filter plus VPL limits the rate of voltage rise to values < 500 V/µs and the typical voltage peaks at rated line voltages to the values below (with motor cable lengths < 150 m):

< 1000 V at $V_{line}$ < 575 V

< 1250 V at 660 V < $V_{line}$ < 690 V.

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

## Selection and ordering data

| Rated power of the Power Module | Suitable for Power Module | Order No. **dv/dt filter plus VPL** |
|---|---|---|
| **380 V to 480 V 3 AC** | | |
| 315 kW | 6SL3310-1GE36-1AA0 | **6SL3000-2DE38-4AA0** |
| 400 kW | 6SL3310-1GE37-5AA0 | |
| 450 kW | 6SL3310-1GE38-4AA0 | |
| 560 kW | 6SL3310-1GE41-0AA0 | **6SL3000-2DE41-4AA0** |
| **500 V to 600 V 3 AC** | | |
| 315 kW | 6SL3310-1GF34-7AA0 | **6SL3000-2DH35-8AA0** |
| 400 kW | 6SL3310-1GF35-8AA0 | |
| 500 kW | 6SL3310-1GF37-4AA0 | **6SL3000-2DH38-1AA0** |
| 560 kW | 6SL3310-1GF38-1AA0 | |
| **660 V to 690 V 3 AC** | | |
| 315 kW | 6SL3310-1GH33-3AA0 | **6SL3000-2DH33-3AA0** |
| 400 kW | 6SL3310-1GH34-1AA0 | **6SL3000-2DH34-1AA0** |
| 450 kW | 6SL3310-1GH34-7AA0 | **6SL3000-2DH35-8AA0** |
| 560 kW | 6SL3310-1GH35-8AA0 | |
| 710 kW | 6SL3310-1GH37-4AA0 | **6SL3000-2DH38-1AA0** |
| 800 kW | 6SL3310-1GH38-1AA0 | |

## Technical data

| ***Line voltage 380 V to 480 V 3 AC*** | | **dv/dt filter plus VPL 6SL3000-2DE38-4AA0** | | | **6SL3000-2DE41-4AA0** |
|---|---|---|---|---|---|
| Suitable for **Power Module** | Type | 6SL3310-1GE36-1AA0 | 6SL3310-1GE37-5AA0 | 6SL3310-1GE38-4AA0 | 6SL3310-1GE41-0AA0 |
| Rated power of the Power Module | kW | 315 | 400 | 450 | 560 |
| **dv/dt reactor** | | | | | |
| $I_{thmax}$ | A | 840 | 840 | 840 | 1405 |
| Power loss | kW | 0.80 | 0.86 | 0.90 | 0.90 |
| Line/power connection | | M12 connection lugs | | | |
| Degree of protection | | IP00 | | | |
| Width | mm | 460 | 460 | 460 | 445 |
| Height | mm | 385 | 385 | 385 | 385 |
| Depth | mm | 312 | 312 | 312 | 312 |
| Weight, approx. | kg | 149 | 149 | 149 | 158 |
| **Voltage peak limiter (VPL)** | | | | | |
| $I_{thmax}$ | A | 840 | 840 | 840 | 1405 |
| Power loss | kW | 0.08 | 0.10 | 0.10 | 0.134 |
| Load/DC connection | | M8 connection lugs | M8 connection lugs | M8 connection lugs | M10 connection lugs |
| Degree of protection | | IP00 | | | |
| Width | mm | 310 | | | |
| Height | mm | 1315 | | | |
| Depth | mm | 400 | | | |
| Weight, approx. | kg | 48 | 48 | 48 | 72 |

Note: Two dv/dt reactors are required for Power Modules with a rated power of 560 kW. The listed technical data relates to one dv/dt reactor.

## Technical data (continued)

| *Line voltage 500 V to 600 V 3 AC* | | dv/dt filter plus VPL 6SL3000-2DH35-8AA0 | | 6SL3000-2DH38-1AA0 | |
|---|---|---|---|---|---|
| Suitable for **Power Module** | Type | 6SL3310-1GF34-7AA0 | 6SL3310-1GF35-8AA0 | 6SL3310-1GF37-4AA0 | 6SL3310-1GF38-1AA0 |
| Rated output of the Power Module | kW | 315 | 400 | 500 | 560 |
| **dv/dt reactor** | | | | | |
| $I_{thmax}$ | A | 575 | 575 | 810 | 810 |
| Power loss | kW | 0.65 | 0.72 | 0.66 | 0.70 |
| Line/power connection | | M12 connection lugs | | | |
| Degree of protection | | IP00 | | | |
| Width | mm | 460 | 460 | 445 | 445 |
| Height | mm | 385 | | | |
| Depth | mm | 312 | | | |
| Weight, approx. | kg | 172 | 172 | 160 | 160 |
| **Voltage peak limiter (VPL)** | | | | | |
| $I_{thmax}$ | A | 575 | 575 | 810 | 810 |
| Power loss | kW | 0.063 | 0.063 | 0.102 | 0.106 |
| Load/DC connection | | M8 connection lugs | M8 connection lugs | M10 connection lugs | M10 connection lugs |
| Degree of protection | | IP00 | | | |
| Width | mm | 310 | | | |
| Height | mm | 1315 | | | |
| Depth | mm | 345 | | | |
| Weight, approx. | kg | 48 | 48 | 72 | 72 |

Note: Two dv/dt reactors are required for Power Modules with a rated power of 500 kW and 560 kW. The listed technical data relates to one dv/dt reactor.

| *Line voltage 660 V to 690 V 3 AC* | | dv/dt filter plus VPL 6SL3000-2DH33-3AA0 | 6SL3000-2DH34-1AA0 | 6SL3000-2DH35-8AA0 | | 6SL3000-2DH38-1AA0 | |
|---|---|---|---|---|---|---|---|
| Suitable for **Power Module** | Type | 6SL3310-1GH33-3AA0 | 6SL3310-1GH34-1AA0 | 6SL3310-1GH34-7AA0 | 6SL3310-1GH35-8AA0 | 6SL3310-1GH37-4AA0 | 6SL3310-1GH38-1AA0 |
| Rated output of the Power Module | kW | 315 | 400 | 450 | 560 | 710 | 800 |
| **dv/dt reactor** | | | | | | | |
| $I_{thmax}$ | A | 330 | 419 | 575 | 575 | 810 | 810 |
| Power loss | kW | 0.48 | 0.67 | 0.72 | 0.72 | 0.66 | 0.70 |
| Line/power connection | | M10 connection lugs | M12 connection lugs | M12 connection lugs | M12 connection lugs | M12 connection lugs | M12 connection lugs |
| Degree of protection | | IP00 | | | | | |
| Width | mm | 460 | 460 | 460 | 460 | 445 | 445 |
| Height | mm | 360 | 385 | 385 | 385 | 385 | 385 |
| Depth | mm | 275 | 312 | 312 | 312 | 312 | 312 |
| Weight, approx. | kg | 135 | 147 | 172 | 172 | 160 | 160 |
| **Voltage peak limiter (VPL)** | | | | | | | |
| $I_{thmax}$ | A | 330 | 419 | 575 | 575 | 810 | 810 |
| Power loss | kW | 0.042 | 0.051 | 0.059 | 0.063 | 0.102 | 0.106 |
| Load/DC connection | | 70 $mm^2$ terminal | M8 connection lugs | M8 connection lugs | M8 connection lugs | M10 connection lugs | M10 connection lugs |
| Degree of protection | | IP00 | | | | | |
| Width | mm | 400 | 310 | 310 | 310 | 310 | 310 |
| Height | mm | 285 | 1315 | 1315 | 1315 | 1315 | 1315 |
| Depth | mm | 210 | 400 | 400 | 400 | 400 | 400 |
| Weight, approx. | kg | 16 | 48 | 48 | 48 | 72 | 72 |

Note: Two dv/dt reactors are required for Power Modules with a rated power of 710 kW and 800 kW. The listed technical data relates to one dv/dt reactor.

# Control Unit Kit



## 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 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 RS 232 interface
- 1 x option slot
- 3 x test sockets and one reference ground for commissioning support
- 1 x connection for the electronics power supply via the 24 V DC power supply connector
- 1 x PE (protective ground) 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 | |
|---|---|
| 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<br>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<br>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<br>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 |
| Ground connection | On housing with M5 screw |
| Width | 50 mm |
| Height | 270 mm |
| Depth | 226 mm |
| Weight, approx. | 1.5 kg |

## Selection and ordering data

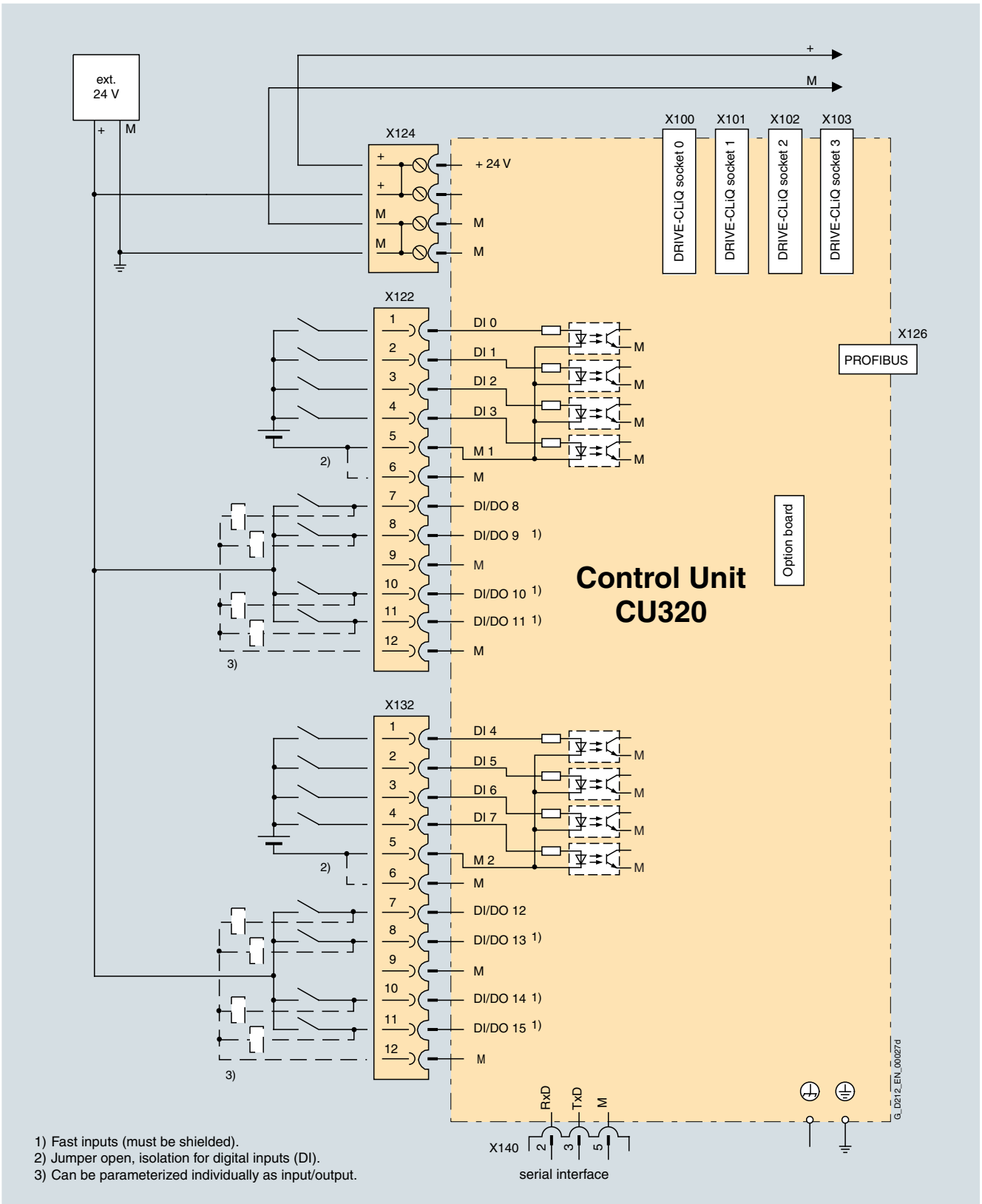
| Description | Order No. |
|---|---|
| **Control Unit Kit** consisting of:<br>• CU320 Control Unit<br>• CompactFlash card with the latest firmware<br>• Device documentation on CD-ROM | **6SL3040-0GA00-1AA0** |

## Accessories

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

## Integration

Communication between a CU320 Control Unit and the connected components takes place via DRIVE-CLiQ.




Connection diagram for CU320 Control Unit

# Supplementary system components
# TB30 Terminal Board



## 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 interfaces 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.

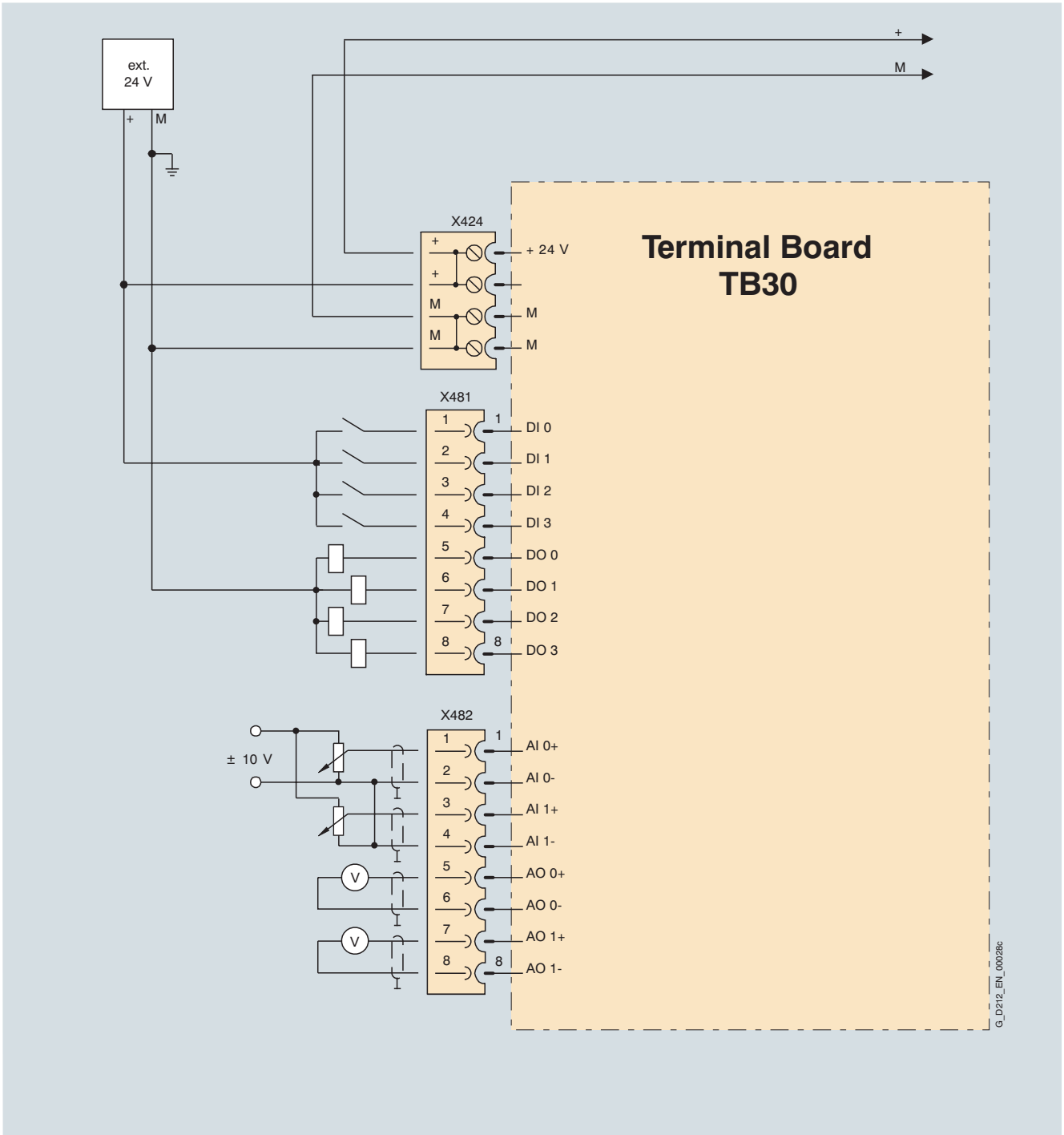
## Technical data

| TB30 Terminal Board | |
|---|---|
| Max. current requirement (at 24 V DC) via CU320 Control Unit without taking account of the 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<br>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 the TB30 Terminal Board

## Supplementary system components
## TM31 Terminal Module



### 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 ground) connection.

The TM31 Terminal Module can be snapped onto a 35 × 15/7.5 DIN rail in accordance with EN 50022.

The signal cable shield can be connected to the TM31 Terminal Module via a shield connection terminal, e.g. Phoenix Contact type SK8 or Weidmüller type KLBÜ CO 1. The shield connection terminal must not be used for strain relief.

The status of the TM31 Terminal Module is indicated via a multi-color LED.

### Selection and ordering data

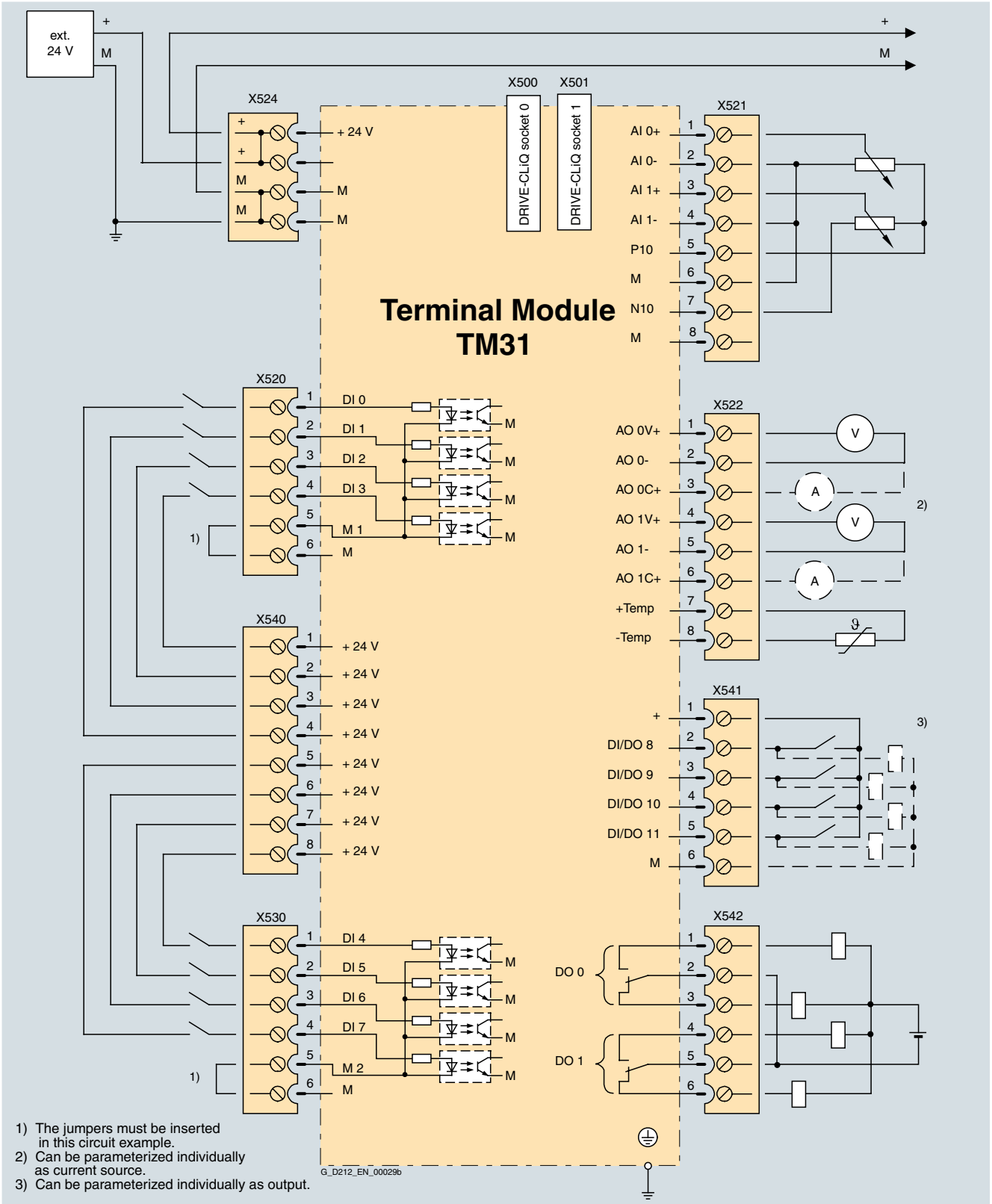
| Description | Order No. |
|---|---|
| **TM31 Terminal Module**<br>(without DRIVE-CLiQ cable) | **6SL3055-0AA00-3AA0** |

### 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<br>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 bis +20 mA |
| • Resolution | 11 bit + sign |
| • Max. connectable cross-section | 1.5 mm$^2$ |
| Relay outputs (changeover 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 phi = 1)<br>750 VA (cos phi = 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 |

## Integration

The TM31 Terminal Module communicates with the CU320 Control Unit via DRIVE-CLiQ.




1) The jumpers must be inserted in this circuit example.
2) Can be parameterized individually as current source.
3) Can be parameterized individually as output.

Connection diagram for the TM31 Terminal Module

## Supplementary system components
## SMC30 Sensor Module Cabinet-Mounted



### Overview

SMC30 Sensor Modules Cabinet-Mounted are required when a motor with a DRIVE-CLiQ interface is not available or when external sensors 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 temperature 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 or PTC) 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 ground) 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 in accordance with EN 50022.

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 0.5 $mm^2$.

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 requirement (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** (excluding DRIVE-CLiQ cable) | **6SL3055-0AA00-5CA0** |

## Overview


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

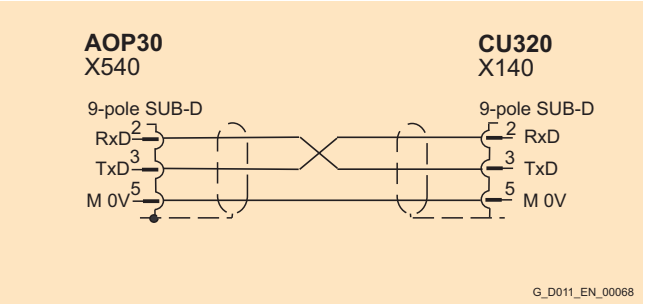
It has the following features and characteristics:

- 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 the RS 232 serial interface with PPI protocol.

The AOP30 may be omitted if the drive is only operated via PROFIBUS, for example, and no local display is required on the cabinet. The AOP30 can then be used simply for commissioning purposes and to obtain diagnostic information, in which case it is plugged into the RS 232 interface on the CU320 Control Unit.

An external 24 V power supply (max. power requirement 200 mA) is needed to run the AOP30. This can be tapped off from the Power Module's power supply (see also Configuration).




Assignment of the serial plug-in cable

## Design

The AOP30 is an operator panel with graphical display and membrane keypad. An RS 232 port is used as the interface to the drive unit. The device can be installed in a cabinet door with a thickness between 2 mm and 4 mm.

Features:

- display with green backlighting, resolution: 240 x 64 pixels
- 26-key membrane keypad
- connection for a 24 V power supply
- RS 232 interface
- time and data 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.

English, French, German, Italian and Spanish are stored on the CU320 Control Unit's CompactFlash card as operator panel languages. The desired language must be downloaded to the AOP30 prior to commissioning.

## Selection and ordering data

| Description | Order No. |
|---|---|
| **AOP30 advanced operator panel** | **6SL3055-0AA00-4CA2** |

## Accessories

| **RS 232 plug-in cable for connecting the AOP to the CU320** | Order No. |
|---|---|
| 1 m long | **6FX8002-1AA01-1AB0** |
| 2 m long | **6FX8002-1AA01-1AC0** |
| 3 m long | **6FX8002-1AA01-1AD0** |
| 4 m long | **6FX8002-1AA01-1AE0** |
| 5 m long | **6FX8002-1AA01-1AF0** |
| 6 m long | **6FX8002-1AA01-1AG0** |
| 7 m long | **6FX8002-1AA01-1AH0** |
| 8 m long | **6FX8002-1AA01-1AJ0** |
| 9 m long | **6FX8002-1AA01-1AK0** |
| 10 m long | **6FX8002-1AA01-1BA0** |

## Connection system MOTION-CONNECT 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. Pre-assembled cables are available for this purpose.

#### *MOTION-CONNECT DRIVE-CLiQ cables*

Pre-assembled 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 which have an external 24 V DC power supply.

#### *Serial cable for connecting the AOP30 to the CU320*

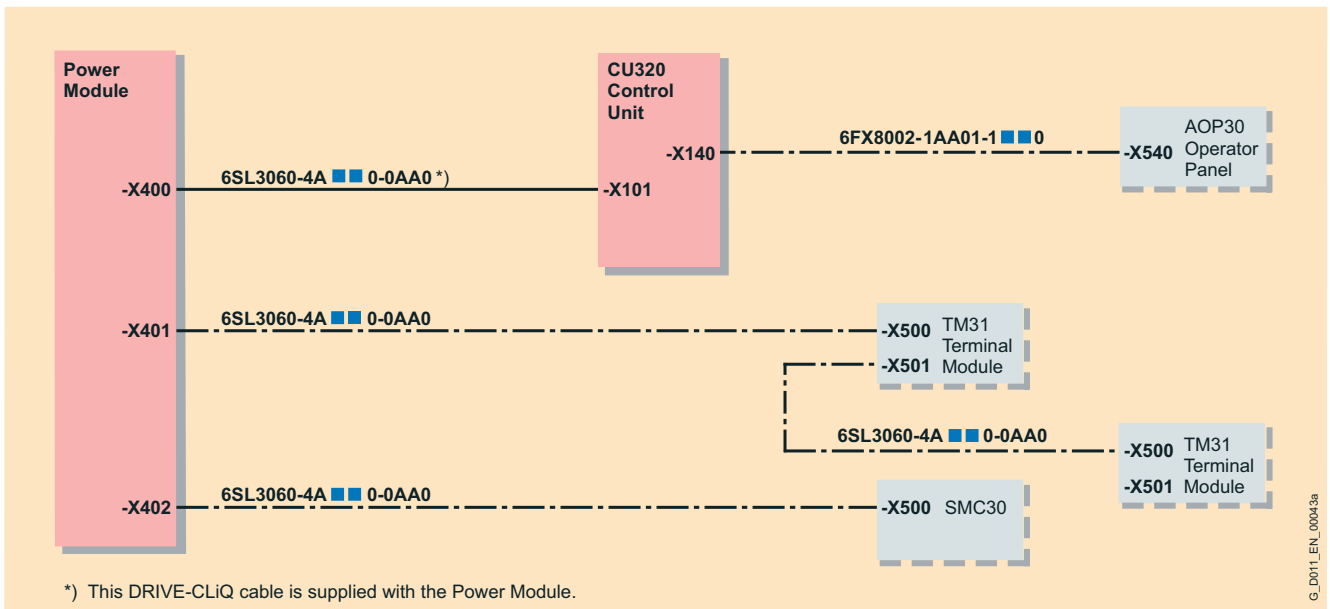
The AOP30 operator panel is connected to the CU320 Control Unit via a serial plug-in cable (RS 232 cable).

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. |
|---|---|---|
| Pre-assembled DRIVE-CLiQ cable<br>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** |

### Integration




*) This DRIVE-CLiQ cable is supplied with the Power Module.

Connection example - CU320 Control Unit

# SINAMICS G150
# Drive converter cabinet units

3

SINAMICS


| | |
|---|---|
| **3/2** | **Overview** |
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## SINAMICS G150 cabinet units

### Overview


SINAMICS G150 drive converter cabinet units, versions A and C

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

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 drive 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.

There are two versions of the drive converter cabinet units:

- *Version A*
  All available line connection components, such as the main switch, circuit-breakers, main contactor, line fuses, line filters, motor components, and additional monitoring devices, can be installed as required. This version is also available with power units connected in parallel.
- *Version C*
  This offers an extremely space-optimized structure without line-side components. This version can be used, for example, when line connection components are accommodated in a central low-voltage distribution panel (MCC) on the plant side.

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

| **Line voltage** | **Power** | **Power units connected in parallel** (version A only) |
|---|---|---|
| 380 V to 480 V 3 AC | 110 kW to 560 kW | 630 kW to 900 kW |
| 500 V to 600 V 3 AC | 110 kW to 560 kW | 630 kW to 1000 kW |
| 660 V to 690 V 3 AC | 75 kW to 800 kW | 1000 kW to 1500 kW |

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

### *Global use*

SINAMICS G150 drive converter cabinet units are manufactured in compliance with relevant international standards and regulations, 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.

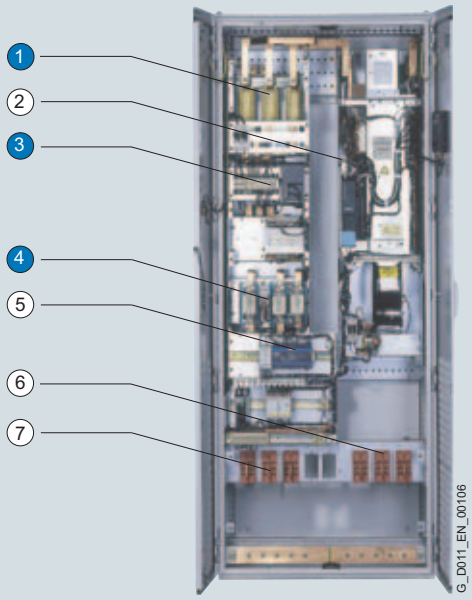
This means the following applications, in particular:

- 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).



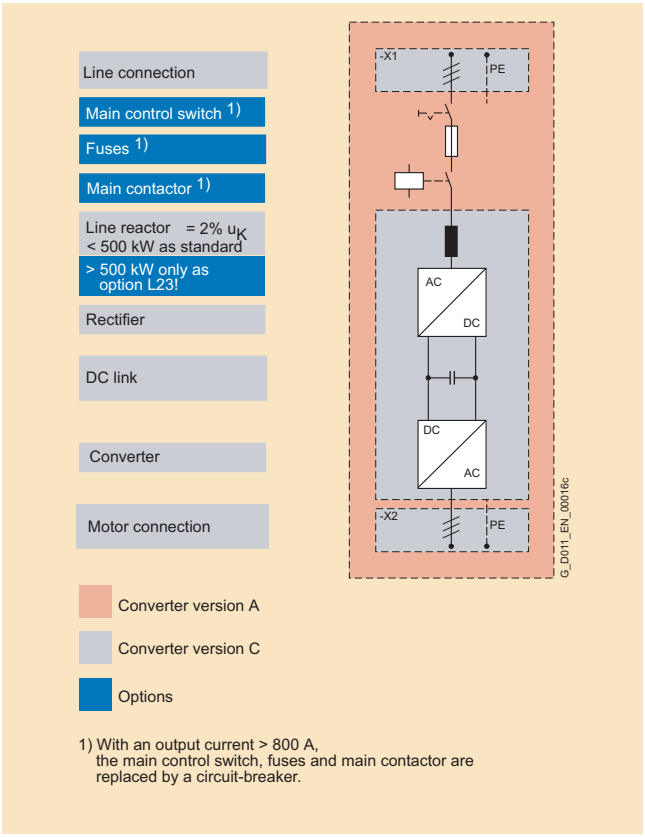

1 Line reactor (< 500 kW standard)
2 PROFIBUS connection
3 Main contactor
4 Main control switch with fuses
5 Customer's terminal block
6 Motor connection
7 Line connection

○ Standard version
● Options

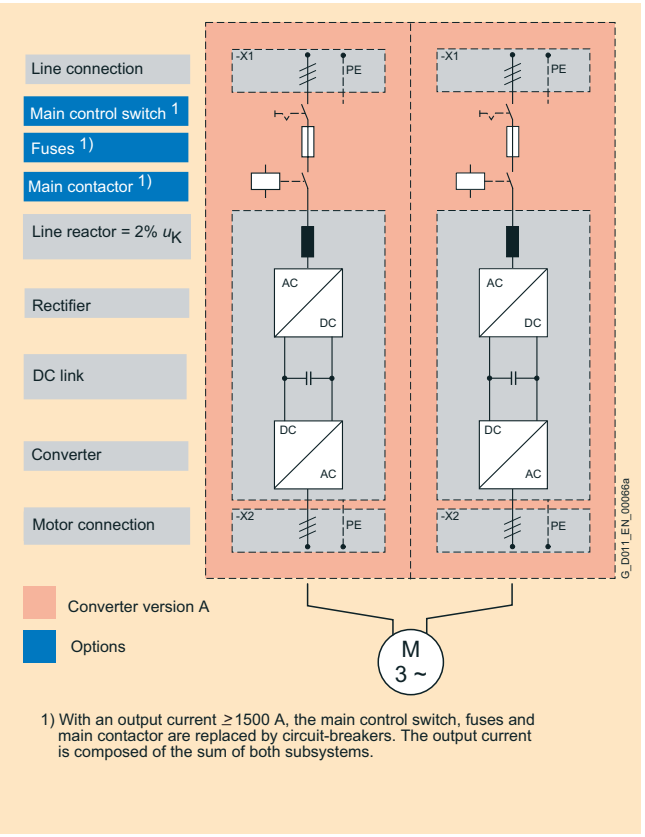
Example of design of a SINAMICS G150 drive converter cabinet unit, version A

## 75 kW to 1500 kW

### Design (continued)




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




Basic design of a SINAMICS G150 drive converter cabinet unit connected in parallel in order to increase power, with a number of version-specific options

## Function

### *AOP30 operator panel*


An AOP30 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. 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. 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 commissioned for the first time. The control is then optimized automatically to fine-tune the converter to the motor.

English, French, German, Italian and Spanish are stored on the CU320 Control Unit's CompactFlash card as operator panel languages. The desired languages must be downloaded to the AOP30 prior to commissioning. The currently desired language can be selected using parameters.

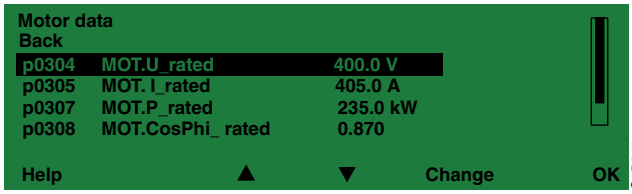
The following pictures show examples of plain-text displays in various operating phases.

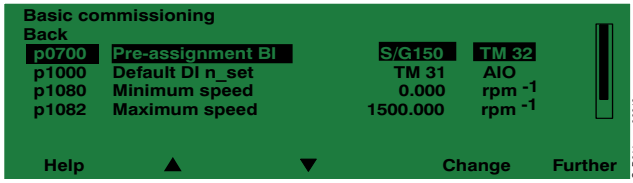
The **initial commissioning** is carried out using the operator panel.


Only 6 motor parameters have to be entered:

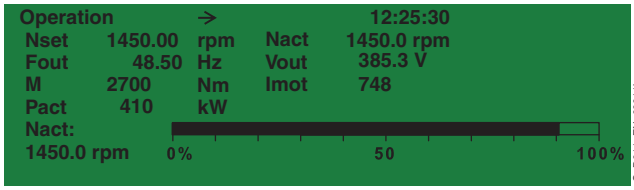
power, speed, current, cos phi, voltage and frequency of the motor.

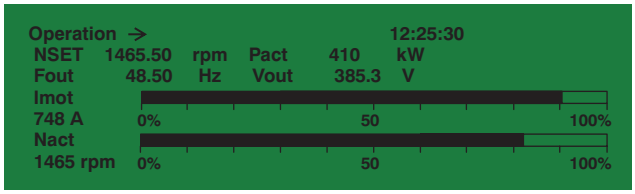
This information can be found on the motor rating plate and is entered into the screens on the display by following a short, menu-driven procedure. The type of motor cooling must be entered in addition.



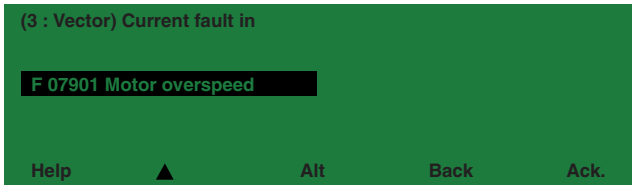



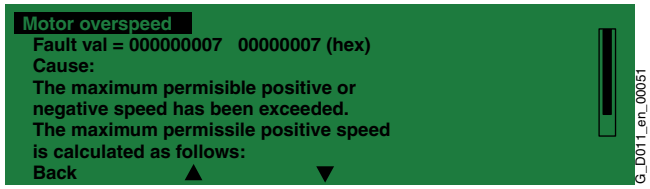

During **operation**, current data are output on the display as absolute values, such as setpoint and actual values, or it is possible to parameterize up to three process variables as a quasi-analog bar display.




Any **alarms** which occur are signaled by flashing of the yellow "ALARM" LED, **faults** by lighting up of the 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 (→ Configuration).

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

The converter 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 adjustable rounding times in the lower and upper speed ranges, improves the control response and therefore prevents 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)** | Line voltage 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 line voltage 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 bumpless connection of the converter to a rotating motor. |
| **Technology controller** | The technology controller function module allows simple control functions to be implemented, e.g. level control or volumetric flow control. The technology controller is designed as a PID controller, whereby the differentiator can be switched to the control deviation channel or the actual value channel (factory setting). The P, I, and D components can be set separately. |
| **$I^2t$ 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 unit protection** | |
| **Ground fault monitoring on the output side** | A ground fault on the output side is recognized by summation current monitoring and results in shutdown in grounded networks. |
| **Electronic short-circuit protection on output side** | A short-circuit (e.g. on the converter output terminals, in the motor cable or in the motor's terminal box) is detected on the output side and the converter switches off with a fault. |
| **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 parameterized)

## Technical data

| Electrical data | Simple connection | | Parallel connection |
|---|---|---|---|
| Line voltages and power ranges | • 380 V to 480 V 3 AC, ±10% (-15% < 1 min) 110 kW to 560 kW | | 630 kW to 900 kW |
| | • 500 V to 600 V 3 AC, ±10% (-15% < 1 min) 110 kW to 560 kW | | 630 kW to 1000 kW |
| | • 660 V to 690 V 3 AC, ±10% (-15% < 1 min) 75 kW to 800 kW | | 1000 kW to 1500 kW |
| Supply systems | TN/TT systems or isolated systems (IT systems) | | |
| Line frequency | 47 Hz to 63 Hz | | |
| Output frequency | 0 Hz to 300 Hz (*f* > 100 Hz: derating required) | | |
| 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, parameterizable (in the default setting, 3 fixed setpoints plus 1 minimum speed are selectable using terminal block/PROFIBUS) | | |
| Skipped speed ranges | 4, parameterizable | | |
| 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 [1] | In accordance with EN 50178, Part 1 | | |
| Cooling method | Forced air ventilation | | |
| Sound pressure level $L_{pA}$ (1 m) | ≤ 72 dB at 50 Hz line frequency | | ≤ 75 dB |
| Shock protection | BGV A3 | | |
| Cabinet system | Rittal TS 8, doors with double-barb lock, three-section base plates for cable entry | | |
| Paint finish | RAL 7035 (indoor requirements) | | |
| **Compliance with standards** | | | |
| Standards | [1] EN 50178 | | |
| | [2] EN 60146-1, EN 61800-2, EN 61800-3, EN 60204-1, EN 60529 | | |
| CE marking | In accordance with EMC directive No. 89/336/EC and low voltage directive No. 73/23/EC | | |
| RI suppression | In accordance with EMC product standard for variable-speed drives EN 61800-3, "second environment", "first environment" on request | | |
| | **Storage** | **Transport** | **Operation** |
| **Ambient conditions** | | | |
| Ambient temperature | -25 °C to +55 °C | -25 °C to +70 °C<br>from -40 °C for 24 hours | 0 °C to +40 °C<br>up to +50 °C, see derating data |
| Relative humidity [2] (non-condensing) | 5% to 95% | 5% to 95% at 40 °C | 5% to 95% |
| | Class 1K4 to EN 60721-3-1 | Class 2K3 to EN 60721-3-2 | Class 3K3 to EN 60721-3-3 |
| Environmental class/harmful chemical substances [2] | Class 1C2 to EN 60721-3-1 | Class 2C2 to EN 60721-3-2 | Class 3C2 to EN 60721-3-3 |
| Organic/biological influences [2] | Class 1B1 to EN 60721-3-1 | Class 2B1 to EN 60721-3-2 | Class 3B1 to EN 60721-3-3 |
| Installation altitidue | Up to 2000 m above sea level without derating, > 2000 m, see derating data | | |
| **Strain resistance** | | | |
| Vibratory load [2] | | | |
| - Deflection | 1.5 mm at 5 Hz to 9 Hz | 3.1 mm at 5 Hz to 9 Hz | 0.075 mm at 10 Hz to 58 Hz |
| - Acceleration | 5 m/s$^2$ at > 9 Hz to 200 Hz | 10 m/s$^2$ at > 9 Hz to 200 Hz | 10 m/s$^2$ at > 58 Hz to 200 Hz |
| | Class 1M2 to EN 60721-3-1 | Class 2M2 to EN 60721-3-2 | – |
| Shock load [2] | | | |
| - Acceleration | 40 m/s$^2$ at 22 ms | 100 m/s$^2$ at 11 ms | 100 m/s$^2$ at 11 ms |
| | Class 1M2 to EN 60721-3-1 | Class 2M2 to EN 60721-3-2 | Class 3M4 to EN 60721-3-3 |

Deviations from the defined classes are identified by underlining.

1) The EN standard specified is the European edition of international standard IEC 62103.

2) The EN standards specified are the European editions of the international IEC standards with the same designations.

## 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 in accordance with 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 drive converter cabinet unit).

| 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% | 100% | 100% | 100% | 100% | 95.0% | 87.0% |
| 2001-2500 | 100% | 100% | 100% | 100% | 96.3% | 91.4% | 83.7% |
| 2501-3000 | 100% | 100% | 100% | 96.2% | 92.5% | 87.9% | 80.5% |
| 3001-3500 | 100% | 100% | 96.7% | 92.3% | 88.8% | 84.3% | 77.3% |
| 3501-4000 | 100% | 97.8% | 92.7% | 88.4% | 85.0% | 80.8% | 74.0% |

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

| 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% | 100% | 100% | 100% | 95.0% | 87.5% | 80.0% |
| 2001-2500 | 100% | 100% | 100% | 96.3% | 91.4% | 84.2% | 77.0% |
| 2501-3000 | 100% | 100% | 96.2% | 92.5% | 87.9% | 81.0% | 74.1% |
| 3001-3500 | 100% | 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 (inlet air temperature) 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 in accordance with the following table with **installation altitudes > 2000 m** above sea level

| Installation altitude above sea level | **Voltage derating** for a rated input voltage of | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| m | 380 V | 400 V | 420 V | 440 V | 460 V | 480 V | 500 V | 525 V | 550 V | 575 V | 600 V | 660 V | 690 V |
| 0-2000 | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% |
| 2001-2250 | 100% | 100% | 100% | 100% | 100% | 96% | 100% | 100% | 100% | 100% | 97% | 100% | 96% |
| 2251-2500 | 100% | 100% | 100% | 100% | 98% | 94% | 100% | 100% | 100% | 98% | 94% | 98% | 94% |
| 2501-2750 | 100% | 100% | 100% | 98% | 94% | 90% | 100% | 100% | 99% | 95% | 91% | 95% | 90% |
| 2751-3000 | 100% | 100% | 100% | 95% | 91% | 88% | 100% | 100% | 96% | 92% | 88% | 92% | 88% |
| 3001-3250 | 100% | 100% | 97% | 93% | 89% | 85% | 100% | 98% | 93% | 89% | 85% | 89% | 85% |
| 3251-3500 | 100% | 98% | 93% | 89% | 85% | 82% | 99% | 94% | 90% | 86% | 83% | 85% | 82% |
| 3501-3750 | 100% | 95% | 91% | 87% | 83% | 79% | 96% | 91% | 87% | 83% | 80% | – | – |
| 3751-4000 | 96% | 92% | 87% | 83% | 80% | 76% | 92% | 88% | 84% | 80% | 77% | – | – |

Voltage derating depending on installation altitude

## Technical data (continued)

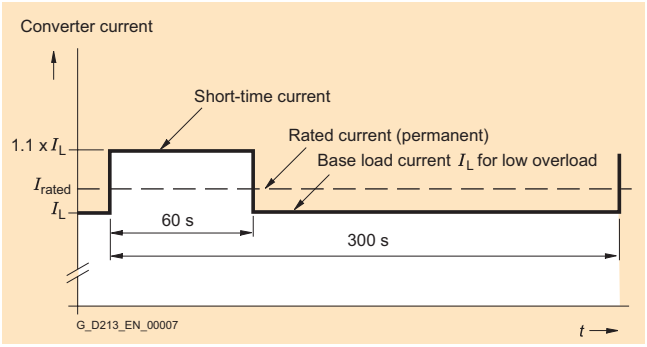
### Overload capability

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.

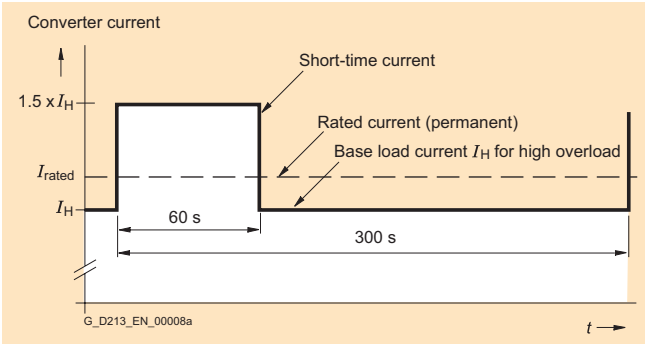
The criterion for overload is that the drive is operated with its base load current before and after the overload occurs, and a load duration of 300 s is assumed here.

The base load current $I_L$ for a low 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.




Low overload




High overload

### EMC guidelines

The electromagnetic compatibility describes – in accordance with 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 61800-3. 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 61800-3 defines different limits depending on the location of the drive system, referred to as the first and second environment.

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 61800-3 Ed.2 depending on the location and the power of the drive:

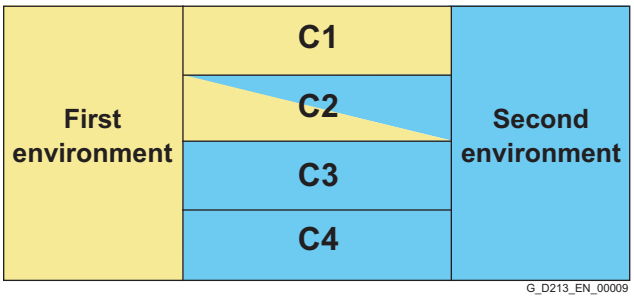
**Category C1:** Drive systems for rated voltages < 1000 V for unlimited use in the first environment.

**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 environment:




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

To limit **emitted interference**, the SINAMICS G150 drive converter cabinet units are equipped as standard with a radio interference suppression filter in accordance with the limit values specified in category C3. This means that they meet the requirements for industrial use. Optional filters are available on request for use in the first environment (category C2).

SINAMICS G150 drive converter cabinet units fulfill the requirements for **noise immunity** defined in EN 61800-3 for the second environment and consequently also the lower noise immunity values in the first environment.

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

## Technical data (continued)

### *Technical data for simple connection*

| *Line voltage 380 V to 480 V 3 AC* | | SINAMICS G150 drive converter cabinet units Type 6SL3710-1GE..-.... | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | **32-1...** | **32-6...** | **33-1...** | **33-8...** | **35-0...** | **36-1...** | **37-5...** | **38-4...** | **41-0...** |
| Rated output current $I_{rated}$ | A | 210 | 260 | 310 | 380 | 490 | 605 | 745 | 840 | 985 |
| Base load current $I_L$ 1) | A | 205 | 250 | 302 | 370 | 477 | 590 | 725 | 820 | 960 |
| Base load current $I_H$ 2) | A | 178 | 233 | 277 | 340 | 438 | 460 | 570 | 700 | 860 |
| Power for $I_L$ at 400 V | kW | **110** | **132** | **160** | **200** | **250** | **315** | **400** | **450** | **560** |
| Power for $I_H$ at 400 V | kW | 90 | 110 | 132 | 160 | 200 | 250 | 315 | 400 | 450 |
| Power for $I_L$ at 60 Hz 460 V | hp | 150 | 200 | 250 | 300 | 400 | 500 | 600 | 600 | 800 |
| Power for $I_H$ at 60 Hz 460 V | hp | 125 | 150 | 200 | 250 | 350 | 350 | 450 | 500 | 700 |
| Max. current requirement 3) (at 24 V DC) | A | 1.1 | 1.1 | 1.35 | 1.35 | 1.35 | 1.4 | 1.4 | 1.4 | 1.5 |
| Rated input current 4) | A | 239 | 294 | 348 | 405 | 519 | 639 | 785 | 883 | 1034 |
| Power loss | kW | 2.9 | 3.8 | 4.4 | 5.3 | 6.4 | 8.2 | 9.6 | 10.1 | 14.4 |
| Cooling air requirement | $m^3/s$ | 0.17 | 0.23 | 0.36 | 0.36 | 0.36 | 0.78 | 0.78 | 0.78 | 1.48 |
| Sound pressure level $L_{pA}$ (1 m) at 50/60 Hz | dB | 67/68 | 69/73 | 69/73 | 69/73 | 69/73 | 70/73 | 70/73 | 70/73 | 72/75 |
| Width for version A/C | mm | 800/400 | 800/400 | 800/400 | 1000/400 | 1000/400 | 1200/600 | 1200/600 | 1200/600 | 1600/1000 |
| Height 5) | mm | 2000 | | | | | | | | |
| Depth | mm | 600 | | | | | | | | |
| Weight (without options) for version A/C, approx. | kg | 320/225 | 320/225 | 390/300 | 480/300 | 480/300 | 860/670 | 865/670 | 1075/670 | 1360/980 |

Note: The performance data in hp units are based on the NEC/CEC standards for the North American market.

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

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

3) If the main power supply fails and drive control remains active, the Power Module should be externally supplied with 24 V DC.
The following should also be taken into account:
- CU320: 0.8 A
- TM31: 0.5 A
- AOP30: 0.2 A
- SMC: 0.6 A
- Current requirement of digital inputs/outputs.

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

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

Version C: The cabinet height is increased by
250 mm for degree of protection IP21,
400 mm for degrees of protection IP23 and IP54.

## Technical data (continued)

### *Technical data for simple connection*

| *Line voltage 500 V to 600 V 3 AC* | | SINAMICS G150 drive converter cabinet units Type 6SL3710-1GF..-.... | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | **31-8...** | **32-2...** | **32-6...** | **33-3...** | **34-1...** | **34-7...** | **35-8...** | **37-4...** | **38-1...** |
| Rated output current $I_{rated}$ | A | 175 | 215 | 260 | 330 | 410 | 465 | 575 | 735 | 810 |
| Base load current $I_L$ [1] | A | 171 | 208 | 250 | 320 | 400 | 452 | 560 | 710 | 790 |
| Base load current $I_H$ [2] | A | 157 | 192 | 233 | 280 | 367 | 416 | 514 | 657 | 724 |
| Power for $I_L$ at 500 V | kW | **110** | **132** | **160** | **200** | **250** | **315** | **400** | **500** | **560** |
| Power for $I_H$ at 500 V | kW | 110 | 132 | 160 | 200 | 250 | 250 | 315 | 450 | 500 |
| Power for $I_L$ at 60 Hz 575 V | kW | 150 | 200 | 250 | 300 | 400 | 450 | 500 | 700 | 800 |
| Power for $I_H$ at 60 Hz 575 V | kW | 150 | 200 | 200 | 250 | 350 | 450 | 500 | 600 | 710 |
| Max. current requirement [3] (at 24 V DC) | A | 1.35 | 1.35 | 1.35 | 1.35 | 1.4 | 1.4 | 1.4 | 1.5 | 1.5 |
| Rated input current [4] | A | 201 | 234 | 280 | 353 | 436 | 493 | 608 | 774 | 852 |
| Power loss | kW | 3.8 | 4.2 | 5.0 | 6.1 | 8.1 | 7.8 | 8.7 | 12.7 | 14.1 |
| Cooling air requirement | $m^3/s$ | 0.36 | 0.36 | 0.36 | 0.36 | 0.78 | 0.78 | 0.78 | 1.48 | 1.48 |
| Sound pressure level $L_{pA}$ (1 m) at 50/60 Hz | dB | 69/73 | 69/73 | 69/73 | 69/73 | 72/75 | 72/75 | 72/75 | 72/75 | 72/75 |
| Width for version A/C | mm | 800/400 | 800/400 | 800/400 | 800/400 | 1200/600 | 1200/600 | 1200/600 | 1600/1000 | 1600/1000 |
| Height [5] | mm | 2000 | | | | | | | | |
| Depth | mm | 600 | | | | | | | | |
| Weight (without options) for version A/C, approx. | kg | 390/300 | 390/300 | 390/300 | 390/300 | 860/670 | 860/670 | 860/670 | 1320/940 | 1360/980 |

Note: The performance data in hp units are based on the NEC/CEC standards for the North American market.

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

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

3) If the main power supply fails and drive control remains active, the Power Module should be externally supplied with 24 V DC.
The following should also be taken into account:
- CU320: 0.8 A
- TM31: 0.5 A
- AOP30: 0.2 A
- SMC: 0.6 A
- Current requirement of digital inputs/outputs.

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

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

Version C: The cabinet height is increased by
250 mm for degree of protection IP21,
400 mm for degrees of protection IP23 and IP54.

## Technical data (continued)

### *Technical data for simple connection*

| *Line voltage 660 V to 690 V 3 AC* | | SINAMICS G150 drive converter cabinet units Type 6SL3710-1GH..-.... | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | **28-5...** | **31-0...** | **31-2...** | **31-5...** | **31-8...** | **32-2...** | **32-6...** | **33-3...** | **34-1...** | **34-7...** | **35-8...** | **37-4...** | **38-1...** |
| Rated output current $I_{rated}$ | A | 85 | 100 | 120 | 150 | 175 | 215 | 260 | 330 | 410 | 465 | 575 | 735 | 810 |
| Base load current $I_L$ [1] | A | 80 | 95 | 115 | 142 | 171 | 208 | 250 | 320 | 400 | 452 | 560 | 710 | 790 |
| Base load current $I_H$ [2] | A | 76 | 89 | 107 | 134 | 157 | 192 | 233 | 280 | 367 | 416 | 514 | 657 | 724 |
| Power for $I_L$ at 690 V | kW | **75** | **90** | **110** | **132** | **160** | **200** | **250** | **315** | **400** | **450** | **560** | **710** | **800** |
| Power for $I_H$ at 690 V | kW | 55 | 75 | 90 | 110 | 132 | 160 | 200 | 250 | 315 | 400 | 450 | 560 | 710 |
| Max. current requirement [3] (at 24 V DC) | A | 1.1 | 1.1 | 1.1 | 1.1 | 1.35 | 1.35 | 1.35 | 1.35 | 1.4 | 1.4 | 1.4 | 1.5 | 1.5 |
| Rated input current [4] | A | 103 | 119 | 141 | 174 | 201 | 234 | 280 | 353 | 436 | 493 | 608 | 774 | 852 |
| Power loss | kW | 1.7 | 2.1 | 2.7 | 2.8 | 3.8 | 4.2 | 5.0 | 6.1 | 8.1 | 9.1 | 10.8 | 13.5 | 14.7 |
| Cooling air requirement | $m^3/s$ | 0.17 | 0.17 | 0.17 | 0.17 | 0.36 | 0.36 | 0.36 | 0.36 | 0.78 | 0.78 | 0.78 | 1.48 | 1.48 |
| Sound pressure level $L_{pA}$ (1 m) at 50/60 Hz | dB | 67/68 | 67/68 | 67/68 | 67/68 | 69/73 | 69/73 | 69/73 | 69/73 | 72/75 | 72/75 | 72/75 | 72/75 | 72/75 |
| Width for version A/C | mm | 800/ 400 | 800/ 400 | 800/ 400 | 800/ 400 | 800/ 400 | 800/ 400 | 800/ 400 | 800/ 400 | 1200/ 600 | 1200/ 600 | 1200/ 600 | 1600/ 1000 | 1600/ 1000 |
| Height [5] | mm | 2000 | | | | | | | | | | | | |
| Depth | mm | 600 | | | | | | | | | | | | |
| Weight (without options) for version A/C, approx. | kg | 320/ 225 | 320/ 225 | 320/ 225 | 320/ 225 | 390/ 300 | 390/ 300 | 390/ 300 | 390/ 300 | 860/ 670 | 860/ 670 | 860/ 670 | 1320/ 940 | 1360/ 980 |

Note: The performance data in hp units are based on the NEC/CEC standards for the North American market.

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

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

3) If the main power supply fails and drive control remains active, the Power Module should be externally supplied with 24 V DC.
The following should also be taken into account:
- CU320: 0.8 A
- TM31: 0.5 A
- AOP30: 0.2 A
- SMC: 0.6 A
- Current requirement of digital inputs/outputs.

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

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

## Technical data (continued)

### *Technical data for parallel connection*

| | | SINAMICS G150 drive converter cabinet units, version A Type 6SL3710-2G..-.... | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | E41-1AA0 | E41-4AA0 | E41-6AA0 | F38-6AA0 | F41-1AA0 | F41-4AA0 | H41-1AA0 | H41-4AA0 | H41-5AA0 |
| ***Line voltage*** | | ***380 V to 480 V 3 AC*** | | | ***500 V to 600 V 3 AC*** | | | ***660 V to 690 V 3 AC*** | | |
| Rated output current $I_{rated}$ 6) | A | 1120 | 1380 | 1560 | 860 | 1070 | 1360 | 1070 | 1360 | 1500 |
| Base load current $I_L$ 1) 6) | A | 1092 | 1340 | 1516 | 836 | 1036 | 1314 | 1036 | 1314 | 1462 |
| Base load current $I_H$ 2) 6) | A | 850 | 1054 | 1294 | 770 | 950 | 1216 | 950 | 1216 | 1340 |
| Power for $I_L$ at 400 V, 500 V or 690 V | kW | **630** | **710** | **900** | **630** | **710** | **1000** | **1000** | **1350** | **1500** |
| Power for $I_H$ at 400 V, 500 V or 690 V | kW | 500 | 560 | 710 | 560 | 630 | 800 | 900 | 1200 | 1350 |
| Power for $I_L$ at 60 Hz 460 V or 575 V | hp | 900 | 1000 | 1250 | 800 | 1000 | 1250 | – | – | – |
| Power for $I_H$ at 60 Hz 460 V or 575 V | hp | 700 | 800 | 1000 | 800 | 1000 | 1250 | – | – | – |
| Max. current requirement 3) (at 24 V DC) | A | 2.8 | 2.8 | 3.0 | 2.8 | 2.8 | 3.0 | 2.8 | 2.8 | 3.0 |
| Rated input current 4) 6) | A | 1174 | 1444 | 1624 | 904 | 1116 | 1424 | 1116 | 1424 | 1568 |
| Power loss | kW | 16.2 | 19.0 | 19.9 | 15.4 | 17.2 | 23.8 | 21.3 | 26.6 | 29.0 |
| Cooling air requirement | $m^3/s$ | 1.56 | | | 1.56 | 1.56 | 2.96 | 1.56 | 2.96 | 2.96 |
| Sound pressure level $L_{pA}$ (1 m) at 50/60 Hz | dB | 73/76 | | | 75/78 | | | 75/78 | | |
| Width 7) | mm | 2400 | | | 2400 | 2400 | 3200 | 2400 | 3200 | 3200 |
| Height 5) | mm | 2000 | | | 2000 | | | 2000 | | |
| Depth | mm | 600 | | | 600 | | | 600 | | |
| Weight (without options), approx. | kg | 1700 | 1710 | 2130 | 1700 | 1700 | 2620 | 1700 | 2620 | 2700 |

Note: The performance data in hp units are based on the NEC/CEC standards for the North American market.

1) The base load current $I_L$ is based on a load cycle of 110% for 60 s or 150% for 10 s with a load cycle period of 300 s. See Technical data → Overload capability.
2) The base load current $I_H$ is based on a load cycle of 150% for 60 s or 160% for 10 s with a load cycle period of 300 s. See Technical data → Overload capability.
3) If the main power supply fails and drive control remains active, the Power Module should be externally supplied with 24 V DC.
The following should also be taken into account:
- CU320: 0.8 A
- TM31: 0.5 A
- AOP30: 0.2 A
- SMC: 0.6 A
- Current requirement of digital inputs/outputs.
4) The currents listed here are based on the rated output current and include 10 A for the external auxiliaries as required for options **L19** or **B03**, for example.
5) Version A: The cabinet height is increased by
250 mm for degree of protection IP21,
400 mm for degrees of protection IP23 and IP54,
405 mm for the **M13** and **M78** options.
6) The currents listed here represent the aggregate current of both converter sections.
7) The power units connected in parallel are supplied as two transport units.

## 75 kW to 1500 kW

### Selection and ordering data

#### *Simple connection*

| Power | | Rated output current | Order No. **SINAMICS G150 drive converter cabinet units** |
|---|---|---|---|
| at 400 V, 500 V or 690 V | at 60 Hz 460 V or 575 V | | (Order No. supplement, see below) |
| kW | hp | A | |
| **380 V to 480 V 3 AC** | | | |
| **110** | 150 | 210 | **6SL3710-1GE32-1■A0** |
| **132** | 200 | 260 | **6SL3710-1GE32-6■A0** |
| **160** | 250 | 310 | **6SL3710-1GE33-1■A0** |
| **200** | 300 | 380 | **6SL3710-1GE33-8■A0** |
| **250** | 400 | 490 | **6SL3710-1GE35-0■A0** |
| **315** | 500 | 605 | **6SL3710-1GE36-1■A0** |
| **400** | 600 | 745 | **6SL3710-1GE37-5■A0** |
| **450** | 600 | 840 | **6SL3710-1GE38-4■A0** |
| **560** | 800 | 985 | **6SL3710-1GE41-0■A0** |
| **500 V to 600 V 3 AC** | | | |
| **110** | 150 | 175 | **6SL3710-1GF31-8■A0** |
| **132** | 200 | 215 | **6SL3710-1GF32-2■A0** |
| **160** | 250 | 260 | **6SL3710-1GF32-6■A0** |
| **200** | 300 | 330 | **6SL3710-1GF33-3■A0** |
| **250** | 400 | 410 | **6SL3710-1GF34-1■A0** |
| **315** | 450 | 465 | **6SL3710-1GF34-7■A0** |
| **400** | 500 | 575 | **6SL3710-1GF35-8■A0** |
| **500** | 700 | 735 | **6SL3710-1GF37-4■A0** |
| **560** | 800 | 810 | **6SL3710-1GF38-1■A0** |
| **660 V to 690 V 3 AC** | | | |
| **75** | | 85 | **6SL3710-1GH28-5■A0** |
| **90** | | 100 | **6SL3710-1GH31-0■A0** |
| **110** | | 120 | **6SL3710-1GH31-2■A0** |
| **132** | | 150 | **6SL3710-1GH31-5■A0** |
| **160** | | 175 | **6SL3710-1GH31-8■A0** |
| **200** | | 215 | **6SL3710-1GH32-2■A0** |
| **250** | | 260 | **6SL3710-1GH32-6■A0** |
| **315** | | 330 | **6SL3710-1GH33-3■A0** |
| **400** | | 410 | **6SL3710-1GH34-1■A0** |
| **450** | | 465 | **6SL3710-1GH34-7■A0** |
| **560** | | 575 | **6SL3710-1GH35-8■A0** |
| **710** | | 735 | **6SL3710-1GH37-4■A0** |
| **800** | | 810 | **6SL3710-1GH38-1■A0** |

Order No. supplement

| | |
|---|---|
| **Version A**<br>with possibility for mounting all available line connection components | **A** |
| **Version C**<br>expecially for space-saving mounting | **C** |

Note: The performance data in hp units are based on the NEC/CEC standards for the North American market.

#### *Parallel connection*

| Power | | Rated output current | Order No. **SINAMICS G150 drive converter cabinet units, version A** |
|---|---|---|---|
| at 400 V, 500 V or 690 V | at 60 Hz 460 V or 575 V | | |
| kW | hp | A | |
| **380 V to 480 V 3 AC** | | | |
| **630** | 900 | 1120 | **6SL3710-2GE41-1AA0** |
| **710** | 1000 | 1380 | **6SL3710-2GE41-4AA0** |
| **900** | 1250 | 1560 | **6SL3710-2GE41-6AA0** |
| **500 V to 600 V 3 AC** | | | |
| **630** | 800 | 860 | **6SL3710-2GF38-6AA0** |
| **710** | 1000 | 1070 | **6SL3710-2GF41-1AA0** |
| **1000** | 1250 | 1360 | **6SL3710-2GF41-4AA0** |
| **660 V to 690 V 3 AC** | | | |
| **1000** | | 1070 | **6SL3710-2GH41-1AA0** |
| **1350** | | 1360 | **6SL3710-2GH41-4AA0** |
| **1500** | | 1500 | **6SL3710-2GH41-5AA0** |

Note: The performance data in hp units are based on the NEC/CEC standards for the North American market.

## 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 |
|---|---|---|---|
| **Line-side options** | | | |
| Line filter for use in the first environment in accordance with EN 61800-3, category C2 (TN/TT systems) | **L00** | ✓ | – |
| Main contactor (for currents < 800 A) | **L13** | ✓ | – |
| Without line reactor | **L22** | ✓ | ✓ |
| Line reactor 2% | **L23** | ✓ | ✓ |
| Main switch (incl. fuses/circuit-breakers) | **L26** | ✓ | – |
| EMC shield bus [1] (cable connection from below) | **M70** | ✓ | ✓ |
| PE busbar [1] (cable connection from below) | **M75** | ✓ | ✓ |
| **Load-side options** | | | |
| Motor reactor | **L08** | ✓ | – |
| dv/dt filter plus VPL | **L10** | ✓ | – |
| Sinusoidal filter (on request, only for converters up to 200 kW at 380 V to 480 V, up to 132 kW at 500 V to 600 V) | **L15** | ✓ | – |
| EMC shield bus [1] (cable connection from below) | **M70** | ✓ | ✓ |
| PE busbar [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 (shutdown) | **L84** | ✓ | – |
| PT100 evaluation unit (for six PT100 sensors) | **L86** | ✓ | – |
| Insulation monitoring | **L87** | ✓ | – |
| Additional shock-hazard protection | **M60** | ✓ | ✓ |
| **Increase in degree of protection** | | | |
| IP21 degree of protection | **M21** | ✓ | ✓ |
| IP23 degree of protection | **M23** | ✓ | ✓ |
| IP54 degree of protection | **M54** | ✓ | ✓ |
| **Mechanical options** | | | |
| Base 100 mm high, RAL 7022 | **M06** | ✓ | ✓ |
| Cable plinth 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 supported |

1) This option is listed for the line-side and load-side options, but is only required once.
2) The drive stop requirements must be taken into account with this option. Additional braking units may be required.

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

Converter version A

Converter version C

3

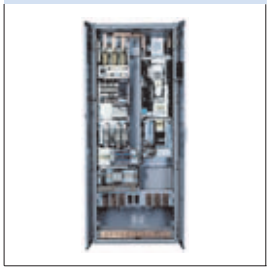
## Options (continued)

| Available options | Order code | for version A | for version C |
|---|---|---|---|
| **Other options** | | | |
| TM31 customer's terminal block expansion | **G61** | ✓ | – |
| SMC30 Sensor Module Cabinet-Mounted for actual motor speed acquisition | **K50** | ✓ | – |
| Connection for external auxiliary equipment (controlled max. 10 A) | **L19** | ✓ | – |
| Cabinet illumination with service socket | **L50** | ✓ | – |
| Cabinet anti-condensation heating | **L55** | ✓ | – |
| Braking unit 25 kW ($P_{20}$ power: 100 kW) | **L61** | ✓ | – |
| Braking unit 50 kW ($P_{20}$ power: 200 kW) | **L62** | ✓ | – |
| Special cabinet paint finish [3] | **Y09** | ✓ | ✓ |
| **Documentation (standard: English/German)** | | | |
| Plant-specific documentation in DXF format | **D02** | ✓ | ✓ |
| Plant-specific advance documentation | **D14** | ✓ | ✓ |
| Documentation in English/French | **D58** | ✓ | ✓ |
| Documentation in English/Spanish | **D60** | ✓ | ✓ |
| Documentation in English/Italian | **D80** | ✓ | ✓ |
| **Languages (standard: English/German)** | | | |
| Rating plate in English/French | **T58** | ✓ | ✓ |
| Rating plate in English/Spanish | **T60** | ✓ | ✓ |
| Rating plate in English/Italian | **T80** | ✓ | ✓ |
| **Options specific to chemidal industry** | | | |
| NAMUR terminal block | **B00** | ✓ | – |
| Protective separation for 24 V supply (PELV) | **B02** | ✓ | – |
| Separate output for external auxiliaries (uncontrolled) | **B03** | ✓ | – |
| **Options specific to the shipbuilding industry** | | | |
| Marine version | **M66** | ✓ | ✓ |
| Individual certificate from Germanische Lloyd (GL) | **E11** | ✓ | ✓ |
| Individual certificate from Lloyds Register (LR) | **E21** | ✓ | ✓ |
| Individual certificate from Bureau Veritas (BV) | **E31** | ✓ | ✓ |
| Individual certificate from Det Norske Veritas (DNV) | **E51** | ✓ | ✓ |
| Individual certificate from American Bureau of Shipping (ABS) | **E61** | ✓ | ✓ |
| Individual certificate from Chinese Classification Society (CCS) | **E71** | ✓ | ✓ |
| **Converter acceptance 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** | ✓ | ✓ |
| Insulation test of converter | **F77** | ✓ | ✓ |
| Customized converter acceptance (on request) | **F97** | ✓ | ✓ |

✓ possible
– not supported

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

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



Converter version A

Converter version C

## Options (continued)

### *Option selection matrix*

Certain options are mutually excluding. The following tables only provide an overview. Please refer to the descriptions of the individual options for a precise description of options and other exclusions.

| | |
|---|---|
| ✓ | possible combinations |
| – | not supported |

### *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 as standard.
For converters > 500 kW/700 hp, option **L23** must be ordered separately if
- the converters are to be operated on lines with high short-circuit power (RSC > 20) (see Configuration) or
- a line filter is used (option **L00**).

2) Combination **L13/L26** is only possible for currents < 800 A. Circuit-breakers are used from 800 A upwards. 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 | L08 | L10 | L15 | M06 | M07 | M13 | M21 | M23 | M54 | M60 | M66 | M70 | M75 | M78 | M90 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **L00** | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | 4) | ✓ | ✓ | ✓ |
| **L08** | ✓ | | 7) | 7) | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | – | ✓ |
| **L10** | ✓ | 7) | | 7) | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | – | ✓ |
| **L15** | ✓ | 7) | 7) | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | – | ✓ |
| **M06** | ✓ | ✓ | ✓ | ✓ | | – | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| **M07** | ✓ | ✓ | ✓ | ✓ | – | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| **M13** | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | – | ✓ | ✓ | – | ✓ | 5) | 5) | ✓ | ✓ |
| **M21** | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | – | | – | – | 6) | – | ✓ | ✓ | – | ✓ |
| **M23** | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | – | | – | – | – | ✓ | ✓ | ✓ | ✓ |
| **M54** | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | – | – | | – | ✓ | ✓ | ✓ | ✓ | ✓ |
| **M60** | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | – | 6) | – | – | | ✓ | ✓ | ✓ | – | ✓ |
| **M66** | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | – | – | ✓ | ✓ | | ✓ | ✓ | ✓ | ✓ |
| **M70** | 4) | ✓ | ✓ | ✓ | ✓ | ✓ | 5) | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | 5) | ✓ |
| **M75** | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | 5) | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | 5) | ✓ |
| **M78** | ✓ | – | – | – | ✓ | ✓ | ✓ | – | ✓ | ✓ | – | ✓ | 5) | 5) | | ✓ |
| **M90** | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | |

### *Rating plate data*

| | T58 | T60 | T80 |
|---|---|---|---|
| **T58** | | – | – |
| **T60** | – | | – |
| **T80** | – | – | |

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 busbar are not required in the lower cabinet area.

6) Can only be selected for converters in the voltage range 400 V up to 250 kW, 500 V up to 200 kW and 690 V up to 315 kW. Option **M60** is supplied as standard for larger power ranges.

7) Options **L08** and **L10** may only be used on request with drive converter cabinet units with power units connected in parallel.

## 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 base and the degree of protection should be IP54. The installation altitude is < 1000 mm above sea level, 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, a 450 kW, 400 V drive converter cabinet unit should be selected with options
**M06** (100 mm cabinet base) and
**M54** (IP54 degree of protection).

The relevant ordering data 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:*
A 315 kW, 690 V version A drive converter cabinet unit should be selected with the following options:
**L26** (main switch including fuses),
**L13** (main contactor),
**L86** (PT100 evaluation unit) and
**Y09** (special cabinet paint coating).

The relevant ordering data is:
**6SL3710-1GH33-3AA0-Z**
**+L26 +L13 +L86 +Y09**
**Cabinet color RAL 3002**

## Options (continued)

### *Description of options*

#### *B00, B02, B03*
#### *Options in accordance with NAMUR requirements*

Exclusion list to other options:

The following limitations and exclusions resulting together with the **B00** NAMUR terminal block 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.<br>The forced line disconnection is accessed at terminals -A1-X2: 17, 18. |
| **L83, L84** | Option **B00** already provides a thermistor motor protection unit (shutdown) as standard. |
| **L19** | Alternatively, option **B03** can be selected.<br>This provides a reduced scope for external auxiliaries. |
| **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.

Attention: In case of line disconnection, option **L13** for currents < 800 A or option **L26** for currents > 800 A have to be ordered additionally to option **B00**.

#### *B00*
#### *NAMUR terminal block*

The terminal block has been configured in accordance with the requirements and guidelines of the Standards Working Group for Instrumentation and Control in the Chemicals Industry (NAMUR Recommendation NE37), i.e. certain functions of the device are assigned to specified terminals. The inputs and outputs connected to the terminals comply with the requirements of "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 | Comments |
|---|---|---|---|
| **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 | Lock | |
| **16** | DI | Counterclockwise | "0" signal for CW phase sequence<br>"1" signal for CCW phase sequence |
| **17, 18** | | Line 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 provided at the customer end via terminals -A1-X2:1-3 (fused inside the 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, option **B00** 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 |

In parallel to operation via the NAMUR terminal block, there is also the option to operate the converter via the PROFIBUS interface provided as standard on the CU320 Control Unit. The PROFIdrive profile "process technology" used in the chemical industry can be selected via macros.

**Options** (continued)

### *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 option **B00**, 24 V supply at terminals -A1-X1:1, 2, 3 are omitted.)

Attention: Option **B02** is only possible together with **B00**.

### *B03*
### *Separate output for external auxiliaries (uncontrolled)*

If a motor fan has to be supplied on the plant, option **B03** provides an uncontrolled separate output with a 10 A fuse. 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 ($V = V_{line}$). This should be observed when planning the external fans.

| **Terminal -A1-X1:** | Meaning |
|---|---|
| **1, 2, 3, PE** | Separate output for motor of external fan |

Attention: Option **B03** is only possible together with **B00**.

### *D02*
### *Plant-specific documentation in DXF format*

This option can be used to order documents such as circuit diagrams, terminal diagrams, arrangement diagrams, and dimension drawings in DXF format, in order to process them further in CAD systems, for example. They are supplied on the documentation CD in the desired language (standard is English/German, for other languages, see options **D58, D60, D80**).

### *D14*
### *Plant-specific advance documentation*

If documents such as circuit diagrams, terminal diagrams, arrangement diagrams, and dimension drawings are required in advance for system engineering, advance documentation can be ordered when ordering the converter. These documents are then supplied electronically a few working days after the order has been entered. The plant-specific documentation is supplied to the ordering party via e-mail in the desired language (standard is English/German, for other languages, see options **D58, D60, D80**). The recipient's e-mail address should be provided when the order is placed. If option **D02** is selected at the same time, the documents are sent out in DXF format, otherwise they are sent in PDF format. In the e-mail, the recipient is also provided with a link for downloading general advance documentation such as Operating Instructions, Manuals and Commissioning Manuals.

### *D58*
### *Language English/French*

With option **D58**, the documentation will be supplied with the converter in English and French on CD-ROM and in a printed version (standard: English/German).

### *D60*
### *Language English/Spanish*

With option **D60**, the documentation will be supplied with the converter in English and Spanish on CD-ROM and in a printed version (standard: English/German).

### *D80*
### *Language English/Italian*

With option **D80**, the documentation will be supplied with the converter in English and Italian on CD-ROM and in a printed version (standard: English/German).

### *E11 to E71*
### *Individual certification of the converter*

The individual certification of the converter by the relevant certification body contains the expansions described in option **M66**.

**E11** Individual certificate from Germanische Lloyd (GL)

**E21** Individual certificate from Lloyds Register (LR)

**E31** Individual certificate from Bureau Veritas (BV)

**E51** Individual certificate from Det Norske Veritas (DNV)

**E61** Individual certificate from American Bureau of Shipping (ABS)

**E71** Individual certificate from Chinese Classification Society (CCS)

Note: A combination of several individual certificates is not provided.

## Options (continued)

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

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

### *G61*
### *TM31 customer's terminal block expansion*

The standard version of the SINAMICS G150 drive converter cabinet units already contains 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 the acquisition of the actual motor speed*

The SMC30 Sensor Module can be used to acquire the actual motor speed. The signals emitted by the rotary pulse encoder are converted here and made available via the DRIVE-CLiQ interface of the closed-loop control for evaluation purposes.

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 systems)*

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 61800-3 for the second environment, and thus also with the lower noise immunity requirements in the first environment.

Used 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 (option **M70**) is factory fitted at the converter input and output. A separate order is not required in this case.

### *L08*
### *Motor reactor*

Motor reactors reduce the voltage load on the motor windings by reducing the voltage gradients on the motor terminals generated when the converter is used. At the same time, the capacitive charge/discharge currents that occur at the converter output when long motor cables are used are reduced. The maximum permissible output frequency when a motor reactor is used is 150 Hz.

A motor reactor can be supplied on request for drive converter cabinet units with power units connected in parallel.

Option **L08** is only available with version A and cannot be combined with option **M78** (motor connection from above).

## Options (continued)

### L10
### dv/dt filter plus VPL

The dv/dt filter plus VPL consists of two components: the dv/dt reactor and the VPL (**V**oltage **P**eak **L**imiter), which limits voltage peaks and returns the energy to the DC link.

The dv/dt filters plus VPL are to be used for motors for which the voltage endurance of the insulation system is unknown or insufficient. Standard motors of the 1LA5, 1LA6 and 1LA8 series only require them at supply voltages > 500 V +10%.

The dv/dt filters plus VPL limit the rate of voltage rise to values < 500 V/µs and the typical voltage peaks to the values below (with motor cable lengths < 150 m):

< 1000 V at $V_{line}$ < 575 V

< 1250 V at 660 V < $V_{line}$ < 690 V.

Depending on the converter output, option **L10** can be accommodated in the drive converter cabinet unit or an additional cabinet of width 400 mm is required.

| Voltage range | Installation of the dv/dt filter plus VPL within the drive converter cabinet unit | Installation of the VPL in an additional cabinet |
|---|---|---|
| V | kW | kW |
| 380 to 480 | 110 to 250 | 315 to 560 |
| 500 to 600 | 110 to 200 | 250 to 560 |
| 660 to 690 | 75 to 315 | 400 to 800 |

The dv/dt filter plus VPL is available on request for drive converter cabinet units with power units connected in parallel.

Option **L10** is only available with version A and cannot be combined with option **M78** (motor connection from above).

### L13
### Main contactor (for currents < 800 A)

The SINAMICS G150 drive converter cabinet units are provided 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 voltage ranges from 380 V to 480 V and 500 V to 600 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 option **L15**. This reduces the power available at the converter output (derating factor 0.88). The control factor of the output voltage returns to approximately 85% (380 V to 480 V) or 81% (500 V to 600 V). 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 | 380 V AC to 690 V |
| **2** | L2 | 380 V AC to 690 V |
| **3** | L3 | 380 V AC to 690 V |
| **11** | Contactor control | 230 V AC |
| **12** | Contactor control | 230 V AC |
| **13** | Circuit-breaker checkback | 230 V AC/0.5 A; 24 V DC/2 A |
| **14** | Circuit-breaker checkback | 230 V AC/0.5 A; 24 V DC/2 A |
| **15** | Contactor checkback | 230 V AC/6 A |
| **16** | Contactor checkback | 230 V AC/6 A |
| **PE** | PE | |

### L22
### Without line reactor

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

Available on request for drive converter cabinet units with power units connected in parallel.

### L23
### Line reactor $u_K$ = 2%

The line reactor is included in the converter as standard for converters up to 500 kW and for those with power units connected in parallel. The line reactor ($u_K$ = 2%) is optional for converter outputs > 500 kW, because converters in this power range are often connected to the medium-voltage supply using transformers adapted to the converter output.

### L26
### Main switch incl. fuses/circuit-breakers

For up to 800 A, a switch disconnector with fuses is offered as main switch. Cabinets with an output current greater than 800 A are fitted with a circuit-breaker instead of a switch disconnector. The circuit-breaker is energized and supplied within the converter.

| Terminal -X50: | Meaning |
|---|---|
| **1** | Checkback contact (NO contact) Main switch/circuit-breaker closed |
| **2** | Checkback contact (NC contact) Main switch/circuit-breaker closed |
| **3** | Root |

## Options (continued)

### 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**

Attention: By pressing the EMERGENCY STOP button, the motor is stopped either uncontrolled or controlled depending on the selected category 0 or 1, and the main voltage disconnected from the motor, in accordance with IEC 60204-1 (VDE 0113). Auxiliary voltages (e.g. for separately-driven fans or anti-condensation heating) may still be present. Certain areas within the converter also remain under voltage, e.g. the control function or auxiliaries. If complete disconnection of all voltages is required, the EMERGENCY STOP button must be incorporated into a protection function to be provided on the plant side. An NC contact is available at terminal –X120 for this purpose.

### L50
### Cabinet illumination with service socket

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

The power supply (on terminal block -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 forming. 100 W cabinet heating unit is installed for each cabinet element (two heating units are installed for each element for cabinet element widths from 800 mm to 1200 mm).

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

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

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

EMERGENCY STOP category 0 for uncontrolled stop in accordance with EN 60204.

The function includes voltage disconnection of the converter via the line contactor with bypassing of the microprocessor controller by means of a safety combination in accordance with EN 60204-1. 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: Option **L57** always assumes that the converter can be electrically isolated from the supply; i.e. option **L13** for converter currents ≤ 800 A and option **L26** for converter currents > 800 A.

| Terminal -X120: | Meaning |
|---|---|
| 7 | Looping in the EMERGENCY STOP button from the plant side; remove jumper 7–8! |
| 8 | Looping in the EMERGENCY STOP button from the plant side; remove jumper 7–8! |
| 15 | "On" for monitored start; remove jumper 15–16! |
| 16 | "On" for monitored start; remove jumper 15–16! |
| 17 | Checkback "Triggering safety combination" |
| 18 | Checkback "Triggering safety combination" |

### L59
### EMERGENCY STOP category 1 (230 V AC)

EMERGENCY STOP category 1 for controlled stop in accordance with EN 60204.

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 in EMERGENCY STOP category 0.

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

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

| Terminal -X120: | Meaning |
|---|---|
| 7 | Looping in the EMERGENCY STOP button from plant side; remove jumper 7–8! |
| 8 | Looping in EMERGENCY STOP button from plant side; remove jumper 7–8! |
| 15 | "On" for manual start; remove jumper 15–16! |
| 16 | "On" for manual start; remove jumper 15–16! |
| 17 | Checkback "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 in accordance with EN 60204.

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 in EMERGENCY STOP category 0.

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

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

| **Terminal -X120:** | Meaning |
|---|---|
| **7** | Looping in the EMERGENCY STOP button from plant side; remove jumper 7–8! |
| **8** | Looping in the EMERGENCY STOP button from plant side; remove jumper 7–8! |
| **15** | "On" for manual start; remove jumper 15–16! |
| **16** | "On" for manual start; remove jumper 15–16! |
| **17** | Checkback "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 externally installed 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.

Braking units are available on request for drive converter cabinet units with power units connected in parallel.

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 | Rated power | Peak power | Drive converter cabinet units | | |
|---|---|---|---|---|---|
| | $P_{DB}$ | $P_{15}$ | 380 V to 480 V | 500 V to 600 V | 660 V to 690 V |
| **L61** | 25 kW | 125 kW | 110 kW to 132 kW | – | 75 kW to 132 kW |
| **L62** | 50 kW | 250 kW | 160 kW to 560 kW | 110 kW to 560 kW | 160 kW to 800 kW |

$P_{DB}$: Rated power (continuous braking power)
$P_{15}$: Permitted peak power for a period of 15 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 (on request). In this case, a Braking Module is assigned to each braking resistor.

### *L83*
### *Thermistor motor protection unit (alarm)*

Thermistor motor protection unit (with PTB approval) for PTC thermistors 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 (shutdown)*

Thermistor motor protection unit (with PTB approval) for PTC thermistors type A for shutdown. 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 |

## Options (continued)

### L86
### PT100 evaluation unit

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

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

The output relays are integrated in the internal fault and shutdown train 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 mA to 20 mA and 0/2 V 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 a two-wire or three-wire system.

The inputs Tx1 and Tx3 must be used for a two-wire system. With a three-wire system, input Tx2 must also be connected (x = 1, 2, ..., 6)

| | |
|---|---|
| **51, 52, 54** | Relay output<br>Limit for group 1 reached; (changeover contact) |
| **61, 62, 64** | Relay output<br>Limit for group 2 reached; (changeover contact) |
| **Ground (OUT 1)** | Analog output OUT 1; Group 1 sensors |
| **U1 (OUT 1)** | Analog output OUT 1; Group 1 sensors |
| **I1 (OUT 1)** | Analog output OUT 1; Group 1 sensors |
| **Ground (OUT 2)** | Analog output OUT 2; Group 2 sensors |
| **U2 (OUT 2)** | Analog output OUT 2; Group 2 sensors |
| **I2 (OUT 2)** | Analog output OUT 2; Group 2 sensors |

### L87
### Insulation monitoring

An insulation monitor must be used if the converter is operated on an insulated network. 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.

Since the response philosophy when a ground fault occurs in the insulated network can be different, the output relays are available for integration into a control system on the plant side. It is also possible to integrate the outputs into the converter monitoring on the plant side.

| Terminal -A1-A101: | Meaning |
|---|---|
| **11** | Signaling relay ALARM 1 |
| **12** | Signaling relay ALARM 1 |
| **14** | Signaling relay ALARM 1 |
| **21** | Signaling relay ALARM 2 |
| **22** | Signaling relay ALARM 2 |
| **24** | Signaling 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 |

Insulation monitoring can be supplied on request for drive converter cabinet units with power units connected in parallel.

### M06
### Base 100 mm high, RAL 7022

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

The cabinet base 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 wiring compartment 200 mm high, RAL 7035

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

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

**Options** (continued)

### *M13*
### *Line connection from above*

The control cabinet is provided with an additional hood in the case of a line connection from above. This hood contains the terminal links for the power cables as well as the cable clamping rail for mechanical support of the cables, an EMC shield bus and a PE rail.

The cabinet height is increased by 405 mm. The rails 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 cable braces 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 on the plant side for fitting cable glands for introduction of the cables.

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

The hoods have IP21 degree of protection. In combination with options **M23** and **M54**, additional plastic ventilation grilles and filter pads are provided.

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 option **M60** are included in the scope of supply.

Option **M13** cannot be combined with option **L50** (cabinet illumination with service socket) for drive converter cabinet units with power units connected in parallel.

### *M21*
### *IP21 degree of protection*

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*
### *IP23 degree of protection*

Drive converter cabinet units with degree of protection IP23 are supplied with additional hoods and plastic ventilation grilles in the air inlet and outlet. The cabinet height is increased by 400 mm. The covers used with option **M60** are included in the scope of supply. They are a standard part of the cabinet internal air routing and are adapted accordingly.

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.

### *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 increased by 400 mm. The covers used with option **M60** are included in the scope of supply. They are a standard part of the cabinet internal air routing and are adapted accordingly. 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-hazard protection*

The drive converter cabinet units are designed as standard in accordance with BGV A3. Option **M60** provides additional covers (outside normal arm's reach) in the vicinity of the AC rails and above the power unit (can only be selected as an option with converters up to 250 kW in the 400 V range, with converters up to 200 kW in the 500 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).

**Options** (continued)

### *M66*
### *Marine version*

In accordance with the requirements of the classification company:

- Lloyds Register
- American Bureau of Shipping
- Germanische Lloyd
- Bureau Veritas
- Det Norske Veritas
- Chinese Classification Society

This option includes a strengthened mechanical version of the cabinet, handles (handrail) below the operator panel and a mechanical locking of the cabinet doors. The cabinet is provided in the IP23 degree of protection (option **M23**) and includes a cabinet anti-condensation heating (option **L55**). To attach the converter to the bulge, a welding frame (height 5 mm) is supplied separately.

Note: A combination of options **M21, M23** and **L55** is not possible. If the converter is used for a safety-relevant drive on the ship, individual certification is necessary (see options **E11** to **E71**).

### *M70*
### *EMC shield bus (cable connection from below)*

The EMC shield bus is used to connect shielded power cables for line and motor feeder cables. The EMC shield bus is included as standard with option **L00** (radio interference suppression 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 power 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 elements.

### *M78*
### *Motor connection from above*

The control cabinet is provided with an additional hood in the case of a motor connection from above. Within this hood, there are the connection lugs for the power cable and the cable-clamping bar for the mechanical attachment of the cable, an EMC shield bus and a PE busbar.

The cabinet height is increased by 405 mm. The rails 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 cable braces 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 on the plant side for fitting cable glands for introduction of the cables.

Note: The control cables are still connected from below. With option **M78**, the standard motor connection from below is not used. A combination of motor-side options **L08, L10** and **L15** is not possible. If option **L61** or **L62** is selected at the same time as option **M78**, the braking resistor should also be connected from above.

The hoods have IP21 degree of protection. In combination with options **M23** and **M54**, additional plastic ventilation grilles and filter pads are provided.

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 option **M60** 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 coating*

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 wiring compartment (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.

## Line-side power components
## Line harmonics filters

### Overview


Line harmonics filters reduce the converters' low-frequency harmonic effects to a level that can otherwise only be achieved using 12-pulse rectifiers.

### Design

Line harmonics filters are supplied as stand-alone components in a rugged housing. They are installed between the customer-end low-voltage distribution unit and the converter. The voltage is disconnected and fused in the customer-end low-voltage switchgear, as is the power supply cable.

The line harmonics filters are connected without fans (natural convection). This means that no auxiliary power supply is required.

The line harmonics filters are equipped with a floating thermostatic switch, which can be monitored externally, for the purpose of monitoring thermal overloads (as a result of insufficient cooling air being fed in, for example).

Note: The converter must have a line reactor in order to use a line harmonics filter.

### Selection and ordering data

| Suitable for drive converter cabinet unit | Power at 400 V, 500 V or 690 V | Order No. Line harmonics filters |
|---|---|---|
| **380 V to 480 V 3 AC** | | |
| 6SL3710-1GE35-0AA0 | 250 kW | **6SL3000-0JE36-1AA0** |
| 6SL3710-1GE36-1AA0 | 315 kW | |
| 6SL3710-1GE37-5AA0 | 400 kW | **6SL3000-0JE38-4AA0** |
| 6SL3710-1GE38-4AA0 | 450 kW | |
| 6SL3710-1GE41-0AA0 | 560 kW | **6SL3000-0JE41-0AA0** |
| **500 V to 600 V 3 AC** | | |
| 6SL3710-1GF32-6AA0 | 160 kW | **6SL3000-0JH33-3AA0** |
| 6SL3710-1GF33-3AA0 | 200 kW | |
| 6SL3710-1GF34-1AA0 | 250 kW | **6SL3000-0JH34-7AA0** |
| 6SL3710-1GF34-7AA0 | 315 kW | |
| 6SL3710-1GF35-8AA0 | 400 kW | **6SL3000-0JH35-8AA0** |
| 6SL3710-1GF37-4AA0 | 500 kW | **6SL3000-0JH38-1AA0** |
| 6SL3710-1GF38-1AA0 | 560 kW | |
| **660 V to 690 V 3 AC** | | |
| 6SL3710-1GH32-6AA0 | 250 kW | **6SL3000-0JH33-3AA0** |
| 6SL3710-1GH33-3AA0 | 315 kW | |
| 6SL3710-1GH34-1AA0 | 400 kW | **6SL3000-0JH34-7AA0** |
| 6SL3710-1GH34-7AA0 | 450 kW | |
| 6SL3710-1GH35-8AA0 | 560 kW | **6SL3000-0JH35-8AA0** |
| 6SL3710-1GH37-4AA0 | 710 kW | **6SL3000-0JH38-1AA0** |
| 6SL3710-1GH38-1AA0 | 800 kW | |

## Technical data

| ***Line voltage 380 V to 480 V 3 AC*** | | **Line harmonics filters 6SL3000-0JE36-1AA0** | | **6SL3000-0JE38-4AA0** | | **6SL3000-0JE41-0AA0** |
|---|---|---|---|---|---|---|
| Suitable for drive converter cabinet unit | Type | 6SL3710-1GE35-0AA0 | 6SL3710-1GE36-1AA0 | 6SL3710-1GE37-5AA0 | 6SL3710-1GE38-4AA0 | 6SL3710-1GE41-0AA0 |
| Rated power at 400 V | kW | **250** | **315** | **400** | **450** | **560** |
| Rated current | A | 500 | 500 | 700 | 700 | 900 |
| Power loss | kW | 1.0 | 1.0 | 1.5 | 1.5 | 2.0 |
| Max. conductor cross-section | $mm^2$ (DIN VDE) | 4 × 240 | | | | |
| | AWG/MCM (NEC, CEC) | 4 × 500 MCM | | | | |
| PE connection | | 3 × M 12 fastening bolts | | | | |
| Degree of protection | | IP21 | | | | |
| Width | mm | 600 | 600 | 800 | 800 | 1000 |
| Height | mm | 1700 | | | | |
| Depth | mm | 540 | | | | |
| Weight, approx. | kg | 450 | 450 | 600 | 600 | 900 |

| ***Line voltage 500 V to 600 V 3 AC*** | | **Line harmonics filters 6SL3000-0JH33-3AA0** | | **6SL3000-0JH34-7AA0** | | **6SL3000-0JH35-8AA0** | **6SL3000-0JH38-1AA0** | |
|---|---|---|---|---|---|---|---|---|
| Suitable for drive converter cabinet unit | Type | 6SL3710-1GF32-6AA0 | 6SL3710-1GF33-3AA0 | 6SL3710-1GF34-1AA0 | 6SL3710-1GF34-7AA0 | 6SL3710-1GF35-8AA0 | 6SL3710-1GF37-4AA0 | 6SL3710-1GF38-1AA0 |
| Rated power at 500 V | kW | **160** | **200** | **250** | **315** | **400** | **500** | **560** |
| Rated current | A | 290 | 290 | 400 | 400 | 520 | 710 | 710 |
| Power loss | kW | 0.8 | 0.8 | 1.0 | 1.0 | 1.5 | 2.0 | 2.0 |
| Max. conductor cross-section | $mm^2$ (DIN VDE) | 4 × 240 | | | | | | |
| | AWG/MCM (NEC, CEC) | 4 × 500 MCM | | | | | | |
| PE connection | | 3 × M 12 fastening bolts | | | | | | |
| Degree of protection | | IP21 | | | | | | |
| Width | mm | 600 | 600 | 800 | 800 | 1000 | 1000 | 1000 |
| Height | mm | 1700 | | | | | | |
| Depth | mm | 540 | | | | | | |
| Weight, approx. | kg | 450 | 450 | 600 | 600 | 830 | 830 | 830 |

## Technical data (continued)

| *Line voltage 660 V to 690 V 3 AC* | | Line harmonics filters 6SL3000-0JH33-3AA0 | | 6SL3000-0JH34-7AA0 | | 6SL3000-0JH35-8AA0 | 6SL3000-0JH38-1AA0 | |
|---|---|---|---|---|---|---|---|---|
| Suitable for drive converter cabinet unit | Type | 6SL3710-1GH32-6AA0 | 6SL3710-1GH33-3AA0 | 6SL3710-1GH34-1AA0 | 6SL3710-1GH34-7AA0 | 6SL3710-1GH35-8AA0 | 6SL3710-1GH37-4AA0 | 6SL3710-1GH38-1AA0 |
| Rated power at 690 V | kW | **250** | **315** | **400** | **450** | **560** | **710** | **800** |
| Rated current | A | 290 | 290 | 400 | 400 | 520 | 710 | 710 |
| Power loss | kW | 0.8 | 0.8 | 1.0 | 1.0 | 1.5 | 2.0 | 2.0 |
| Max. conductor cross-section | $mm^2$ (DIN VDE) | 4 × 240 | | | | | | |
| | AWG/MCM (NEC, CEC) | 4 × 500 MCM | | | | | | |
| PE connection | | 3 × M 12 fastening bolts | | | | | | |
| Degree of protection | | IP21 | | | | | | |
| Width | mm | 600 | 600 | 800 | 800 | 1000 | 1000 | 1000 |
| Height | mm | 1700 | | | | | | |
| Depth | mm | 540 | | | | | | |
| Weight, approx. | kg | 450 | 450 | 600 | 600 | 830 | 830 | 830 |

## Overview

### *Simple connection*

| Power | | SINAMICS G150 converters | Fuse with existing fuse switch disconnector (option L26) | | | Fuse (with semiconductor protection effect) without fuse switch disconnector [1] | | |
|---|---|---|---|---|---|---|---|---|
| (at 400 V, 500 V or 690 V) | (at 60 Hz 460 V or 575 V) | Type | Order No. | Rated current | Frame size in accordance with DIN 43620-1 | Order No. | Rated current | Frame size in accordance with DIN 43620-1 |
| kW | hp | 6SL3710- ... | | A | | | A | |
| **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 | – | – |
| **500 V to 600 V 3 AC** | | | | | | | | |
| **110** | **150** | -1GF31-8 . A0 | **3NA3244-6** | 250 | 2 | **3NE1227-2** | 250 | 1 |
| **132** | **200** | -1GF32-2 . A0 | **3NA3252-6** | 315 | 2 | **3NE1230-2** | 315 | 1 |
| **160** | **250** | -1GF32-6 . A0 | **3NA3354-6** | 355 | 3 | **3NE1331-2** | 350 | 2 |
| **200** | **300** | -1GF33-3 . A0 | **3NA3365-6** | 500 | 3 | **3NE1334-2** | 500 | 2 |
| **250** | **400** | -1GF34-1 . A0 | **3NA3365-6** | 500 | 3 | **3NE1334-2** | 500 | 2 |
| **315** | **450** | -1GF34-7 . A0 | **3NA3352-6** | 2 × 315 | 3 | **3NE1435-2** | 560 | 3 |
| **400** | **500** | -1GF35-8 . A0 | **3NA3354-6** | 2 × 355 | 3 | **3NE1447-2** | 670 | 3 |
| **500** | **700** | -1GF37-4 . A0 | **3NA3365-6** | 2 × 500 | 3 | **3NE1448-2** | 850 | 3 |
| **560** | **800** | -1GF38-1 . A0 | Circuit-breaker | – | – | Circuit-breaker | – | – |
| **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** | 2 × 315 | 3 | **3NE1435-2** | 560 | 3 |
| **560** | | -1GH35-8 . A0 | **3NA3354-6** | 2 × 355 | 3 | **3NE1447-2** | 670 | 3 |
| **710** | | -1GH37-4 . A0 | **3NA3365-6** | 2 × 500 | 3 | **3NE1448-2** | 850 | 3 |
| **800** | | -1GH38-1 . A0 | Circuit-breaker | – | – | Circuit-breaker | – | – |

Note: The performance data in hp units are based on the NEC/CEC standards for the North American market.

1) If the drive converter cabinet units ($I$ < 800 A) are used without option **L26**, appropriate precautions for line and semiconductor protection must be made on the plant side. The 3NE1... combined fuses are recommended for currents up to 800 A.

## Overview (continued)

***Parallel connection (data per converter subsystem)***

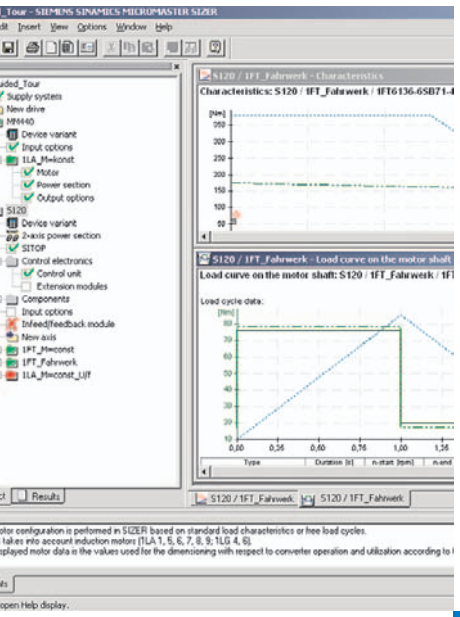
| Power | | SINAMICS G150 converters | Fuse with existing fuse switch disconnector (option L26) | | | Fuse (with semiconductor protection effect) without fuse switch disconnector [1] | | |
|---|---|---|---|---|---|---|---|---|
| (at 400 V, 500 V or 690 V) | (at 60 Hz 460 V or 575 V) | Type | Order No. | Rated current | Frame size in accordance with DIN 43620-1 | Order No. | Rated current | Frame size in accordance with DIN 43620-1 |
| kW | hp | 6SL3710- ... | | A | | | A | |
| **380 V to 480 V 3 AC** | | | | | | | | |
| **630** | 900 | -2GE41-1AA0 | **3NA3745** | 800 | 4 | **3NE1438-2** | 800 | 3 |
| **710** | 1000 | -2GE41-4AA0 | **3NA3745** | 800 | 4 | **3NE1448-2** | 850 | 3 |
| **900** | 1250 | -2GE41-6AA0 | Circuit-breaker | - | - | Circuit-breaker | - | - |
| **500 V to 600 V 3 AC** | | | | | | | | |
| **630** | 900 | -2GF38-6AA0 | **3NA3352-6** | 2 × 315 | 3 | **3NE1435-2** | 560 | 3 |
| **710** | 1000 | -2GF41-1AA0 | **3NA3354-6** | 2 × 355 | 3 | **3NE1447-2** | 670 | 3 |
| **1000** | 1250 | -2GF41-4AA0 | **3NA3365-6** | 2 × 500 | 3 | **3NE1448-2** | 850 | 3 |
| **660 V to 690 V 3 AC** | | | | | | | | |
| **1000** | | -2GH41-1AA0 | **3NA3354-6** | 2 × 355 | 3 | **3NE1447-2** | 670 | 3 |
| **1350** | | -2GH41-4AA0 | **3NA3365-6** | 2 × 500 | 3 | **3NE1448-2** | 850 | 3 |
| **1500** | | -2GH41-5AA0 | Circuit-breaker | – | – | Circuit-breaker | – | – |

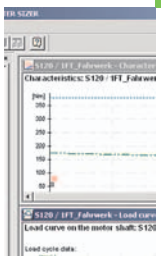
Note: The performance data in hp units are based on the NEC/CEC standards for the North American market.

1) If the drive converter cabinet units (subsystems, $I < 800$ A) are used without option **L26**, appropriate precautions for line and semiconductor protection must be taken on the plant side. The 3NE1... combined fuses are recommended for currents up to 800 A.

# Configuration

4

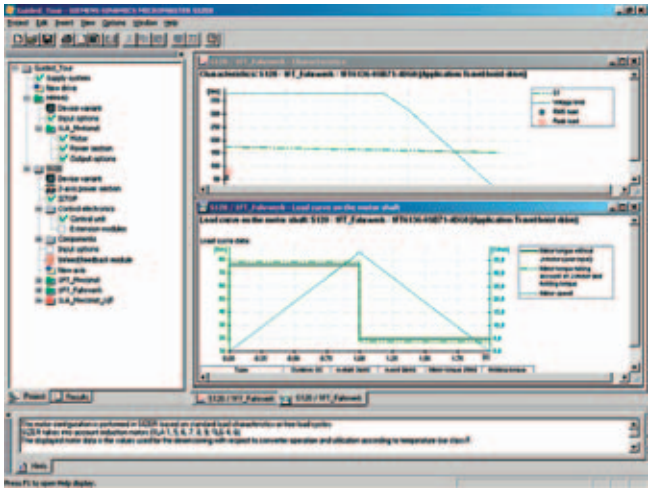





| | |
|---|---|
| **4/2** | **Selection guides** |
| 4/2 | SIZER configuration tool |
| 4/3 | STARTER drive/commissioning software |
| 4/4 | Drive ES engineering system |
| **4/5** | **Configuration of the SINAMICS G130 drive converter chassis units** |
| 4/5 | Dimensioning and selection guides |
| 4/8 | Customer's terminal blocks |
| 4/11 | Line-side components |
| 4/12 | DC link components |
| 4/14 | Load-side components and cables |
| **4/15** | **Configuration of the SINAMICS G150 drive converter cabinet units** |
| 4/15 | Dimensioning and selection guides |
| 4/16 | Customer's terminal block |
| 4/17 | Conductor cross-sections and connections |
| 4/21 | Line-side components |
| 4/22 | DC link components |
| 4/24 | Load-side components and cables |
| **4/25** | **Dimensioning drives** |
| **4/26** | **Motors** |

# 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 form of a workflow, which comprises the following stages:

- selection of the line supply
- dimensioning of the motor(s)
- calculation of the drive components
- selection of 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 about 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 and
- 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

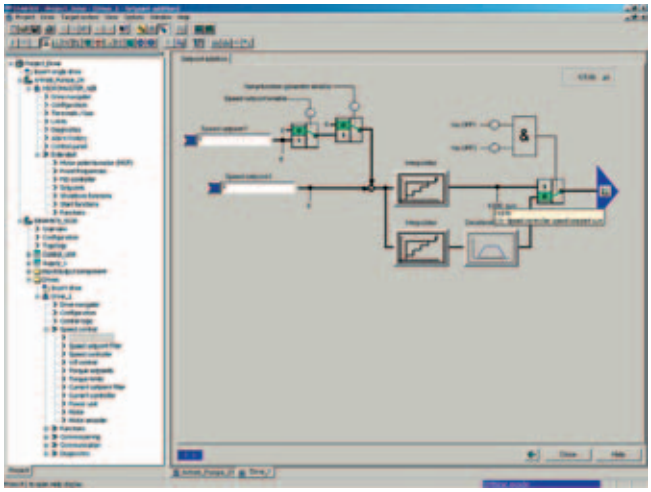
Windows™ NT 4.0 SP5, 2000 SP2, XP Professional SP1

Microsoft Internet Explorer 5.5 SP2

## Selection and ordering data

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

## Overview



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

- commissioning,
- optimization and
- diagnostics.

This software can be operated either as a stand-alone 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 and frequency converters for the centralized SIMATIC ET 200S FC I/O.

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

First-time users are supported by a solution-based dialog menu, with a standard graphics-based 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 screenforms, 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

For the communication between PG/PC and the CU320 Control Unit a PROFIBUS Communication Module and a connection cable are required.

E.g. PROFIBUS Communication Module CP 5512 (PCMCIA card, type 2 + adapter with 9-pole SUB-D socket for connection to PROFIBUS. For MS Windows 2000/XP Professional and PCMCIA 32)
Order No.: 6GK1551-2AA00

and connection cable between CP 5512 and PROFIBUS
Order No.: 6ES7901-4BD00-0XA0

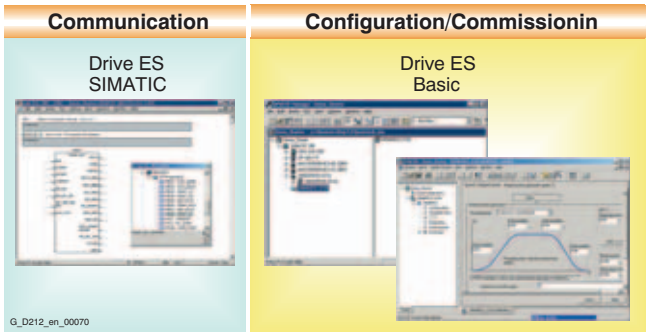
## Selection and ordering data

| | Order No. |
|---|---|
| STARTER commissioning tool for SINAMICS and MICROMASTER<br>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:

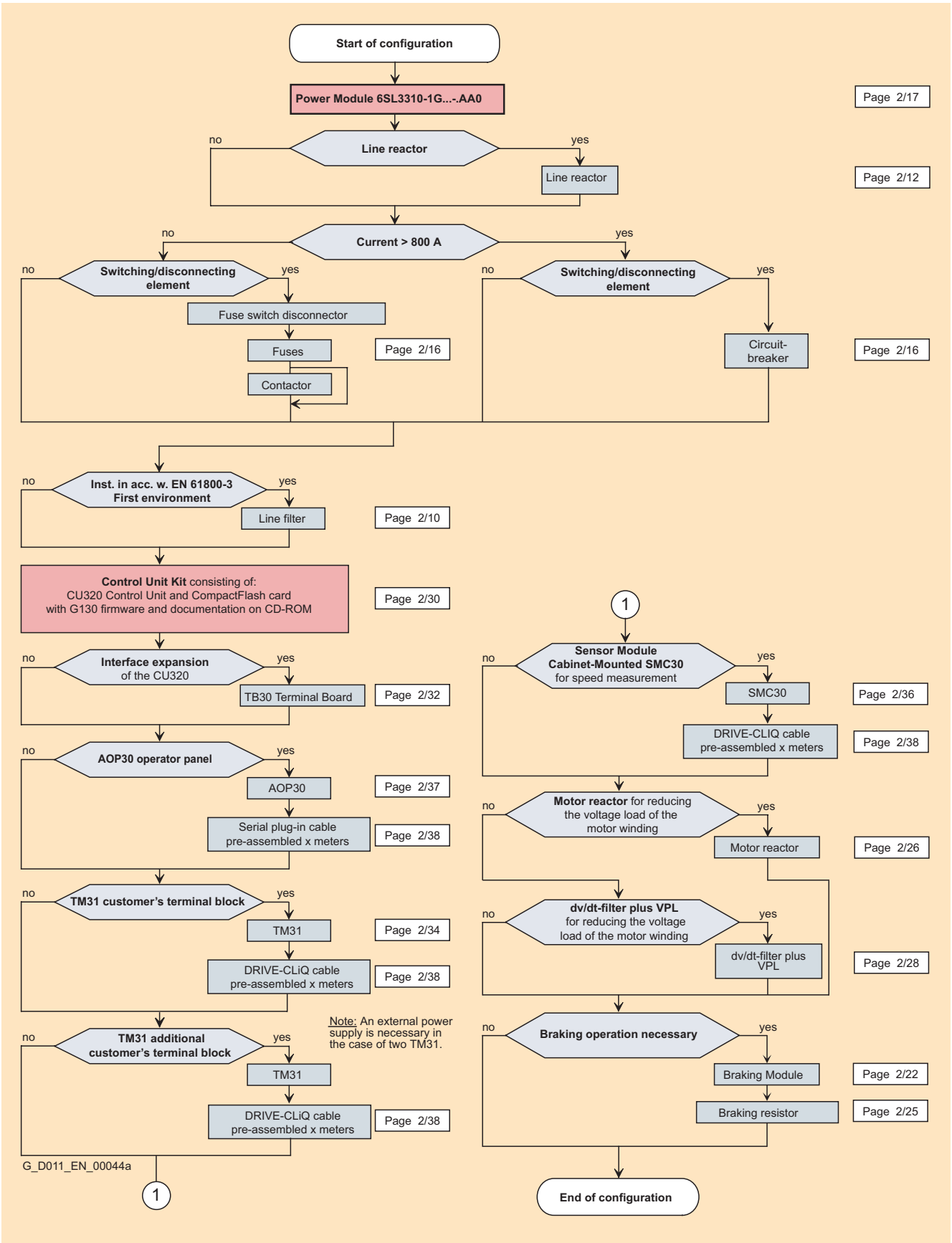
- **Drive ES Basic**
  for first-time users of the world of Totally Integrated Automation and the option for routing beyond network limits and the use of the SIMATIC teleservice.
  Drive ES Basic is the basic software program for setting the parameters of all drives online and offline.
  Drive ES Basic enables both the automation system and drives to be handled via the SIMATIC Manager user interface.
  Drive ES Basic is the starting point for common data archiving for complete projects and for extending the use of the SIMATIC teleservice to drives. Drive ES Basic provides the configuration tools for the new Motion Control functions slave-to-slave communication, equidistance and isochronous operation with PROFIBUS DP.
- **Drive ES SIMATIC**
  simple parameterization of the STEP 7 communication instead of programming.
  In order to use Drive ES SIMATIC, STEP 7 must be installed. It features a SIMATIC function block library, making the programming of the PROFIBUS interface in the SIMATIC CPU for the drives easy and secure. There is no need for separate, time-consuming programming of the data exchange between the SIMATIC CPU and the drive.
  All Drive ES users need to remember is:
  **Copy – Modify – Download – Ready.**
  **Customized, fully-developed function blocks** are copied from the library into user-specific projects.
  Frequently-used 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 set (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 higher. 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**<br>• Configuration software for the integration of drives into Totally Integrated Automation<br>• Requirement: STEP 7 V5.1 and higher, SP3<br>• Supply format: CD-ROM Ger., Eng., Fr., Sp., It. with electronic documentation | |
| Single-user license | **6SW1700-5JA00-3AA0** |
| Multi-user license, 60 pieces | **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 SIMATIC V 5.3**<br>• Function block library for SIMATIC for the parameterization of communication with the drives<br>• Requirement: STEP 7 V5.1 and higher, SP3<br>• Supply format: CD-ROM Ger., Eng., Fr., Sp., 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**<br>• Function block library for PCS 7 for the integration of drives<br>• Requirement: PCS 7 V 6.0 and higher<br>• Supply format: CD-ROM Ger., Eng., Fr., Sp., 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** |

## Configuration



## Dimensioning and selection guides

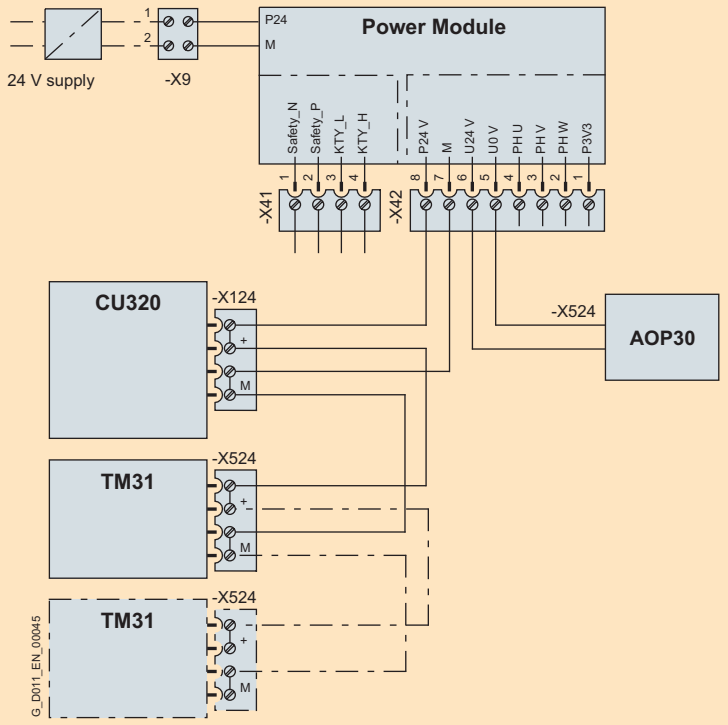
### Configuration (continued)

Integration of the various loads into the 24 V supply

The maximum output currents of the Power Module should be observed. If these are exceeded by the connected loads, 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 | Maximum output current | Comments |
|---|---|---|
| -X42 Pin 5 and 6 | 350 mA | Sufficient to supply the AOP30 with < 200 mA |
| -X42 Pin 7 and 8 | 2000 mA | Current requirement of the CU320 Control Unit is approximately 800 mA, ignoring the assignment of the slot and the Control Unit's digital outputs.<br>Current requirement of the TM31 Terminal Module is approximately 500 mA, ignoring the digital outputs. |



**Configuration** (continued)

### *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 line 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 in the complete frequency/speed adjustment range. For output frequencies greater than 100 Hz, currents should be observed in accordance with the required derating factors.

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. In accordance with EN 60204, an EMERGENCY STOP must be designed as a category 0 or category 1 stop.

Explanation of terms:

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

The category selection must be based on the risk evaluation of the drive unit.

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. If, however, a shutdown within a specific time is required for the EMERGENCY STOP case, a category 1 EMERGENCY STOP may be required. In certain circumstances this can require a braking facility, even when this is not required for the actual drive application.

## Customer's terminal blocks

### Configuration (continued)

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

**1.** The converter is **controlled via the PROFIBUS interface**, which is supplied as standard.
The digital inputs/outputs on the Control Unit are used to integrate external warning/alarm 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 | Default 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 (pre-assigned) in conjunction with the Braking Module |
| DI/DO13 | P24 | Default as output |
| M | | |
| DI/DO14 | P24 | Default as output |
| DI/DO15 | P24 | Default 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.

**2.** The converter is only **controlled via the digital inputs/outputs on 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 | Default 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 | Default as output |
| M | | |
| DI/DO14 | P24 | Default as output |
| DI/DO15 | P24 | Default as output |
| M | | |

**Configuration** (continued)

**3.** The converter is **controlled via the PROFIBUS interface**, which is supplied as standard.
The digital inputs/outputs on the Control Unit are used to integrate external warning/alarm messages and control signals; the optional **TM31** customer interface is **also** used.

| Terminal block on CU320 Control Unit | Factory default | Comment |
|---|---|---|
| **-X122** | | |
| DI0 | Free | |
| DI1 | Free | |
| DI2 | Free | |
| DI3 | Free | |
| M1 | | |
| M1 | | |
| DI/DO8 | Free | Default as output |
| DI/DO9 | Free | Default as output |
| M | | |
| DI/DO10 | Free | Default as output |
| DI/DO11 | Free | Default 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 | Default as output |
| M | | |
| DI/DO14 | Free | Default as output |
| DI/DO15 | Free | Default 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.

| 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 | Default as input |
| DI/DO10 | Free | Default as input |
| DI/DO11 | External alarm [1] | Default as input |
| **-X542** | Relay outputs (change-over contact) | |
| DO0 | Inverter enable (operation) | |
| DO1 | Checkback signal: no converter fault | |
| **-X521** | Analog inputs, differential | |
| AI0+ | Free | |
| AI0- | | |
| AI1+ | Free | |
| AI1- | | |
| **-X522** | Analog outputs | |
| AO 0V+ | | The outputs are set to 0 V to 10 V at the factory. |
| AO 0V- | Actual speed analog output | |
| AO 0C+ | | |
| AO 1V+ | | The outputs are set to 0 V to 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 | | |

## Customer's terminal blocks

**Configuration** (continued)

**4.** The converter is controlled only **via the digital inputs/outputs or analog inputs/outputs** on 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 | Default as output |
| DI/DO9 | Free | Default as output |
| M | | |
| DI/DO10 | Free | Default as output |
| DI/DO11 | Free | Default 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 | Default as output |
| M | | |
| DI/DO14 | Free | Default as output |
| DI/DO15 | Free | Default 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.

| 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 | Default as input |
| DI/DO10 | Free | Default as input |
| DI/DO11 | External alarm [1] | Default as input |
| **-X542** | Relay outputs (changeover contact) | |
| DO0 | Inverter enable (operation) | |
| DO1 | Checkback signal: no converter fault | |
| **-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 V to 10 V at the factory. |
| AO 0V- | Actual speed analog output | |
| AO 0C+ | | |
| AO 1V+ | | The outputs are set to 0 V to 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 | | |

**5.** The converter is controlled/operated only **via the optional AOP30 operator panel**. The **digital inputs/outputs on the CU320 Control Unit are not used** here.

## Configuration (continued)

### Line fuses

The combined fuses (3NE1.) with operational class gS 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.

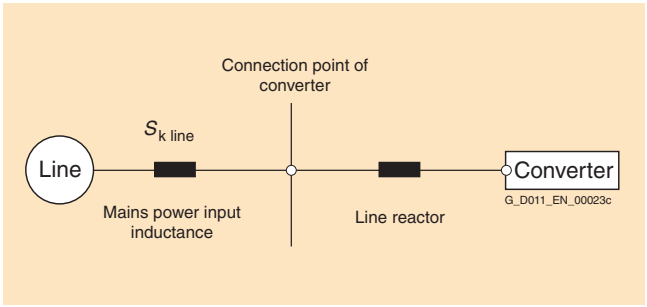
- Superfast
- Adapted to the limit current integral of the semiconductor
- Low arc voltage
- Improved current limiting (lower let-through values)

See Accessories for order numbers and assignments of these fuses. Please refer to Configuration, Order No. E20001-A700-P302, for the description and technical data of the fuses.

### Line reactor

A line reactor is required for high system short-circuit power, partly to protect the converter against excessive harmonic currents, and thus against overload, and partly to limit the harmonic effects on the system to the permissible 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 line connection point to fundamental apparent output $S_{conv}$ of the connected converters (in accordance with EN 50178/VDE 0160).



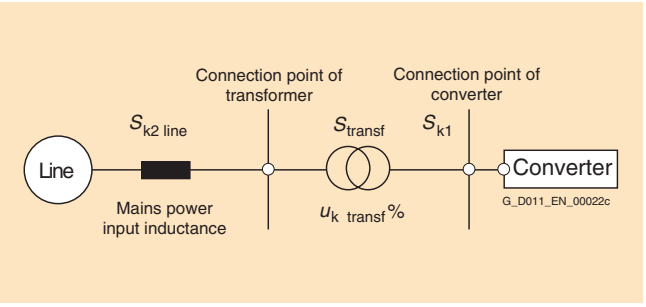

The following applies for SINAMICS G130 drive converter chassis units:

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

As, in practice, it is not known on which line configuration individual converters are to be operated, i.e. which line short-circuit power is present at the converter connection location, 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 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 an integral line filter as standard to limit emitted interference and thus conform to the limits for category C3 defined in the EN 61800-3 product standard.

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 if the installation instructions are followed, they may thus be used in the first environment as defined in EN 61800-3.

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

## DC link components

### Configuration (continued)

#### *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 50 kW are available for the SINAMICS G130 drive converter chassis units ($P_{20}$ power: 200 kW). For higher braking powers, braking units can be connected in parallel for larger converters (on request).

If the braking units are used at ambient temperatures > 40 °C and installation altitudes > 2000 m, the reduction factors for current and power listed for the power units also apply here.

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

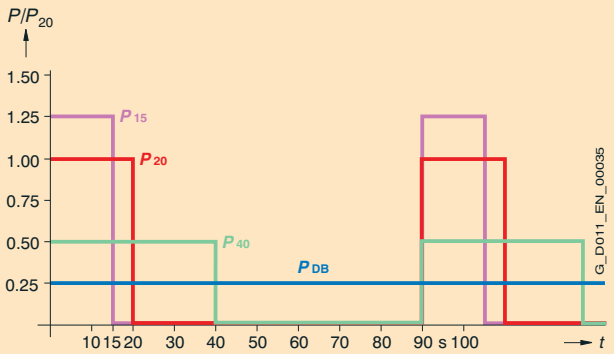
Determining the required braking units and braking resistors

- For periodic duty cycles with a cycle duration of ≤ 90 s, the average value of the braking power must be defined within this duty cycle. The relevant cycle duration must be applied as the time base.
- For periodic duty cycles with a cycle duration of ≥ 90 s or for sporadic braking operations, a time interval of 90 s in which the highest average value occurs must be selected. The 90 s period must be applied as the time base.

Apart from the average braking power, the required peak braking power must also be taken into account when braking units are selected (Braking Module and braking resistor).

Basic data

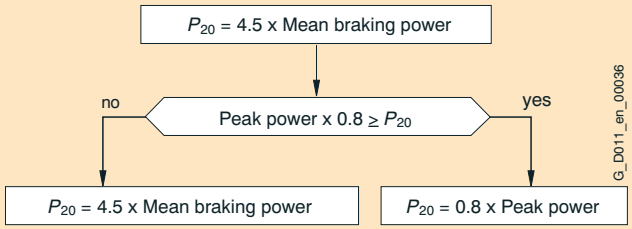
| SINAMICS G130 drive converter chassis units Power Modules | Braking Module | | | | Braking resistor $R_B$ | Max. current |
|---|---|---|---|---|---|---|
| | Rated power (continuous braking power) $P_{DB}$ | Power $P_{40}$ | Power $P_{20}$ | Peak power $P_{15}$ | | |
| kW | kW | kW | kW | kW | | A |
| **380 V to 480 V 3 AC** | | | | | | |
| 315 to 560 | 50 | 100 | 200 | 250 | 2.2 Ω ±7.5% | 378 |
| **500 V to 600 V 3 AC** | | | | | | |
| 315 to 560 | 50 | 100 | 200 | 250 | 3.4 Ω ±7.5% | 306 |
| **660 V to 690 V 3 AC** | | | | | | |
| 315 to 800 | 50 | 100 | 200 | 250 | 4.9 Ω ±7.5% | 255 |




$P_{DB}$ = 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 for activation of the braking unit and, therefore, the resulting DC link voltage, can be reduced. For example, the DC link voltage for converters in the voltage range 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 should be used instead of 0.8.

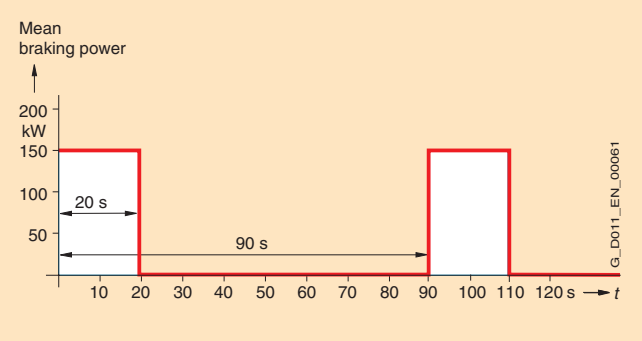
The ON/OFF states of the Braking Module are controlled by a 2-point controller. The respective response thresholds are shown in the following table:

| Line voltage | Braking unit response threshold |
|---|---|
| 380 V to 480 V 3 AC | 774 V (673 V) |
| 500 V to 600 V 3 AC | 967 V (841 V) |
| 660 V to 690 V 3 AC | 1158 V (1070 V) |

**Configuration** (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 configuring the Braking Module and braking resistor, i.e. a braking unit ≥ 150 kW should be provided.

The braking unit with 50 kW ($P_{20}$ = 200 kW) must 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 configuring the Braking Module and braking resistor, i.e. a braking unit ≥ 159 kW should be provided.

The braking unit with 50 kW ($P_{20}$ = 200 kW) must be selected.

## Load-side components and cables

**Configuration** (continued)

### *Motor reactor*

IGBT-converter switching frequencies result in high voltage rises *dv/dt* at the converter output. If long motor cables are used, this leads to an additional current load on the converter due to capacitive charge/discharge currents. The high voltage rises, and the resulting voltage peaks at the motor terminals, cause the motors' electrical winding load to increase in comparison to direct on-line operation. In conjunction with the connected cable capacitances, the motor reactors with adapted inductances reduce the capacitive charge/discharge currents in the motor cables and, as a function of those motor cables, limit the voltage rise *dv/dt* and the voltage peaks $\hat{V}_{LL}$ at the motor terminals.

### *dv/dt filter plus VPL*

The dv/dt filter plus VPL consists of two components: the dv/dt reactor and the VPL (**V**oltage **P**eak **L**imiter), which limits voltage peaks and returns the energy to the DC link.

The dv/dt filters plus VPL are to be used for motors for which the voltage endurance of the insulation system is unknown or insufficient. Standard motors of the 1LA5, 1LA6 and 1LA8 series only require them at supply voltages > 500 V +10%.

The dv/dt filters plus VPL limit the rate of voltage rise to values < 500 V/µs and the typical voltage peaks at rated line voltages to the values below (with motor cable lengths < 150 m):

< 1000 V at $V_{line}$ < 575 V

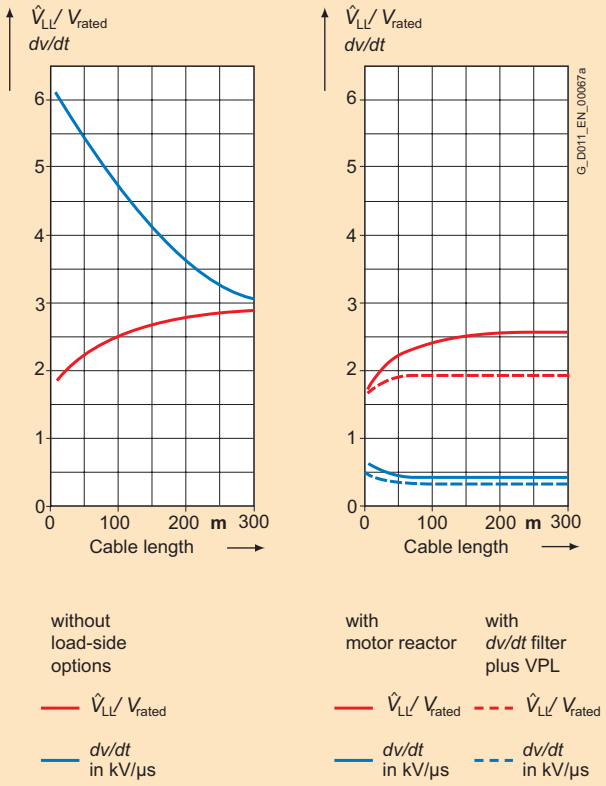
< 1250 V at 660 V < $V_{line}$ < 690 V.

### *Max. connectable motor cable lengths*

The table shows the maximum connectable motor cable lengths. The values apply to all standard motor cables, included the recommended ones. Longer cable lengths are available on request.

| Drive converter cabinet unit | | Max. cable length | | |
|---|---|---|---|---|
| Line voltage | Power | Protoflex EMC 3 Plus [1] | Shielded cable, e.g. Protodur NYCWY | Unshielded cable, e.g. Protodur NYY |
| V | kW | m | m | m |
| **Without reactor and filter** | | | | |
| 380 to 480 3 AC | 110 to 560 | 300 | 300 | 450 |
| 500 to 600 3 AC | 110 to 560 | 300 | 300 | 450 |
| 660 to 690 3 AC | 75 to 800 | 300 | 300 | 450 |
| **With motor reactor** | | | | |
| 380 to 480 3 AC | 110 to 560 | 300 | 300 | 450 |
| 500 to 600 3 AC | 110 to 560 | 300 | 300 | 450 |
| 660 to 690 3 AC | 75 to 800 | 300 | 300 | 450 |
| **With dv/dt filter plus VPL** | | | | |
| 380 to 480 3 AC | 110 to 560 | 300 | 300 | 450 |
| 500 to 600 3 AC | 110 to 560 | 300 | 300 | 450 |
| 660 to 690 3 AC | 75 to 800 | 300 | 300 | 450 |

1) Protoflex EMC 3 Plus cables comply with the limits for interference voltage and emitted noise specified in the EN 61800-3 standard for use in the second environment. The limits in the EN 61800-3 standard correspond to those in the EN 55011 Class A Group 2 standard.



## Configuration

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

SINAMICS G150 drive 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 line 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 in the complete frequency/speed adjustment range. For output frequencies greater than 100 Hz, currents should be observed in accordance with the required derating factors.

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 60529 standard covers the protection of electrical equipment by means of housings, covers or equivalent and includes:

- Protection of persons against accidental contact with live or moving parts within the housing and protection of the equipment against the penetration of solid foreign matter (shock protection and foreign matter 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 (shock and foreign matter protection) | Second digit (protection of the equipment against the penetration of water) |
|---|---|---|
| **IP20** | Protected against solid foreign matter, diameter ≥ 12.5 mm | No water protection |
| **IP21** | Protected against solid foreign matter, diameter ≥ 12.5 mm | Protected against drip water.<br>Vertically falling drip water must not have a harmful effect |
| **IP23** | Protected against solid foreign matter, diameter ≥ 12.5 mm | Protected against spray water.<br>Water sprayed on both sides of the vertical at an angle of up to 60° must not have a harmful effect |
| **IP54** | Dust protected.<br>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.<br>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. In accordance with EN 60204, an EMERGENCY STOP must be designed as a category 0 or category 1 stop.

Explanation of terms:

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

The category selection must be based on the risk evaluation of the drive unit.

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. If, however, a shutdown within a specific time is required for the EMERGENCY STOP case, a category 1 EMERGENCY STOP may be required. In certain circumstances this can require a braking facility, even when this is not required for the actual drive application.

## Customer's terminal block

### Configuration (continued)

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 | Default as input |
| DI/DO10 | Free | Default as input |
| DI/DO11 | Free | Default as input |
| **-X542** | Relay outputs (changeover contact) | |
| DO 0 | Inverter enable (operation) | |
| DO 1 | Checkback signal: no converter fault | |
| **-X521** | Analog inputs, differential | |
| AI0+ | Analog input for setting speed setpoint | The inputs are set to 0 mA to 20 mA at the factory. |
| AI0- | | |
| AI1+ | Analog input reserved | The inputs are set to 0 mA to 20 mA at the factory. |
| AI1- | | |
| **-X522** | Analog outputs | |
| AO 0V+ | | The outputs are set to 0 mA to 20 mA at the factory. |
| AO 0V- | Actual speed analog output | |
| AO 0C+ | | |
| AO 1V+ | | The outputs are set to 0 mA to 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.

## Configuration (continued)

The tables below show the recommended or maximum possible cable connections on the line and motor sides for simple and parallel connection.

The recommended cross-sections are based on the listed fuses and 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 configuration instructions for routing the cables must be taken into account.

### *Simple connection*

| Power | Converter | Weight | Line connection | | | | Motor connection | | | | Cabinet grounding | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | SINAMICS G150 **Version A** | (standard version) | Recommended cross-section [1] | Maximum conductor cross-section | | Mounting screw M12 | Recommended cross-section [1] | Maximum conductor cross-section | | Mounting screw M12 | Mounting screw M12 | Comment |
| | Type | | DIN VDE | DIN VDE | **NEC, CEC** | (No. of holes) | DIN VDE | DIN VDE | **NEC, CEC** | (No. of holes) | (No. of holes) | |
| **kW** | 6SL3710- ... | kg | $mm^2$ | $mm^2$ | **AWG/MCM** | | $mm^2$ | $mm^2$ | **AWG/MCM** | | | |
| **380 V to 480 V 3 AC** | | | | | | | | | | | | |
| **110** | -1GE32-1AA0 | 320 | 2x70 | 4x240 | 4x500 MCM | (2) | 2x50 | 2x150 | 2x300 MCM | (2) | (2) | |
| **132** | -1GE32-6AA0 | 320 | 2x95 | 4x240 | 4x500 MCM | (2) | 2x70 | 2x150 | 2x300 MCM | (2) | (2) | |
| **160** | -1GE33-1AA0 | 390 | 2x120 | 4x240 | 4x500 MCM | (2) | 2x95 | 2x150 | 2x300 MCM | (2) | (2) | |
| **200** | -1GE33-8AA0 | 480 | 2x120 | 4x240 | 4x500 MCM | (2) | 2x95 | 2x150 | 2x300 MCM | (2) | (2) | |
| **250** | -1GE35-0AA0 | 480 | 2x185 | 4x240 | 4x500 MCM | (2) | 2x150 | 2x240 | 2x500 MCM | (2) | (2) | |
| **315** | -1GE36-1AA0 | 860 | 2x240 | 4x240 | 4x500 MCM | (2) | 2x185 | 4x240 | 4x500 MCM | (2) | (2) | |
| **400** | -1GE37-5AA0 | 865 | 2x300 | 4x240 | 4x500 MCM | (2) | 3x150 | 4x240 | 4x500 MCM | (2) | (10) | ground bus |
| **450** | -1GE38-4AA0 | 1075 | 4x150 | 8x240 | 8x500 MCM | (4) | 3x185 | 4x240 | 4x500 MCM | (2) | (16) | ground bus |
| **560** | -1GE41-0AA0 | 1360 | 4x185 | 8x240 | 8x500 MCM | (4) | 4x185 | 6x240 | 6x500 MCM | (3) | (18) | ground bus |
| **500 V to 600 V 3 AC** | | | | | | | | | | | | |
| **110** | -1GF31-8AA0 | 390 | 120 | 4x240 | 4x500 MCM | (2) | 95 | 2x150 | 2x300 MCM | (2) | (2) | |
| **132** | -1GF32-2AA0 | 390 | 2x70 | 4x240 | 4x500 MCM | (2) | 120 | 2x150 | 2x300 MCM | (2) | (2) | |
| **160** | -1GF32-6AA0 | 390 | 2x95 | 4x240 | 4x500 MCM | (2) | 2x70 | 2x185 | 2x350 MCM | (2) | (2) | |
| **200** | -1GF33-3AA0 | 390 | 2x120 | 4x240 | 4x500 MCM | (2) | 2x95 | 2x240 | 2x500 MCM | (2) | (2) | |
| **250** | -1GF34-1AA0 | 860 | 2x185 | 4x240 | 4x500 MCM | (2) | 2x120 | 4x240 | 4x500 MCM | (2) | (2) | |
| **315** | -1GF34-7AA0 | 860 | 2x185 | 4x240 | 4x500 MCM | (2) | 2x150 | 4x240 | 4x500 MCM | (2) | (2) | |
| **400** | -1GF35-8AA0 | 860 | 2x240 | 4x240 | 4x500 MCM | (2) | 2x185 | 4x240 | 4x500 MCM | (2) | (2) | |
| **500** | -1GF37-4AA0 | 1320 | 3x185 | 8x240 | 8x500 MCM | (4) | 3x150 | 6x240 | 6x500 MCM | (3) | (18) | ground bus |
| **560** | -1GF38-1AA0 | 1360 | 4x150 | 8x240 | 8x500 MCM | (4) | 3x185 | 6x240 | 6x500 MCM | (3) | (18) | ground bus |
| **660 V to 690 V 3 AC** | | | | | | | | | | | | |
| **75** | -1GH28-5AA0 | 320 | 50 | 4x240 | 4x500 MCM | (2) | 35 | 2x70 | 2x2/0 AWG | (2) | (2) | |
| **90** | -1GH31-0AA0 | 320 | 50 | 4x240 | 4x500 MCM | (2) | 50 | 2x150 | 2x300 MCM | (2) | (2) | |
| **110** | -1GH31-2AA0 | 320 | 70 | 4x240 | 4x500 MCM | (2) | 70 | 2x150 | 2x300 MCM | (2) | (2) | |
| **132** | -1GH31-5AA0 | 320 | 95 | 4x240 | 4x500 MCM | (2) | 70 | 2x150 | 2x300 MCM | (2) | (2) | |
| **160** | -1GH31-8AA0 | 390 | 120 | 4x240 | 4x500 MCM | (2) | 95 | 2x150 | 2x300 MCM | (2) | (2) | |
| **200** | -1GH32-2AA0 | 390 | 2x70 | 4x240 | 4x500 MCM | (2) | 120 | 2x150 | 2x300 MCM | (2) | (2) | |
| **250** | -1GH32-6AA0 | 390 | 2x95 | 4x240 | 4x500 MCM | (2) | 2x70 | 2x185 | 2x350 MCM | (2) | (2) | |
| **315** | -1GH33-3AA0 | 390 | 2x120 | 4x240 | 4x500 MCM | (2) | 2x95 | 2x240 | 2x500 MCM | (2) | (2) | |
| **400** | -1GH34-1AA0 | 860 | 2x185 | 4x240 | 4x500 MCM | (2) | 2x120 | 4x240 | 4x500 MCM | (2) | (2) | |
| **450** | -1GH34-7AA0 | 860 | 2x185 | 4x240 | 4x500 MCM | (2) | 2x150 | 4x240 | 4x500 MCM | (2) | (2) | |
| **560** | -1GH35-8AA0 | 860 | 2x240 | 4x240 | 4x500 MCM | (2) | 2x185 | 4x240 | 4x500 MCM | (2) | (2) | |
| **710** | -1GH37-4AA0 | 1320 | 3x185 | 8x240 | 8x500 MCM | (4) | 3x150 | 6x240 | 6x500 MCM | (3) | (18) | ground bus |
| **800** | -1GH38-1AA0 | 1360 | 4x150 | 8x240 | 8x500 MCM | (4) | 3x185 | 6x240 | 6x500 MCM | (3) | (18) | ground bus |

1) The recommendations for the North American market in AWG or MCM must be taken from the appropriate NEC (National Electrical Code)/CEC (Canadian Electrical Code) standards.

## Conductor cross-sections and connections

### Configuration (continued)

#### *Simple connection*

| Power | Converter | Weight | Line connection | | | | Motor connection | | | | Cabinet grounding | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | SINAMICS G150 **Version C** | (standard version) | Recommended cross-section [1] | Maximum conductor cross-section | | Mounting screw M12 | Recommended cross-section [1] | Maximum conductor cross-section | | Mounting screw M12 | Mounting screw M12 | Comment |
| | Type | | DIN VDE | DIN VDE | **NEC, CEC** | (No. of holes) | DIN VDE | DIN VDE | **NEC, CEC** | (No. of holes) | (No. of holes) | |
| **kW** | 6SL3710- ... | kg | $mm^2$ | $mm^2$ | **AWG/MCM** | | $mm^2$ | $mm^2$ | **AWG/MCM** | | | |
| **380 V to 480 V 3 AC** | | | | | | | | | | | | |
| **110** | -1GE32-1CA0 | 225 | 2x70 | 2x240 | 2x500 MCM | (1) | 2x50 | 2x150 | 2x300 MCM | (1) | (2) | |
| **132** | -1GE32-6CA0 | 225 | 2x95 | 2x240 | 2x500 MCM | (1) | 2x70 | 2x150 | 2x300 MCM | (1) | (2) | |
| **160** | -1GE33-1CA0 | 300 | 2x120 | 2x240 | 2x500 MCM | (1) | 2x95 | 2x150 | 2x300 MCM | (1) | (2) | |
| **200** | -1GE33-8CA0 | 300 | 2x120 | 2x240 | 2x500 MCM | (1) | 2x95 | 2x150 | 2x300 MCM | (1) | (2) | |
| **250** | -1GE35-0CA0 | 300 | 2x185 | 2x240 | 2x500 MCM | (1) | 2x150 | 2x240 | 2x500 MCM | (1) | (2) | |
| **315** | -1GE36-1CA0 | 670 | 2x240 | 8x240 | 8x500 MCM | (4) | 2x185 | 8x240 | 8x500 MCM | (4) | (2) | |
| **400** | -1GE37-5CA0 | 670 | 2x300 | 8x240 | 8x500 MCM | (4) | 3x150 | 8x240 | 8x500 MCM | (4) | (8) | ground bus |
| **450** | -1GE38-4CA0 | 670 | 4x150 | 8x240 | 8x500 MCM | (4) | 3x185 | 8x240 | 8x500 MCM | (4) | (8) | ground bus |
| **560** | -1GE41-0CA0 | 980 | 4x185 | 8x240 | 8x500 MCM | (4) | 4x185 | 8x240 | 8x500 MCM | (4) | (10) | ground bus |
| **500 V to 600 V 3 AC** | | | | | | | | | | | | |
| **110** | -1GF31-8CA0 | 300 | 120 | 2x240 | 2x500 MCM | (1) | 95 | 2x150 | 2x300 MCM | (1) | (2) | |
| **132** | -1GF32-2CA0 | 300 | 2x70 | 2x240 | 2x500 MCM | (1) | 120 | 2x150 | 2x300 MCM | (1) | (2) | |
| **160** | -1GF32-6CA0 | 300 | 2x95 | 2x240 | 2x500 MCM | (1) | 2x70 | 2x185 | 2x350 MCM | (1) | (2) | |
| **200** | -1GF33-3CA0 | 300 | 2x120 | 4x240 | 4x500 MCM | (1) | 2x95 | 2x240 | 2x500 MCM | (1) | (2) | |
| **250** | -1GF34-1CA0 | 670 | 2x185 | 4x240 | 4x500 MCM | (2) | 2x120 | 4x240 | 4x500 MCM | (2) | (2) | |
| **315** | -1GF34-7CA0 | 670 | 2x185 | 4x240 | 4x500 MCM | (2) | 2x150 | 4x240 | 4x500 MCM | (2) | (2) | |
| **400** | -1GF35-8CA0 | 670 | 2x240 | 4x240 | 4x500 MCM | (2) | 2x185 | 4x240 | 4x500 MCM | (2) | (2) | |
| **500** | -1GF37-4CA0 | 940 | 3x185 | 8x240 | 8x500 MCM | (4) | 3x150 | 6x240 | 6x500 MCM | (3) | (18) | ground bus |
| **560** | -1GF38-1CA0 | 980 | 4x150 | 8x240 | 8x500 MCM | (4) | 3x185 | 6x240 | 6x500 MCM | (3) | (18) | ground bus |
| **660 V to 690 V 3 AC** | | | | | | | | | | | | |
| **75** | -1GH28-5CA0 | 225 | 50 | 2x240 | 2x500 MCM | (1) | 35 | 2x70 | 2x2/0 AWG | (1) | (2) | |
| **90** | -1GH31-0CA0 | 225 | 50 | 2x240 | 2x500 MCM | (1) | 50 | 2x150 | 2x300 MCM | (1) | (2) | |
| **110** | -1GH31-2CA0 | 225 | 70 | 2x240 | 2x500 MCM | (1) | 70 | 2x150 | 2x300 MCM | (1) | (2) | |
| **132** | -1GH31-5CA0 | 225 | 95 | 2x240 | 2x500 MCM | (1) | 70 | 2x150 | 2x300 MCM | (1) | (2) | |
| **160** | -1GH31-8CA0 | 300 | 120 | 2x240 | 2x500 MCM | (1) | 95 | 2x150 | 2x300 MCM | (1) | (2) | |
| **200** | -1GH32-2CA0 | 300 | 2x70 | 2x240 | 2x500 MCM | (1) | 120 | 2x150 | 2x300 MCM | (1) | (2) | |
| **250** | -1GH32-6CA0 | 300 | 2x95 | 2x240 | 2x500 MCM | (1) | 2x70 | 2x185 | 2x350 MCM | (1) | (2) | |
| **315** | -1GH33-3CA0 | 300 | 2x120 | 4x240 | 4x500 MCM | (1) | 2x95 | 2x240 | 2x500 MCM | (1) | (2) | |
| **400** | -1GH34-1CA0 | 670 | 2x185 | 4x240 | 4x500 MCM | (2) | 2x120 | 4x240 | 4x500 MCM | (2) | (2) | |
| **450** | -1GH34-7CA0 | 670 | 2x185 | 4x240 | 4x500 MCM | (2) | 2x150 | 4x240 | 4x500 MCM | (2) | (2) | |
| **560** | -1GH35-8CA0 | 670 | 2x240 | 4x240 | 4x500 MCM | (2) | 2x185 | 4x240 | 4x500 MCM | (2) | (2) | |
| **710** | -1GH37-4CA0 | 940 | 3x185 | 8x240 | 8x500 MCM | (4) | 3x150 | 6x240 | 6x500 MCM | (3) | (18) | ground bus |
| **800** | -1GH38-1CA0 | 980 | 4x150 | 8x240 | 8x500 MCM | (4) | 3x185 | 6x240 | 6x500 MCM | (3) | (18) | ground bus |

1) The recommendations for the North American market in AWG or MCM must be taken from the appropriate NEC (National Electrical Code)/CEC (Canadian Electrical Code) standards.

## Configuration (continued)

### *Parallel connection*

| Power | Converter | Weight | Line connection | | | | Motor connection | | | | Cabinet grounding | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | SINAMICS G150 **Version A** | (standard version) | Recommended cross-section [1] | Maximum conductor cross-section | | Mounting screw M12 | Recommended cross-section [1] | Maximum conductor cross-section | | Mounting screw M12 | Mounting screw M12 | Comment |
| | Type | | DIN VDE | DIN VDE | **NEC, CEC** | (No. of holes) | DIN VDE | DIN VDE | **NEC, CEC** | (No. of holes) | (No. of holes) | |
| **kW** | 6SL3710- ... | kg | $mm^2$ | $mm^2$ | **AWG/MCM** | | $mm^2$ | $mm^2$ | **AWG/MCM** | | | |
| **380 V to 480 V 3 AC** | | | | | | | | | | | | |
| **630** | -2GE41-1AA0 | 1700 | 2x240 | 4x240 | 4x500 MCM | (2) | 2x185 | 4x240 | 4x500 MCM | (2) | (2) | |
| **710** | -2GE41-4AA0 | 1710 | 2x300 | 4x240 | 4x500 MCM | (2) | 3x150 | 4x240 | 4x500 MCM | (2) | (10) | ground bus |
| **900** | -2GE41-6AA0 | 2130 | 4x150 | 8x240 | 8x500 MCM | (4) | 3x185 | 4x240 | 4x500 MCM | (2) | (16) | ground bus |
| **500 V to 600 V 3 AC** | | | | | | | | | | | | |
| **630** | -2GF38-6AA0 | 1700 | 2x185 | 4x240 | 4x500 MCM | (2) | 2x150 | 4x240 | 4x500 MCM | (2) | (2) | |
| **710** | -2GF41-1AA0 | 1700 | 2x240 | 4x240 | 4x500 MCM | (2) | 2x185 | 4x240 | 4x500 MCM | (2) | (2) | |
| **1000** | -2GF41-4AA0 | 2620 | 3x185 | 8x240 | 8x500 MCM | (4) | 3x150 | 6x240 | 6x500 MCM | (3) | (18) | ground bus |
| **660 V to 690 V 3 AC** | | | | | | | | | | | | |
| **1000** | -2GH41-1AA0 | 1700 | 2x240 | 4x240 | 4x500 MCM | (2) | 2x185 | 4x240 | 4x500 MCM | (2) | (2) | |
| **1350** | -2GH41-4AA0 | 2620 | 3x185 | 8x240 | 8x500 MCM | (4) | 3x150 | 6x240 | 6x500 MCM | (3) | (18) | ground bus |
| **1500** | -2GH41-5AA0 | 2700 | 4x150 | 8x240 | 8x500 MCM | (4) | 3x185 | 6x240 | 6x500 MCM | (3) | (18) | ground bus |

Note: The recommended and maximum conductor cross-sections relate to the appropriate subsystem of the converter operated in a parallel circuit.

1) The recommendations for the North American market in AWG or MCM must be taken from the appropriate NEC (National Electrical Code)/CEC (Canadian Electrical Code) standards.

## Conductor cross-sections and connections

**Configuration** (continued)

### *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 (ground 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 loading of 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. Reference should be made to the corresponding reduction factors for such conditions as specified 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.

Current loading in accordance with DIN VDE 0298 Part 2 at 40 °C

| Cross-section of 3-wire cables | With single routing | With several cables 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 |

With higher currents, cables must be connected in parallel.

Note: The recommendations for the North American market in AWG or MCM must be taken from the appropriate NEC (National Electrical Code)/CEC (Canadian Electrical Code) standards.

### *Grounding*

Required PE conductor cross-sections:

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

- In the event of a ground fault caused by voltage losses of the ground fault current on the PE conductor, no impermissible high contact voltages may occur (< 50 V AC or < 120 V DC, EN 50178 Subsection 5.3.2.2, IEC 60364, IEC 60543).
- The ground fault current flowing in the PE conductor in the event of a ground fault must not place an impermissible load on the PE conductor.
- If it is possible for continuous currents to flow through the PE conductor when a fault occurs in accordance with EN 50178 Subsection 8.3.3.4, the PE conductor cross-section must be dimensioned for this continuous current.
- The PE conductor cross-section should be selected in accordance with EN 60204-1, EN 60439-1, IEC 60364.

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

Note: The recommendations for the North American market in AWG or MCM must be taken from the appropriate NEC (National Electrical Code)/CEC (Canadian Electrical Code) standards.

- Switchgear and motors are usually grounded separately with a local ground electrode. With this constellation, the ground fault current flows via the parallel ground connections and is divided. With this grounding, no impermissible contact voltages can occur, despite the PE conductor cross-sections used in the above table. From our experience with different grounding configurations, however, we recommend that the ground 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 ground 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 ground conductors.
- Through their fast control, the converters limit the load current (motor and ground fault currents) to an rms value corresponding to the rated current. Because of this, we recommend the use of a PE conductor cross-section that is analogous to the outer conductor cross-section for grounding the control cabinet.

## Configuration (continued)

### Line fuses

The combined fuses (3NE1.) with operational class gS 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.

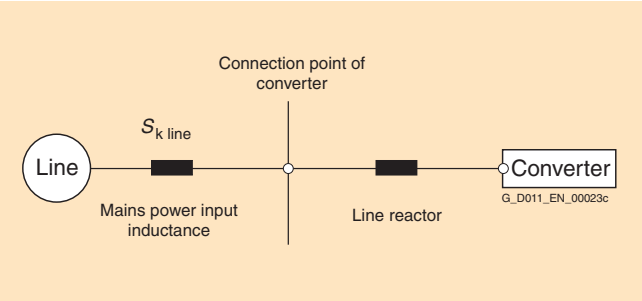
- Superfast
- Adapted to the limit current integral of the semiconductor
- Low arc voltage
- Improved current limiting (lower let-through values)

See Accessories for order numbers and assignments of these fuses. Please refer to Configuration, Order No. E20001-A700-P302, for the description and technical data of the fuses.

### Line reactor

A line reactor is required for high system short-circuit power, partly to protect the actual converter against excessive harmonic currents, and thus against overload, and partly to limit the harmonic effects on the system to the permissible 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 line connection point to fundamental apparent output $S_{conv}$ of the connected converters (in accordance with EN 50178/VDE 0160).

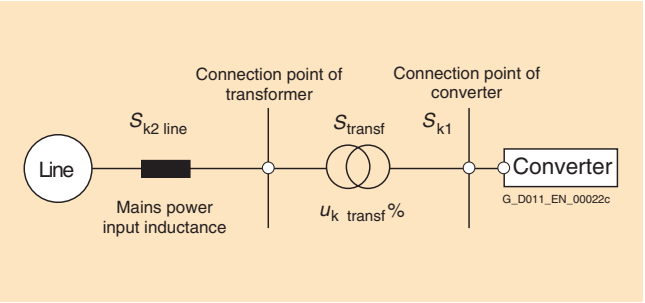



The following applies for SINAMICS G150 drive converter cabinet units:

| Power | 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** |

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

The line reactor can only be omitted (option **L22**) 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 |

As large-power converters should ideally be connected to medium-voltage power supplies via transformers because of the harmonic effects on the supply, cabinet units over 500 kW have no line reactors as standard.

A line reactor (option **L23**) 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 an integral line filter as standard to limit emitted interference and thus conform to the limits for category C3 defined in the EN 61800-3 product standard.

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 if the installation instructions are followed, they may thus be used in the first environment as defined in EN 61800-3.

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

## DC link components

### Configuration (continued)

#### *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 25 kW and 50 kW that cover a wide range. For higher braking powers, braking units can be connected in parallel for larger converters (on request).

If the braking units are used at ambient temperatures > 40 °C and installation altitudes > 2000 m, the reduction factors for current and power listed for the power units also apply here.

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

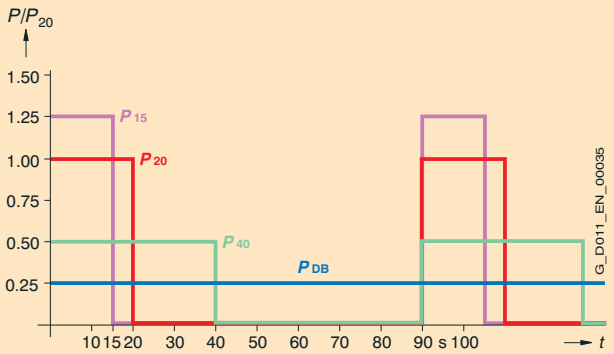
Determining the required braking units and braking resistors

- For periodic duty cycles with a cycle duration of ≤ 90 s, the average value of the braking power must be defined within this duty cycle. The relevant period should be used as the time base.
- For periodic duty cycles with a cycle duration of ≥ 90 s or for sporadic braking operations, a time interval of 90 s in which the highest average value occurs must be selected. The 90 s period must be applied as the time base.

Apart from the average braking power, the required peak braking power must also be taken into account when braking units are selected (Braking Module and braking resistor).

Basic data

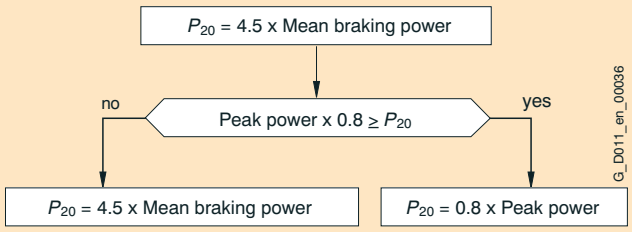
| SINAMICS G150 drive converter cabinet units | Braking Module | | | | Braking resistor $R_B$ | Max. current |
|---|---|---|---|---|---|---|
| | Rated power (continuous braking power) $P_{DB}$ | Power $P_{40}$ | Power $P_{20}$ | Peak power $P_{15}$ | | |
| kW | kW | kW | kW | kW | | A |
| **380 V to 480 V 3 AC** | | | | | | |
| 110 to 132 | 25 | 50 | 100 | 125 | 4.4 Ω ±7.5% | 189 |
| 160 to 560 | 50 | 100 | 200 | 250 | 2.2 Ω ±7.5% | 378 |
| **500 V to 600 V 3 AC** | | | | | | |
| 110 to 560 | 50 | 100 | 200 | 250 | 3.4 Ω ±7.5% | 306 |
| **660 V to 690 V 3 AC** | | | | | | |
| 75 to 132 | 25 | 50 | 100 | 125 | 9.8 Ω ±7.5% | 127 |
| 160 to 800 | 50 | 100 | 200 | 250 | 4.9 Ω ±7.5% | 255 |




$P_{DB}$ = 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 for activation of the braking unit and, therefore, the resulting DC link voltage, 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 should be used instead of 0.8.

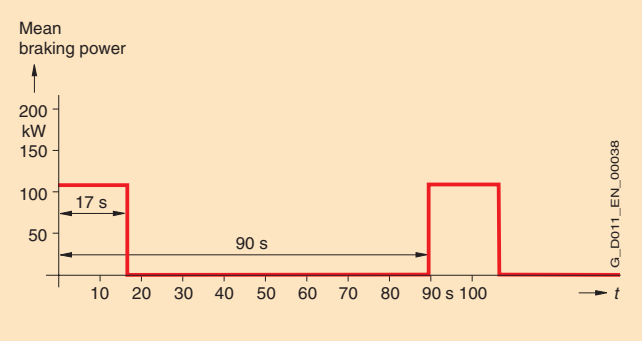
The ON/OFF states of the Braking Module are controlled by a 2-point controller. The respective response thresholds are shown in the following table:

| Line voltage | Braking unit response threshold |
|---|---|
| 380 V to 480 V 3 AC | 774 V (673 V) |
| 500 V to 600 V 3 AC | 967 V (841 V) |
| 660 V to 690 V 3 AC | 1158 V (1070 V) |

**Configuration** (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 configuring the Braking Module and braking resistor, i.e. a braking unit ≥ 76.5 kW should be provided.

The braking unit with 25 kW ($P_{20}$ = 100 kW) must 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 configuring the Braking Module and braking resistor, i.e. a braking unit ≥ 95.4 kW should be provided.

The braking unit with 25 kW ($P_{20}$ = 100 kW) must be selected.

## Load-side components and cables

**Configuration** (continued)

### *Motor reactor*

IGBT-converter switching frequencies result in high voltage rises *dv/dt* at the converter output. If long motor cables are used, this leads to an additional current load on the converter due to capacitive charge/discharge currents. The high voltage rises, and the resulting voltage peaks at the motor terminals, cause the motors' electrical winding load to increase in comparison to direct on-line operation. In conjunction with the connected cable capacitances, the motor reactors with adapted inductances reduce the capacitive charge/discharge currents in the motor cables and, as a function of those motor cables, limit the voltage rise *dv/dt* and the voltage peaks $\hat{V}_{LL}$ at the motor terminals.

### *dv/dt filter plus VPL*

The dv/dt filter plus VPL consists of two components: the dv/dt reactor and the VPL (**V**oltage **P**eak **L**imiter), which limits voltage peaks and returns the energy to the DC link.

The dv/dt filters plus VPL are to be used for motors for which the voltage endurance of the insulation system is unknown or insufficient. Standard motors of the 1LA5, 1LA6 and 1LA8 series only require them at supply voltages > 500 V +10%.

The dv/dt filters plus VPL limit the rate of voltage rise to values < 500 V/µs and the typical voltage peaks at rated line voltages to the values below (with motor cable lengths < 150 m):

< 1000 V at $V_{line}$ < 575 V

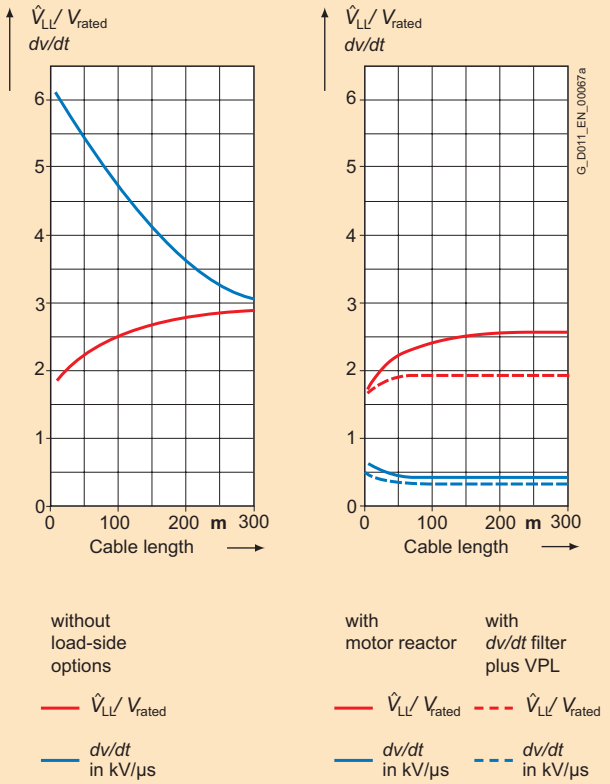
< 1250 V at 660 V < $V_{line}$ < 690 V.

### *Max. connectable motor cable lengths*

The table shows the maximum connectable motor cable lengths. The values apply to all standard motor cables, included the recommended ones. Longer cable lengths are available on request.

| Drive converter cabinet unit | | Max. cable length | | |
|---|---|---|---|---|
| Line voltage | Power | Protoflex EMC 3 Plus [1] | Shielded cable, e.g. Protodur NYCWY | Unshielded cable, e.g. Protodur NYY |
| V | kW | m | m | m |
| **Without reactor and filter** | | | | |
| 380 to 480 V 3 AC | 110 to 560 | 300 | 300 | 450 |
| 500 to 600 V 3 AC | 110 to 560 | 300 | 300 | 450 |
| 660 to 690 V 3 AC | 75 to 800 | 300 | 300 | 450 |
| **With motor reactor (option L08)** | | | | |
| 380 to 480 V 3 AC | 110 to 560 | 300 | 300 | 450 |
| 500 to 600 V 3 AC | 110 to 560 | 300 | 300 | 450 |
| 660 to 690 V 3 AC | 75 to 800 | 300 | 300 | 450 |
| **With dv/dt filter plus VPL (option L10)** | | | | |
| 380 to 480 V 3 AC | 110 to 560 | 300 | 300 | 450 |
| 500 to 600 V 3 AC | 110 to 560 | 300 | 300 | 450 |
| 660 to 690 V 3 AC | 75 to 800 | 300 | 300 | 450 |

1) Protoflex EMC 3 Plus cables comply with the limits for interference voltage and emitted noise specified in the EN 61800-3 standard for use in the second environment. The limits in the EN 61800-3 standard correspond to those in the EN 55011 Class A Group 2 standard.




### *Operation with power units connected in parallel*

Minimum motor cable lengths must be observed if

- a 12-pulse supply and
- a motor with a winding system and
- no motor reactor (option **L08**) is used.

| Power | SINAMICS G150 drive converter cabinet unit, version A | Minimum cable length |
|---|---|---|
| kW | Type 6SL3710–... | m |
| **380 V to 480 V 3 AC** | | |
| 630 | –2GE41–1AA0 | 30 |
| 710 | –2GE41–4AA0 | 25 |
| 900 | –2GE41–6AA0 | 20 |
| **500 V to 600 V 3 AC** | | |
| 630 | –2GF38–6AA0 | 30 |
| 710 | –2GF41–1AA0 | 25 |
| 1000 | –2GF41–4AA0 | 20 |
| **660 V to 690 V 3 AC** | | |
| 630 | –2GH41–1AA0 | 25 |
| 1350 | –2GH41–4AA0 | 20 |
| 1500 | –2GH41–5AA0 | 20 |

**Configuration** (continued)

### *Drives with quadratic load torque*

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

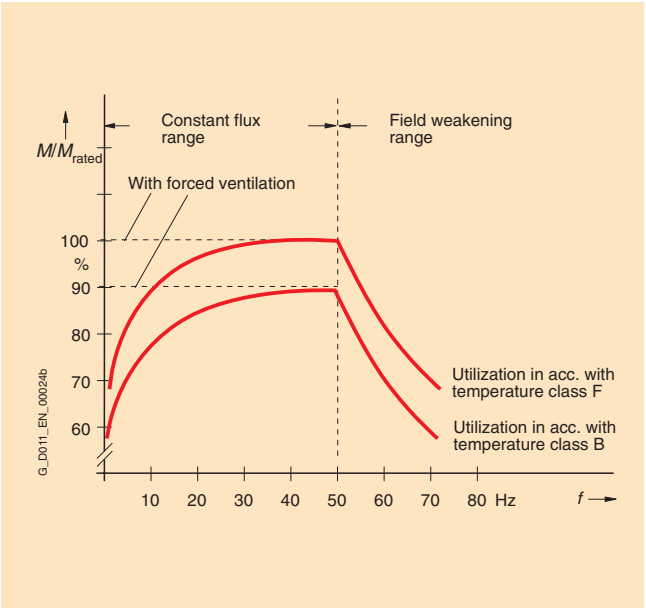
Increased starting torques or high load surges do not usually occur. It is therefore unnecessary to provide a higher overload capability for the converter.

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.

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

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




Typical curve of the permissible torque with 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 complete 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 power, or only by a relatively small amount, depending on the speed range.

In the case of 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 power remains constant. Especially in the control modes with *V/f* characteristic, a sufficient interval of ≥ 30% from the breakdown torque must be observed, which 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 tool.

### *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 is not observed, current peaks which can either lead to switching-off or can cause a continuous reduction in power 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.

## Motors

**Configuration** (continued)

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 $V \leq 500$ V.

For detailed data about motor types 1LG4/1LG6 and 1LA8, please refer to Catalog M 11.

### *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 fans (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 on average 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.

### *Line voltages > 500 V for 1LA/1LG motors*

The standard insulation of the 1LA and 1LG motors is designed such that operation without limitation is only possible on the converter at line 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 power 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 afforded by direct temperature measurement using KTY84 sensors or PTC thermistors in the motor winding.

When using the KTY84 sensor, motor option **A23** must 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, motor option **A11** or **A12** must be specified when ordering 1LG4/1LG6 motors. With 1LA8/1PQ8 motors, the sensors are fitted as standard.

The KTY84 sensor and PTC thermistor can be evaluated by connecting

- to the customer's terminal block in the 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 option **A60** (3 x PT100) or **A61** (6 x PT100) must 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, PTB-approved PTC thermistors and release mechanisms are absolutely essential (options **L83** and **L84** on SINAMICS G150 drive converter cabinet units).

**Configuration** (continued)

### *Bearing currents*

When operating multiphase induction machines on a converter, an electrical bearing stress results from a capacitive induced voltage via the bearing lubricating film, depending on the principle being used. The physical cause of this is the common-mode voltage at the converter output: the sum of the three phase-to-neutral voltages is not zero at all times, unlike with direct on-line operation. The high-frequency, pulse-shaped common-mode voltage brings about a residual current, which closes back to the converter's DC link via the machine's internal capacitances, the machine housing and the grounding circuit. The machine's internal capacitances include the main insulation winding capacitance, the geometric capacitance between the rotor and stator, the lubricating film capacitance and the capacitance of any bearing insulation that may be present. The current level via the internal capacitances is proportional to the common-mode voltage regulation ($i(t) = C \times dv/dt$).

In order to apply currents to the motor which are sinusoidal as far as possible (smooth running, oscillation torques, stray losses), a high clock frequency is required for the converter's output voltage. The related (very steep) switching edges of the converter output voltage (and also, therefore, of the common-mode voltage) cause correspondingly high capacitive currents and voltages on the machine's internal capacitances.

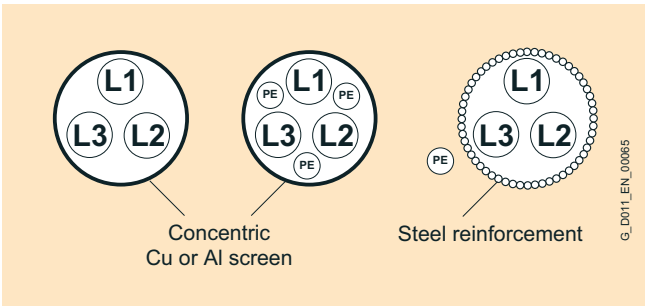
In the worst-case scenario, the capacitive voltage induced via the bearing can lead to random punctures of the bearing lubricating film, thus damaging the bearing/causing premature wear. The current pulses caused by the puncture in the lubricating film are referred to as EDM (Electrostatic Discharge Machining) currents, although this is not primarily a question of an electrostatic effect, but more of (partial) punctures of insulating material, i.e. of partial discharges.

This physical effect, which occurs in isolated cases, has mostly been observed in connection with larger motors.

EMC-compliant installation of the drive system is a basic prerequisite for preventing premature bearing damage via bearing currents.

The most important measures for reducing bearing currents:

- Insulated motor bearings at the non-drive end
  The insulated bearing is standard for all 1LA8 motors designated for converter operation. An insulated bearing at the non-drive end is available as an option for motors of the 1LG4/1LG6 series starting at frame size 280 (order code **L27**).
- Use of cables with a symmetrical cable cross-section:




- Use of motor reactors (option **L08**)
- Preference given to a line with insulated neutral point (IT system)
- Use of grounding cables with low impedance in a large frequency range (DC up to approximately 70 MHz): for example, plaited copper ribbon cables, HF litz wires
- Separate HF equipotential-bonding cable beween motor housing and driven machine
- Separate HF equipotential-bonding cable between motor housing and converter PE busbar
- 360° HF contacting of the cable shield on the motor housing and the converter PE busbar. This can be achieved using EMC screwed glands on the motor end and EMC shield clips on the converter end, for example.
- Common-mode filters at the converter output.

### *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 approximately 0.2 x $f_{slip}$. Taking into account the slip values of standard motors in the power 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 G150 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 type of protection "d"*

1MJ asynchronous motors can be connected as explosion-proof motors with flameproof enclosure EEx de IIC both to the line and 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 in accordance with temperature class B, just like the motors of the 1LA series with the same power.

1MJ motors have a terminal box with increased safety EEx e II as standard.

Detailed motor data can be found in Catalog M 11.

## Notes

# Services and documentation

5



| | |
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| **5/2** | **Training** |
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| 5/3 | Design |
| 5/4 | Description |
| **5/6** | **Training cases** |
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## Training

### Overview

#### *Training is decisive for your success*

**SITRAIN**® – Siemens Training for Automation and Industrial Solutions – provides you with comprehensive support in 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 commissioning times, optimized plant components, faster troubleshooting, reduced downtimes. 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 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 our customers*

The distance is short. 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 learning portal*

Additional information is available on the Internet under:

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
Phone: +49 (0) 1805-23 56 11
Fax: +49 (0) 1805-23 56 12

... and request our latest training catalog on:

| | Language | Order No. |
|---|---|---|
| ITC Catalog (paper version) | German | **E86060-K6850-A101-B6** |
| Dates and price list including CD-ROM | German | **E86060-P6850-A101-D2** |
| SITRAINonCD interactive course information system on CD-ROM | German/ English | **E86060-D6850-A100-C4-7400** |
| Overview of training worldwide | German/ English | **E86060-K6899-A101-B5-7400** |

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## 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 planning course provides all the information you need to size the drive system.

The basic and follow-up courses are sure to provide all the technical knowledge servicing personnel will need for servicing/commissioning Motion Control applications, communication and cabinet units.

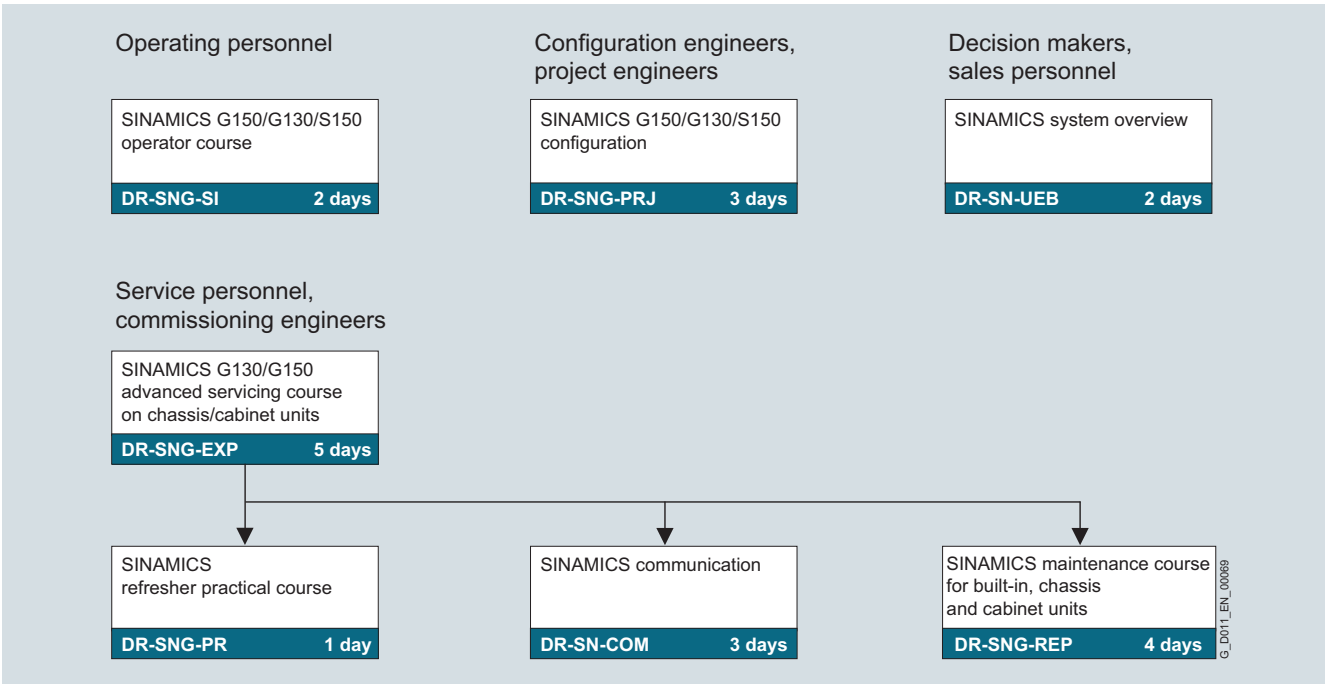
All modules contain as many practical exercises as possible, in order to enable intensive and direct training on the drive system and with the tools in small groups.

| Title | Target group | | | | | | Duration | Course code |
|---|---|---|---|---|---|---|---|---|
| | Decision makers, sales personnel | Configuration engineers, project engineers | Operating personnel | Commissioning engineers, configuration engineers | Service personnel | Maintenance personnel | | |
| SINAMICS system overview | ✓ | | | | | | 2 days | DR-SN-UEB |
| SINAMICS G150/G130/S150 configuration | ✓ | ✓ | ✓ | ✓ | | | 3 days | DR-SNG-PRJ |
| SINAMICS G150/G130/S150 operator course | | | ✓ | | | ✓ | 2 days | DR-SNG-SI |
| SINAMICS G130/G150/S150 advanced servicing course on chassis/cabinet units | | | | ✓ | ✓ | ✓ | 5 days | DR-SNG-EXP |
| SINAMICS refresher practical course | | | | ✓ | ✓ | ✓ | 1 day | DR-SNG-PR |
| SINAMICS communication | | | | ✓ | ✓ | | 3 days | DR-SN-COM |

## Training

### Design (continued)

***SINAMICS G150/G130/S150 learning path***




### Description

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

**Description/learning target**

This course has been specially designed for sales personnel 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 commissioning of a drive
- Practical exercises using the training case.

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

**Description/learning target**

The course is appropriate for design engineers, configuration engineers and sales personnel 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**

Configuration engineers, project engineers

**Content**

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

**Description** (continued)

### *SINAMICS G130/G150/S150 operator course (2 days) DR-SNG-SI*

**Description/learning target**

The course is aimed at operating personnel who has to perform simple replacement of SINAMICS G130/G150/S150 cabinet and chassis units. No specific knowledge of drive technology is required.

Once the course has been completed, simple replacement of units can be carried out using the AOP30 operator panel and the STARTER commissioning tool. Training covers how to handle the CompactFlash card.

**Target group**

Operating personnel

**Content**

- Structure of the drive system
- Overview of documentation
- Commissioning and service using the AOP30 operator panel and the STARTER commissioning tool
- Overview of software functions, parameters and function diagrams
- Practical exercises for commissioning and fault diagnostics on the SINAMICS G150/G130 chassis and cabinet units.

### *SINAMICS G150/G130/S150 advanced servicing course on chassis/cabinet units (5 days) DR-SNG-EXP*

**Description/learning target**

The course is aimed primarily at service personnel and commissioning engineers who have to meet specific configuration requirements, eliminate faults and fit spare parts to SINAMICS G130/G150 and S150 chassis and cabinet units. Training covers the technical knowledge for commissioning and servicing using the AOP30 cabinet operator panel and the STARTER commissioning tool, as well as handling of the CompactFlash card.

Furthermore, once the course has been completed, drives can be commissioned and optimized, spare parts can be replaced and the drive can be diagnosed using the AOP30 or the STARTER commissioning tool. There is also an introduction to PROFIBUS communication, which can be expanded on in course DR-SN-COM.

**Target group**

Commissioning engineers, configuration engineers, service personnel, maintenance personnel

**Content**

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

### *SINAMICS G150/G130/S150 refresher practical course (1 day) DR-SNG-PR*

**Description/learning target**

The course is aimed at service personnel who has 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 units and the STARTER commissioning tool. The trainer will provide instructions and short-term consultation.

**Target group**

Commissioning engineers, configuration engineers, service personnel, maintenance personnel

**Content**

- Provision of current 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 service personnel who, as an extension to the DR-SNS-SI course, require further knowledge of the PROFIBUS and RS 232 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, isochronous mode with servo applications, and direct OP access. Also described are the libraries of DriveES SIMATIC for cyclic and acyclic data exchange.

This knowledge is expanded by practical exercises using SINAMICS and SIMATIC S7 training cases with CPU 315-2 DP.

**Target group**

Commissioning engineers, configuration engineers, service personnel

**Content**

- Overview of the PROFIBUS DP, RS 232-PPI, CAN 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 isochronous 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.

# SINAMICS S150 simulator training case

## Application

This training case contains all the electronic components of a SINAMICS S150 converter and reflects all the control-engineering features of the SINAMICS G130 and SINAMICS G150 converters.

The unit is ready to connect, fully operational and easily manipulable. It can be used in presentations or for testing purposes, as well as for training commissioning and service personnel.

The scope of functions ranges from full operability via the AOP30 through to the simulation of actual drive values. Terminal blocks and interfaces can be used accordingly and, as provided for in the system, adapted to requirements.

## Design

This rugged storage and transport case contains:

- CU320 Control Unit
- SMC30 Sensor Module Cabinet-Mounted
- TM31 Terminal Module
- AOP30 advanced operator panel
- simulator field

## Function

- Online commissioning and parameterization of SINAMICS cabinet units with AOP30 and/or STARTER
- Working with the CompactFlash card: data saving, FW updating
- Testing of PROFIBUS communication using a controller
- Use for demonstrations and training.

## Technical data

| **SINAMICS S150 simulator training case** | |
|---|---|
| Input voltage | 115 V/230 V 1 AC (adapter enclosed) |
| Degree of protection in accordance with DIN VDE 0470 | IP00 |
| Type | Trolley transport system |
| Permitted ambient temperature | |
| • Storage and transport | -20 °C to +60 °C |
| • Operation | +5 °C to +40 °C |
| Width | 540 mm |
| Height | 500 mm |
| Depth | 400 mm |
| Weight, approx. | 16 kg |

## Selection and ordering data

| | Order No. |
|---|---|
| **SINAMICS S150 simulator training case** | **6ZB2480-0CC00** |

## Accessories

The following accessories are included in the scope of supply:

- adapter for different line voltages
- documentation file
- CD-ROM with:
  - STARTER commissioning tool
  - current software version for CU320 Control Unit
  - current firmware for AOP30 cabinet operator panel
  - standard documentation.

## AOP30 cabinet operator panel training case

## Documentation

### 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 line connection
- Internal 24 V DC power supply
- Can be set upright for demonstration purposes
- Offline functions
- Online functions with SINAMICS CU320 Control Unit via RS 232 PPI.

### Technical data

| AOP30 cabinet operator panel training case | |
|---|---|
| Input voltage | 230 V 1 AC |
| Degree of protection in accordance with DIN VDE 0470 | IP00 |
| Width | 377 mm |
| Height | 158 mm |
| Depth | 277 mm |
| Weight, approx. | 7 kg |

### Selection and ordering data

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

### Overview

The equipment documentation consists of a detailed instruction manual with the following sections:

- description
- mounting instruction
- commissioning guide
- function description
- maintenance instructions
- spare parts list

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

- **SINAMICS G130**: The documentation is supplied with the chassis units as standard. The documentation is available here in English, German, French, Italian and Spanish.
- **SINAMICS G150**: The documentation in English/German is supplied with the converter as standard (in printed form and on CD-ROM).
  If a language combination other than English/German is required, this should be specified when ordering by means of the appropriate order code (see options **D58, D60, D80**).
  It is also possible to order system-specific documentation as an option (see options **D02, D14**).

Services and documentation

## Service & Support


In the face of harsh competition you need optimum conditions to keep ahead all the time:
a strong starting position, asophisticated 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 commissioning 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 round 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.

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

In the United States, call toll-free:
**Phone: +1 800 333 7421,**
**Fax: +1 423 262 2200**
E-Mail: solutions.support@sea.siemens.com

In Canada, call:
**Phone: +1 888 303 3353**
E-Mail: cic@siemens.ca

In Asia:
**Phone: +86 10 6475 7575,**
**Fax: +86 10 6474 7474**
E-Mail:
adsupport.asia@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)

### Optimization and upgrading

To enhance productivity and save costs in your project we offer high-quality services in optimization and upgrading. 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
**Phone: 0180 50 50 444** 1)

In the United States, call toll-free:
**Phone: +1 800 333 7421**

In Canada, call:
**Phone: +1 888 303 3353**

### 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
**Phone: 0180 50 50 448** 1)

In the United States, call toll-free:
**Phone: +1 800 241 4453**

In Canada, call:
**Phone: +1 888 303 3353**

### 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

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## Siemens contacts worldwide




At

http://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.

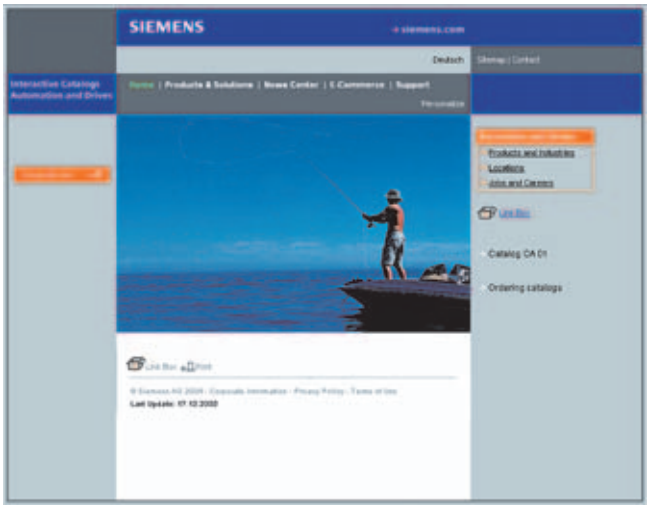
The Siemens Automation and Drives Group (A&D) has therefore built up a comprehensive range of information in the World Wide Web, which offers quick and easy access to all data required.

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 at the press of a button, by fax or by online link.

Information on the Interactive Catalog CA 01 can be found on the Internet under

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

or on CD-ROM or DVD.

## Easy shopping with the A&D Mall


The A&D Mall is the virtual department store of Siemens AG on 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

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## 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 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 a Seat or registered Office in Germany" shall apply.

### *For customers with a seat or registered office outside 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.

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### *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 in accordance with the applicable legal regulations.

In addition to the prices of products which include silver, plump, aluminum and/or copper, surcharges may be calculated if the respective limits of the notes are exceeded. The respective note (e.g. source: German newspaper "Handesblatt" in category "deutsche Edelmetalle" and "Metallverarbeiter") for silver ("verarbeitetes Silber"), plump ("Blei in Kabeln"), aluminum ("Aluminium in Kabeln") and copper ("Elektrolytkupfer", "DEL-Notiz") respectively, of the day the order or rather the on call order is received, is decisive for the calculation of the surcharges.

Surcharges of copper shall be calculated for Drives at a note ("DEL-Notiz") above EUR 225,00 / 100 Kg and for chokes / transformers above EUR 150,00 / 100 kg.

Surcharges shall be charged based on the quantities of the materials which are contained in the relevant products.

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:
http://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.

In accordance with the 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.<br>Products marked other than "N" require an export license.<br>In the case of software products, the export designations of the relevant data medium must also be generally adhered to.<br>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<br>Products marked other than "N" are subject to a reexport license to specific countries.<br>In the case of software products, the export designations of the relevant data medium must also be generally adhered to.<br>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.

A&D/VuL/En 17.03.05

Siemens AG
Automation and Drives
Large Drives
Postfach 47 43
90025 NUERNBERG
FEDERAL REPUBLIC OF GERMANY

Order No.: **E86060-K5511-A101-A3-7600**
Printed in Germany
KG K 0306 10.0 BD 128 En/622165

## CD-ROM for catalog D 11

The enclosed CD-ROM for catalog D 11 · 2006 contains:

- Information on planning/configuration based on the technical documentation; further technical documentation can be found at: http://www.siemens.com/large-drives
- Dimension drawings for the drive converter chassis units and cabinet units (PDF format)
- Dimension drawings for the new H-compact motor series, 2nd generation (PDF format)
- Electrical and mechanical data for the H-compact motor series (Excel format)
- Catalog M 11, Low-Voltage Motors (PDF format)
- Catalog D 11, SINAMICS G130/SINAMICS G150 (PDF format)


### Hardware and software requirements

- Intel Pentium 333 MHz or higher
- At least 128 MB RAM
- Screen resolution 1024 x 768 pixels
- 4 x CD-ROM drive
- Windows 9x/NT 4.x/2000/XP
- Acrobat Reader
- Excel 2000
- Microsoft Internet Explorer version 5.5 and higher

### Start

Insert the CD into the CD-ROM drive. The program starts automatically. If the AutoRun function is not activated in your system, please start the "start.hta" file from the CD-ROM in Windows Explorer.

If Excel is not installed on your PC, you can use the Excel viewer (xlviewer.exe) supplied on the CD-ROM.

### Note

No programs have to be installed to view the information on this CD-ROM.

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

**Further information can be obtained from our branch offices listed in the appendix or at www.siemens.com/automation/partner**

| **Automation and Drives** | *Catalog* |
|---|---|
| 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 | D 21.2 |
| SINAMICS S150 Drive Converter Cabinet Units | 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** | |
|---|---|
| ALPHA Small Distribution Boards and Distribution Boards | ET A1 |
| *PDF: ALPHA 8HP Molded-Plastic Distribution System* | *ET A3* |
| ALPHA FIX Terminal Blocks | ET A5 |
| BETA Modular Installation Devices | ET B1 |
| DELTA Switches and Outlets | ET D1 |
| GAMMA Building Management Systems | ET G1 |

| **Factory Automation Sensors** | FS 10 |
|---|---|

| **Human Machine Interface Systems SIMATIC HMI** | ST 80 |
|---|---|

| **Industrial Communication for Automation and Drives** | IK PI |
|---|---|

| **Low-Voltage Controls and Distribution** | *Catalog* |
|---|---|
| Low-Voltage Switchgear – Controlgear for Industry | LV 10 |
| Power Distribution – Products and Systems for Low-Voltage Power Distribution | LV 30 |
| SIDAC reactors and filters | LV 60 |
| SIVACON 8PS Busbar trunking systems CD, BD01, BD2 up to 1250 A | LV 70 |
| Low-Voltage Controlgear, Switchgear and Systems | LV 90 |

| **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* |
| Products 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* |
| pc-based Automation | ST PC |
| 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** | |
|---|---|
| *PDF: AS 488/TM automation systems* | *PLT 112* |

*PDF: These catalogs are only available as pdf files.*

The information provided in this catalog contains descriptions or characteristics of performance which in case of actual use do not always apply as described or which may change as a result of further development of the products. An obligation to provide the respective characteristics shall only exist if expressly agreed in the terms of contract. Availability and technical specifications are subject to change without notice.

Token fee € 5.00

**Siemens AG**

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

http://www.siemens.com/sinamics

Order No. E86060-K5511-A101-A3-7600

**SIEMENS**

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**Catalog D 11 • 2006**