



sinamics



SINAMICS S150
Drive Converter Cabinet Units
75 kW to 1200 kW

SIEMENS

Related catalogs

SINAMICS G130/G150 D 11
 Drive Converter Chassis Units
 Drive Converter Cabinet Units
 Order No.:
 German: E86060-K5511-A101-A2
 English: E86060-K5511-A101-A2-7600



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



SINAMICS S120 D 21.2
 Servo Control Drive System
 Order No.:
 German: E86060-K5521-A121-A1
 English: E86060-K5521-A121-A1-7600



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



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



Low-Voltage Motors M 11
 Order No.:
 German: E86060-K1711-A101-A3
 English: E86060-K1711-A101-A3-7600



Components for Automation CA 01
 Order No.:
 German: E86060-D4001-A100-C1
 English: E86060-D4001-A100-C2-7600



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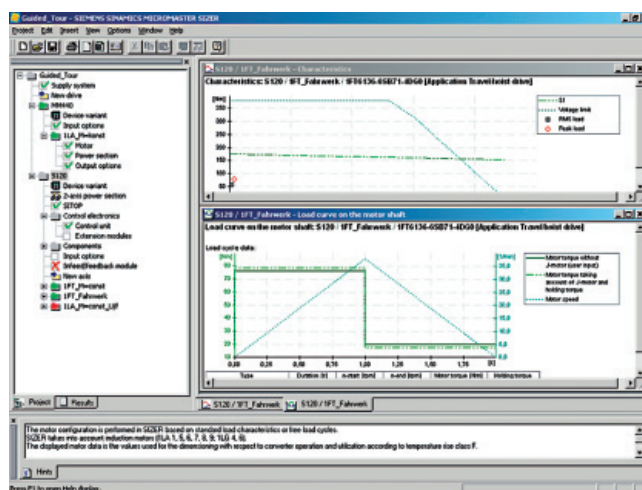
The SINAMICS MICROMASTER SIZER planning tool

The SIZER tool offers fast and simple planning of the drives

SINAMICS G110, SINAMICS G130, SINAMICS G150, SINAMICS S120, SINAMICS S150 and MICROMASTER 4.

The tool supports you when planning the technical components required for a drive task. SIZER leads you through all planning steps covering the power supply, drive components and motors.

Motors are planned using standardized load characteristics, cyclic drives or free load cycles. The drive components required (e.g. power sections, power supplies) are determined by calculation. The planning function completes the drive system by supplementary components (e.g. sensor modules, terminal extension, cables, reactors, filters).



The guided planning helps beginners when using the tool. Status information always shows you the planning progress. The online help supports you during planning. In addition to the calculated data, characteristics are displayed to assist you with optimization and to display the reserves.

Using the export function, the parts list can be sent to the SAP-VSR ordering system.

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 vacant hard disk memory
 Plus 100 MB vacant hard disk memory on Windows system drive

Monitor resolution 1024x768 pixels
 Windows™ NT 4.0 SP5, 2000 SP2, XP SP1
 Microsoft Internet Explorer 5.5 SP2

Use

Use of SINAMICS MICROMASTER SIZER is free of charge. A nominal fee is charged for handling the order.

The HMI is designed in German/English.

The SINAMICS MICROMASTER SIZER planning tool can be obtained using

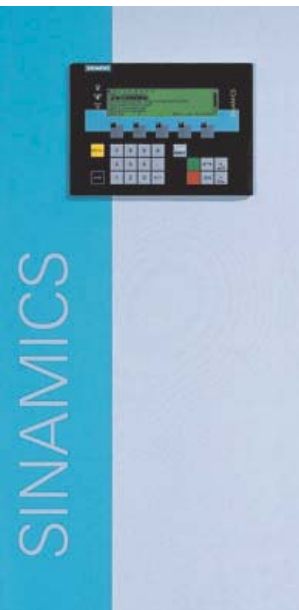
Order No. **6SL3070-0AA00-0AG0**

from your local Siemens office or representative.

SINAMICS S150 Drive Converter Cabinet Units

Catalog D 21.3
May 2004

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



SIEMENS

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Welcome to Automation and Drives

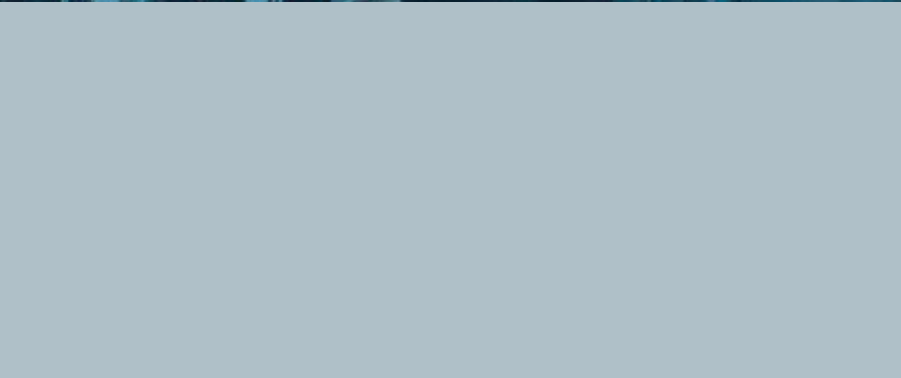
We would like to welcome you to Automation and Drives and our comprehensive range of products, systems, solutions and services for production and process automation and building technology worldwide.

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.

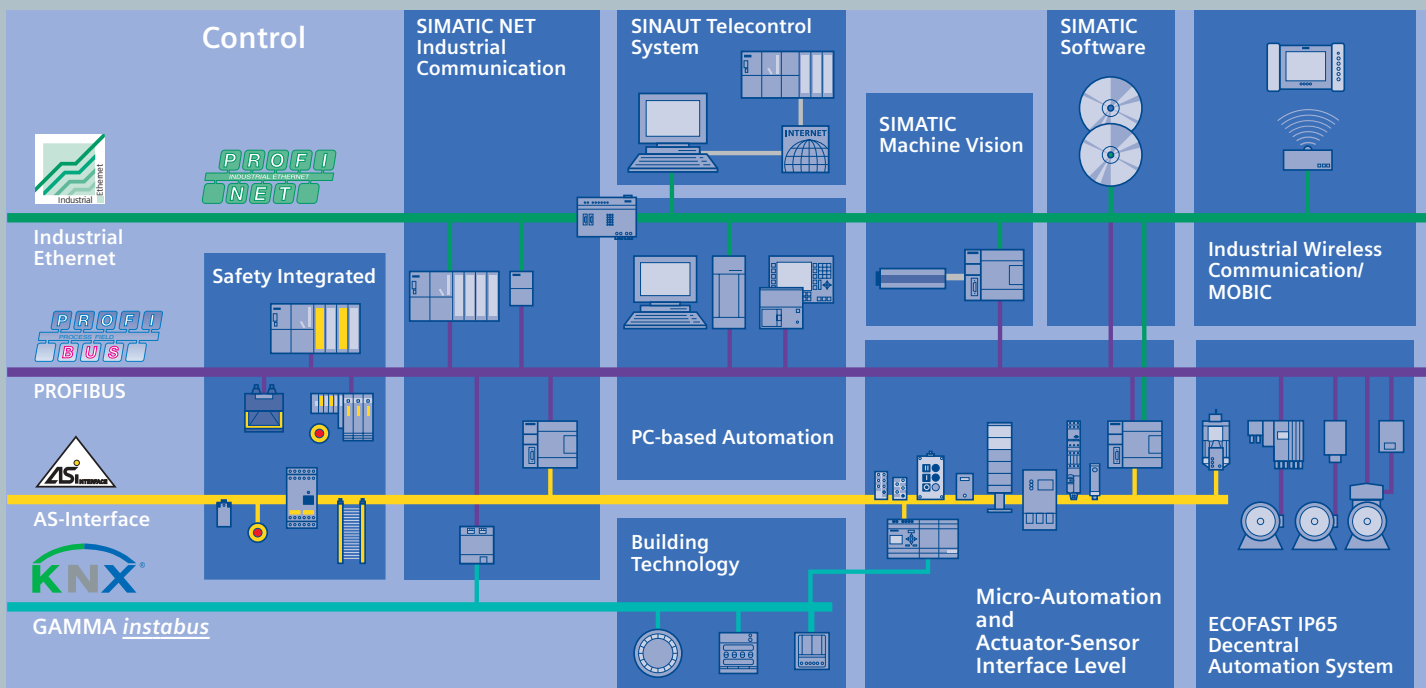
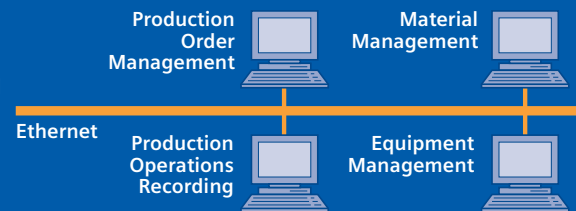
Whether your industry is process- and production-oriented or a hybrid, Totally Integrated Automation is a unique "common solution" platform that covers all the sectors.

Totally Integrated Automation is an integrated platform for the entire production line - from receiving to technical processing

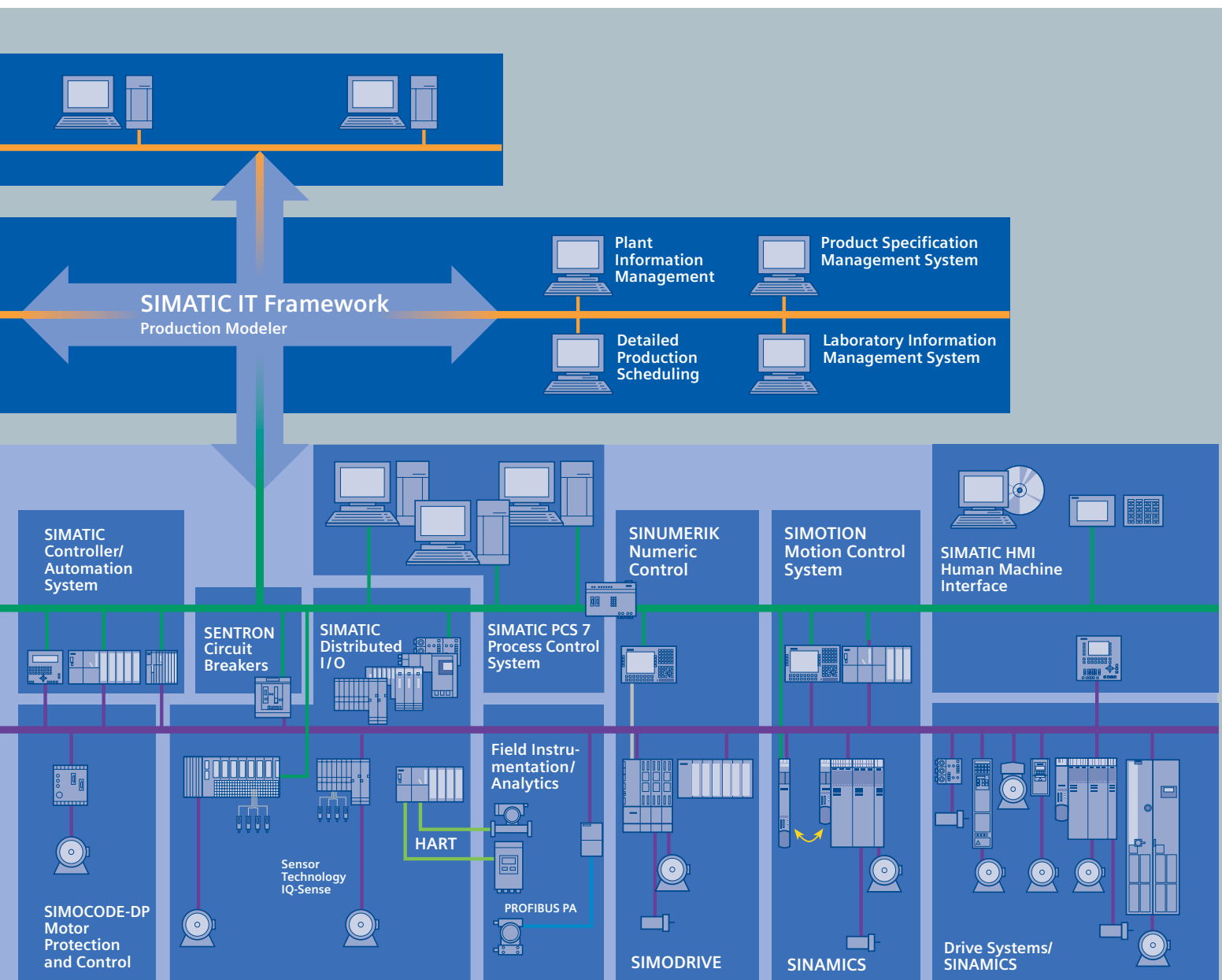
ERP
Enterprise
Resource
Planning




MES
Manufacturing
Execution
Systems




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.



SINAMICS G



Pumps/Fans



Extrusion




Textiles



Conveyor Systems

SINAMICS S



Forming/Shaping



Printing Machines



Machine Tools



Packaging



Rolling Mills

G_D212_EN_00053

SINAMICS applications

Applications

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

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

Versions

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

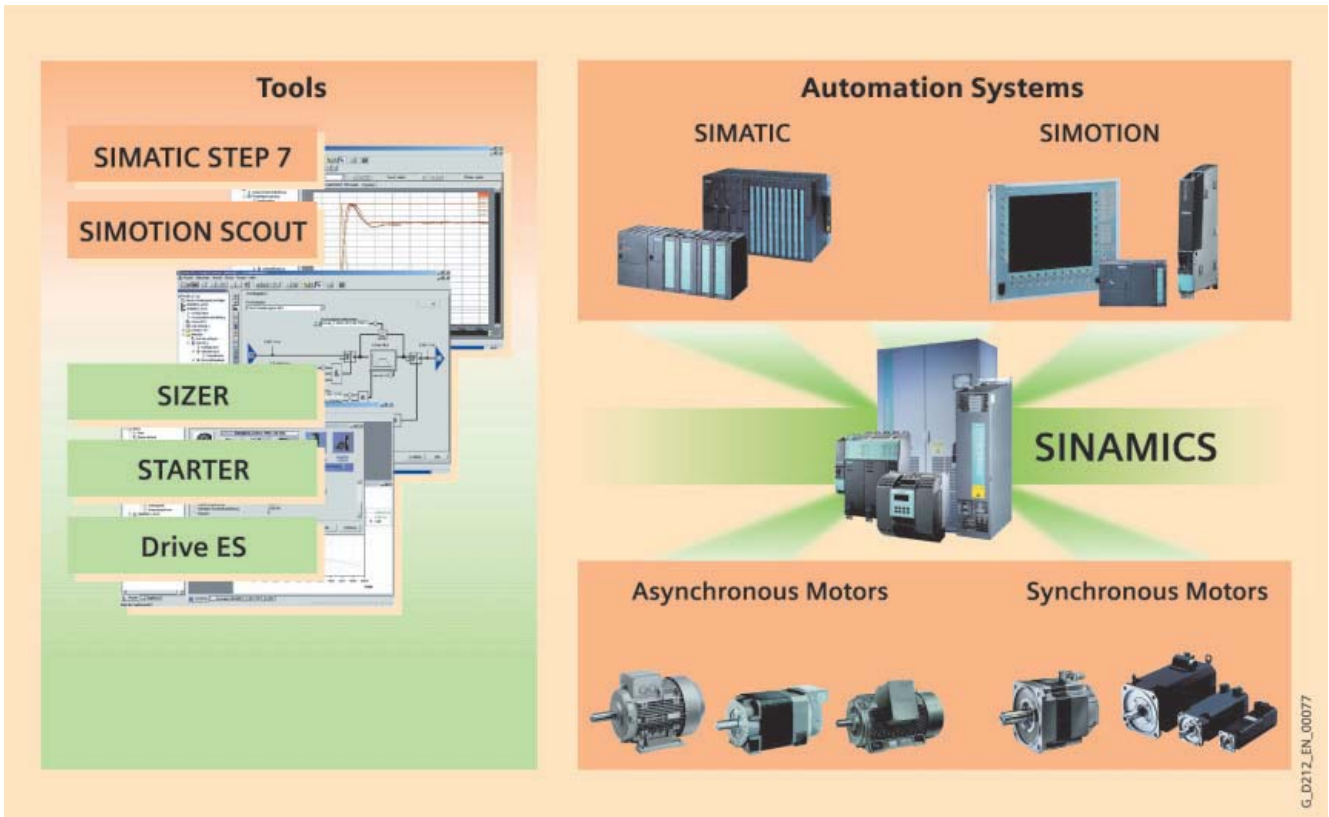
- SINAMICS G is designed for standard applications with asynchronous motors. These applications have less stringent requirements regarding the dynamics and accuracy of the motor speed.
- SINAMICS S handles complex drive tasks with synchronous/asynchronous motors and fulfills stringent requirements regarding: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

Platform Concept and Totally Integrated Automation

All SINAMICS versions are based on a platform concept. Joint hardware and software components, as well as standardized tools for design, configuration, and commissioning tasks ensure high-level integration across all components. SINAMICS handles a wide variety of drive tasks with no system gaps. The different SINAMICS versions can be easily combined with each other.

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

SINAMICS range of converters



G_D212_EN_00077

SINAMICS as part of the Siemens modular automation concept

Quality to DIN EN ISO 9001

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

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

Introduction

1

SINAMICS range of converters

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

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

SINAMICS is characterized by the following system features:

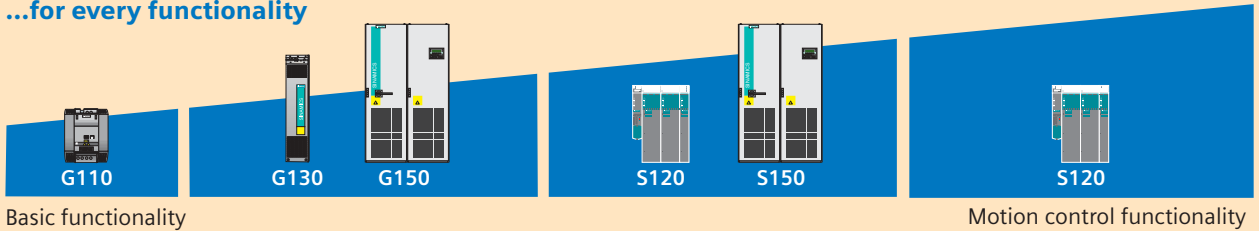
- Uniform functionality based on a common platform strategy
- Uniform engineering
- High degree of flexibility and combination
- Wide output power range
- Designed for worldwide use
- SINAMICS Safety Integrated
- Increased economy and effectiveness
- Flexible interfacing facilities to host controllers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

SINAMICS ...

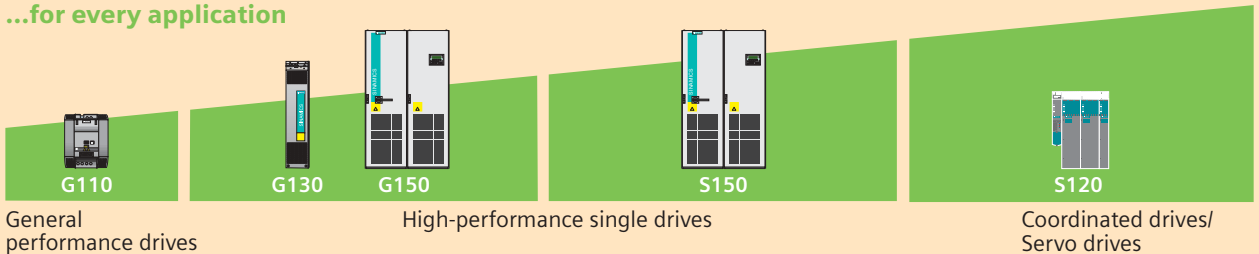
...for every output rating



...for every functionality



...for every application



G_D011_EN_00057

SINAMICS S150 drive converter cabinet units

2



SINAMICS

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SINAMICS S150

Drive converter cabinet units

75 kW to 1200 kW

Overview



SINAMICS S150 drive converter cabinet unit (example with options)

SINAMICS S150 drive converter cabinet units are particularly suitable for all variable-speed drives with high performance requirements, i.e. drives with:

- High dynamic response requirements
- Frequent braking cycles with high braking energy
- Four-quadrant operation.

SINAMICS S150 provides high-performance speed control with a high accuracy and dynamic response.

They are available for the following voltages and outputs:

Voltage	Output
380 V to 480 V	110 kW to 800 kW
660 V to 690 V	75 kW to 1200 kW

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

The drive converter cabinet units make it possible to install line side and motor side components as well as additional monitoring units.

A wide range of electrical and mechanical components enable the drive system to be optimized for the respective requirements.

Benefits

The self-commutating, pulsed rectifier/feedback unit which is based on IGBT technology and is equipped with a Clean Power Filter makes the minimum of demands on the line, which is characterized by the following features:

- The innovative Clean Power Filter minimizes line harmonics
- Power feedback (four-quadrant operation)
- Tolerant towards fluctuations in line voltage
- High line stability (high availability)
- Operation on weak power supplies
- Reactive power compensation is possible (inductive or capacitive)
- High drive dynamics.

Simple handling of the drive from configuration to operation as a result of:

- Compact and modular, service-friendly design
- Straightforward planning and design
- Ready to connect to facilitate the installation process
- Fast, menu-prompted commissioning with no complex parameterization
- Clear and convenient operation via a user-friendly graphical operator control panel with measured values displayed in plain text or in a quasi-analog bar display.

Application

Typical applications for SINAMICS S150 include:

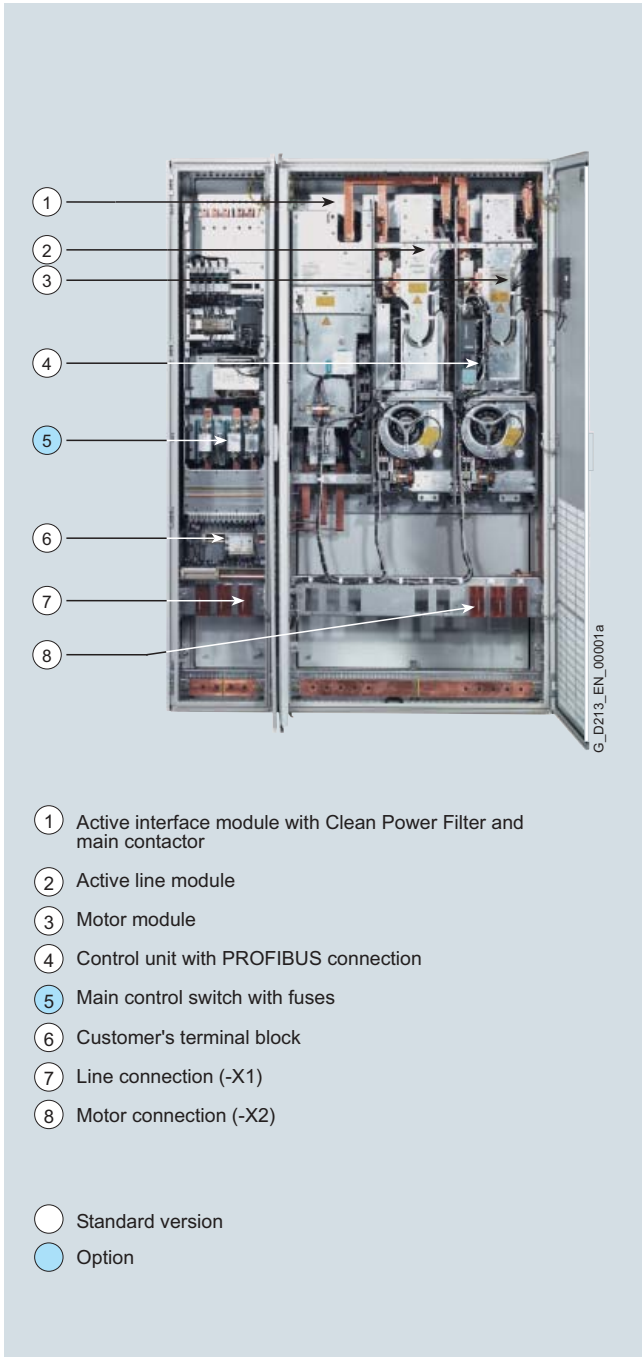
- Test bay drives
- Centrifuges
- Elevators and cranes
- Paper and rolling-mill drives
- Cross cutters and shears
- Conveyor belts
- Presses
- Cable winches.

Worldwide application

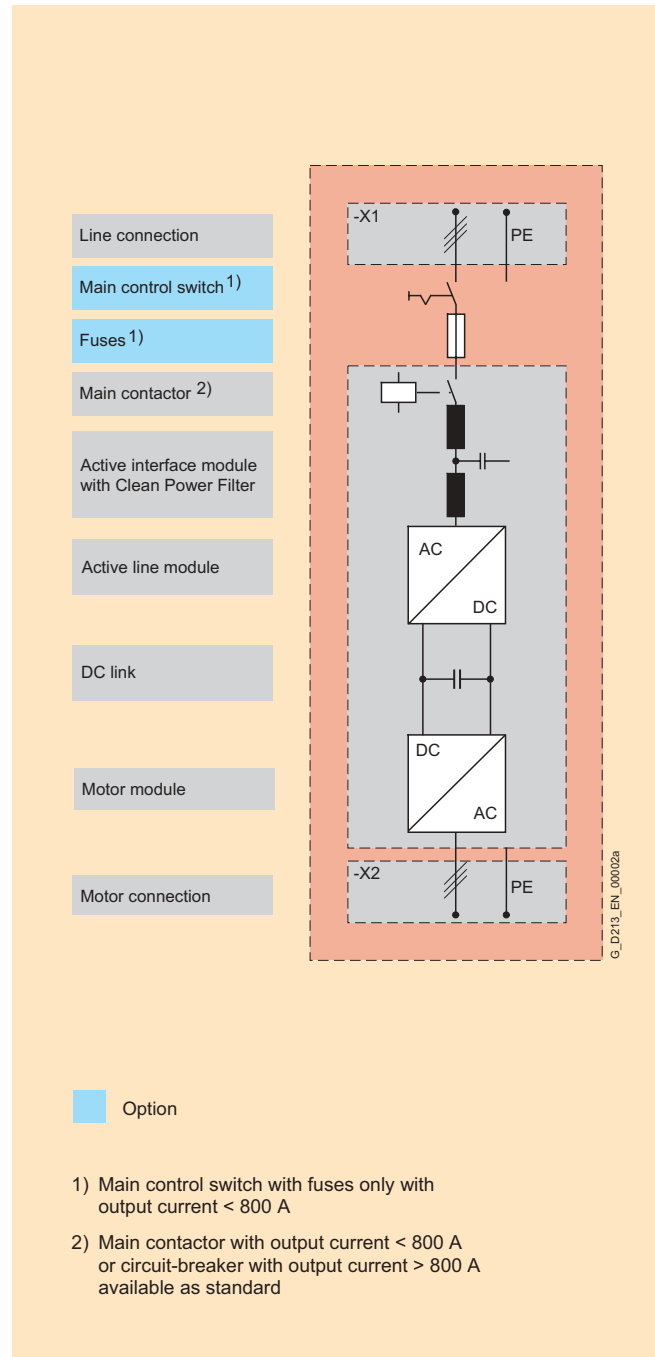
SINAMICS S150 drive converter cabinet units are manufactured in compliance with relevant international standards and directives, and are therefore suitable for worldwide use (see Technical data).

Design

The SINAMICS S150 drive converter cabinet units are characterized by their compact, modular and service-friendly design.



Example of the design of a SINAMICS S150 drive converter cabinet unit



Basic design of a SINAMICS S150 drive converter cabinet unit with a number of version-specific options

SINAMICS S150

Drive converter cabinet units

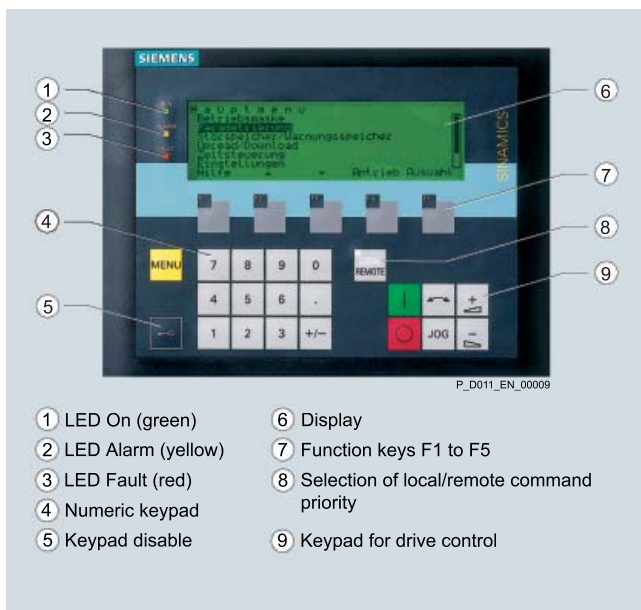
75 kW to 1200 kW

Function

Operator panel

An operator panel is located in the cabinet door of the converter for operation, monitoring and commissioning tasks. It has the following features:

- Graphical LCD with backlighting for plain-text display and a "bar display" of process variables
- LEDs for display 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 in settings. Operation of the drive from the operator panel can be disabled by a password. 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.
- IP54 degree of protection (when installed).



Operator panel

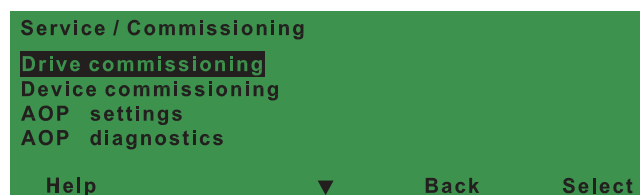
The plain text for the display is stored in two languages, and the currently desired language can be selected using parameters (English/German as standard, see options for other languages).

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

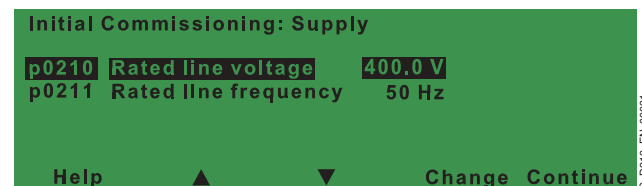
The **first commissioning** is carried out using the operator panel. Screen forms for

- Supply
- Motor data
- Encoder data
- Parameter values

are run through in succession.



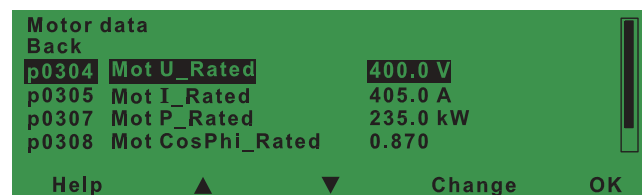
Entering the data for **power supply**



To carry out a **quick start-up**, only 6 motor parameters need to be read from the motor rating plate and entered in the screen form:

- Output
- $\cos \phi$
- Current
- Voltage
- Frequency
- Speed

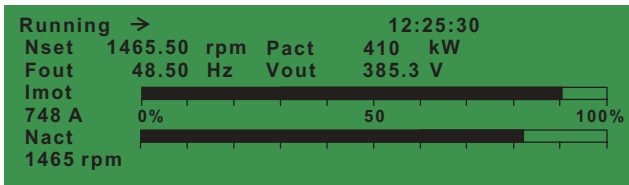
The type of motor cooling must be entered in addition.



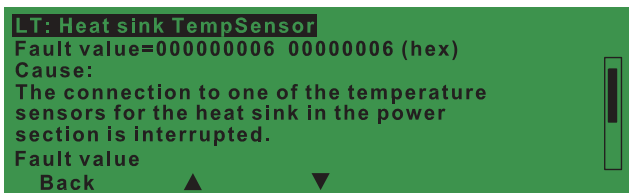
The data and the motor identification are saved following the input of the parameters. This is followed by automatic optimization of the closed-loop control.

Function (continued)

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



Any **Alarms** which occur are indicated by flashing of the yellow "ALARM" LED, **Faults** by a lit red "FAULT" LED. Help text can be called for every fault and alarm, and provides a short description of the cause and possible remedial measures.



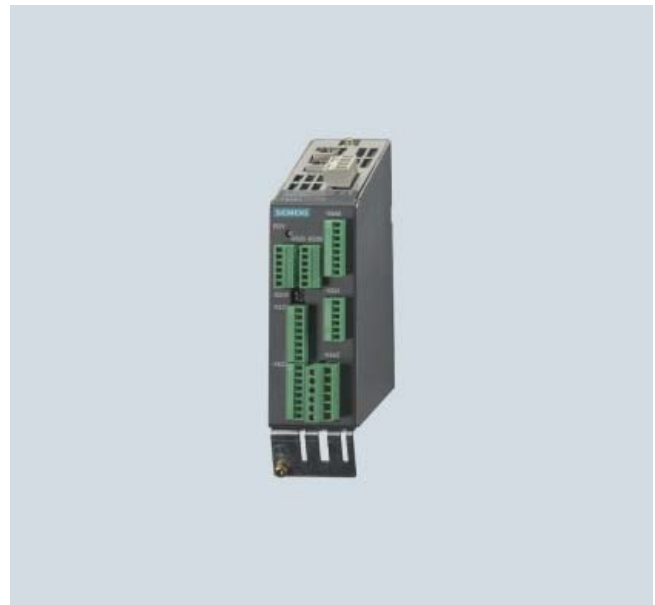
Communication with higher-level control and TM31 customer's terminal block

A PROFIBUS interface on the control unit and the terminal block TM31 are available as customer interfaces for control.

This customer's terminal block permits connection to the higher-level control using analog and digital signals as well as the connection of additional units.

The customer's terminal block contains:

- 8 digital inputs
- 4 bidirectional digital inputs/outputs
- 2 relay outputs with changeover contact
- 2 analog inputs (differential)
- 2 analog outputs
- 1 temperature sensor input (KTY84-130/PTC)
- Auxiliary voltage output ± 10 V for analog setpoint input
- Auxiliary voltage output +24 V for digital inputs.



TM31 customer's terminal block

The "Engineering information" includes detailed information on the interfaces.

SINAMICS S150

Drive converter cabinet units

75 kW to 1200 kW

Function (continued)

Open-loop control and closed-loop control functions

The converter closed-loop control includes a high-quality sensorless vector control with speed and current control, motor and converter protection, and it is additionally possible to connect a speed sensor (see also Engineering information).

Software and protection functions

The software functions available as standard are described below:

Software and protection function	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's terminal block. The internal fixed setpoints and the motorized potentiometer setpoint can be switched over or adjusted using control commands via all interfaces. It is additionally possible to apply additional setpoints, direction of rotation and speed limiting, reversal of direction of rotation and the parameterization of skip frequency bands.
Automatic motor identification	Automatic motor identification permits fast and simple commissioning and optimization of the drive control.
Ramp-function generator	A convenient ramp-function generator with separately adjustable ramp-up and ramp-down times, together with adjustable rounding times in the lower and upper speed ranges, improve the control response and therefore prevent mechanical overloading of the drive train. The deceleration ramps can be parameterized separately for emergency stop.
Kinetic buffering (KIP)	Power supply failures are bridged to the extent permitted by the kinetic energy of the drive train. The speed drops depending on the moment of inertia and the load torque. The current speed is reassumed when the power supply returns.
Flying restart ¹⁾	The flying restart permits connection of the converter to a rotating motor.
I^2t recording for motor protection	The motor temperature is calculated in a motor model stored in the converter software, taking into account the current speed and load. More exact recording of the temperature, also taking into account the influence of the ambient temperature, is possible by means of direct temperature recording using KTY84 sensors in the motor winding.
Evaluation of motor temperature	Motor protection by evaluation of a temperature sensor type KTY84 or PTC. When connecting a KTY84 sensor, the limits for alarm or shutdown can be adjusted. When connecting a PTC thermistor, the reaction following triggering of it (alarm or shutdown) can be defined.
Motor blocking protection	A blocked motor is recognized and protected against thermal overloading by shutting down.
Power section protection	
Earth fault monitoring on output side	An earth fault on the output side is recognized by a total current monitor, and results in shutdown in earthed-neutral systems.
Electronic short-circuit protection on output side	The short-circuit between motor and converter (on the converter output terminals, in the motor cable, in the terminal box) is detected and switched off.
Thermal overload protection	If the excess temperature threshold is triggered, either a shutdown is carried out or automatic influencing of the control (possibly 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 reassumed.

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

SINAMICS S150

Drive converter cabinet units

75 kW to 1200 kW

2

Technical data

Electrical data			
Supply voltages and output ranges	3 AC 380 V to 480 V, ±10% (-15% < 1 min) 110 kW to 800 kW 3 AC 660 V to 690 V, ±10% (-15% < 1 min) 75 kW to 1200 kW		
Types of supplies	TN/TT supplies or isolated supplies (IT supplies)		
Line frequency	47 Hz to 63 Hz		
Output frequency	0 Hz to 300 Hz		
Power factor	Adjustable (factory-set to $\cos \varphi = 1$)		
Control method	Vector control with and without sensor or V/f control		
Fixed speeds	15 fixed speeds plus 1 minimum speed, programmable (in the default setting, 3 fixed setpoints plus 1 minimum speed are selectable using terminal block/PROFIBUS)		
Skipped speed ranges	4, parameterizable		
Setpoint resolution	0.001 rpm digital (14 bit + sign) 12 bit analog		
Braking operation	Four-quadrant operation possible as standard (optionally using braking unit if braking is required in event of power failure)		
Mechanical data			
Degree of protection	IP20 (higher degrees of protection up to IP54 optional)		
Protection class	Acc. to EN 50 178 Part 1		
Type of cooling	Forced air cooling		
Shock-protection	BGV A2		
Cabinet system	Rittal TS 8, doors with double-barb lock, three-section base plates for cable entry		
Paint	RAL 7035 (indoor requirements)		
Compliance with standards			
Standards	EN 60 146-1, EN 61 800-2, EN 61 800-3, EN 50 178, EN 60 204-1, EN 60 529		
CE marking	According to EMC directive No. 89/336/EC and low voltage directive No. 73/23/EC		
RI suppression	According to EMC product standard for variable-speed drives EN 61 800-3, second environment. First environment on request.		
	Operation	Storage	Transport
Ambient conditions			
Ambient temperature	0 °C to +40 °C Up to +50 °C: see derating data	-25 °C to +55 °C	-25 °C to +70 °C above -40 °C: for 24 hours
Relative humidity (non-condensing)	5% to <u>95%</u> corr. to <u>3K3</u> to IEC 60 721-3-3	<u>5% to 95%</u> corr. to <u>1K4</u> to IEC 60 721-3-1	5% to 95% at 40 °C corr. to 2K3 to IEC 60 721-3-2
Installation altitude	Up to 2000 m above sea level without reduction in performance, > 2000 m: see derating data		
Mechanical stability			
Vibratory load			
- Deflection	0.075 mm at 10 Hz to 58 Hz	1.5 mm at <u>5 Hz</u> to 9 Hz	3.5 mm at <u>5 Hz</u> to 9 Hz
- Acceleration	9.8 m/s ² at > 58 Hz to 200 Hz -	5 m/s ² at > 9 Hz to 200 Hz corr. to 1M2 to IEC 60 721-3-1	10 m/s ² at > 9 Hz to 200 Hz corr. to 2M2 to IEC 60 721-3-2
Shock load			
- Acceleration	100 m/s ² at 11 ms corr. to 3M4 to IEC 60 721-3-3	40 m/s ² at 22 ms corr. to 1M2 to IEC 60 721-3-1	100 m/s ² at 11 ms corr. to 2M2 to IEC 60 721-3-2

Deviations from the defined classes are identified by underlining.

SINAMICS S150

Drive converter cabinet units

75 kW to 1200 kW

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 permissible output currents of the converters must be reduced according to the following tables. The degree of protection of the converter cabinets must be observed. The listed derating data already include compensation between the installation altitude and ambient temperature (temperature of inlet air for converter cabinet).

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

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

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

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

Voltage derating as a function of the installation altitude

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

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

Voltage derating as a function of the installation altitude

Technical data (continued)

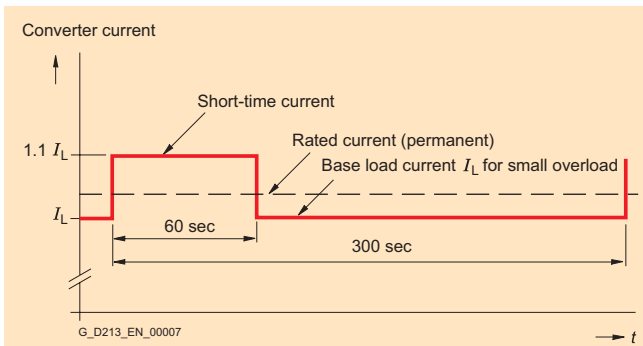
Overload capability

The SINAMICS S150 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.

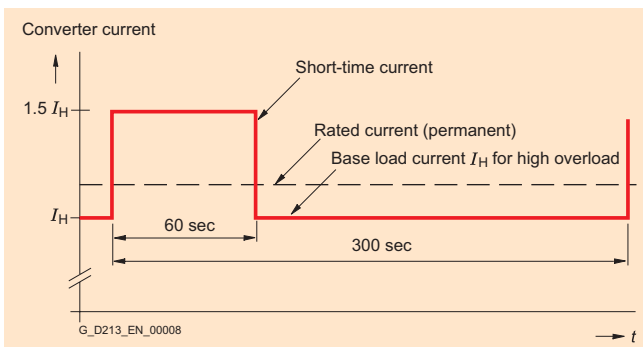
The criterion for overload is that the drive is operated with its base load current before and after the overload occurs, and a load duration of 300 s is assumed here.

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

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



Small overload



High overload

EMC information

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

The EMC requirements for "Variable-speed drive systems" are described in the product standard EN 61 800-3. A variable-speed drive system (or power drive system PDS) consists of the drive converter and the electric motor including cables. The driven machine is not part of the drive system.

EN 61 800-3 defines different limits depending on the location of the drive system, referred to as the first and second environments.

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

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

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

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

Category C2: Stationary drive systems for rated voltages less than 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 less than 1000 V for exclusive use in the second environment.

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

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

First environment	C1	Second environment
	C2	
	C3	
	C4	

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SINAMICS S150 is almost exclusively used in the second environment (categories C3 and C4).

To limit the **emitted interference**, SINAMICS S150 is equipped as standard with a line filter according to the limits defined in Category C3. Optional line filters are available on request for use in the first environment (Category C2).

SINAMICS S150 complies with the **noise immunity** requirements defined in EN 61 800-3 for the second environment and thus also with the lower noise immunity requirements in the first environment.

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

SINAMICS S150

Drive converter cabinet units

75 kW to 1200 kW

Technical data (continued)

Earthing

Required PE conductor cross-sections:

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

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

The cross-section of the PE conductor must be selected according to EN 60 204-1, EN 60 439-1, IEC 60 364.

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

- Switchgear and motors are usually earthed separately with a local earth electrode. With this constellation, the earth fault current flows via the parallel earth connections and is divided. Despite use of cross-sections for the outer conductors in line with the above table, no impermissible contact voltages then occur with this earthing. However, based on experience gained with different earthing constellations, we recommend direct returning of the earth line from the motor to the converter. For EMC reasons and to prevent shaft currents, symmetrical motor cables and not four-wire cables should be used here. The earth connection (PE) must be routed separately or arranged symmetrically in the motor cable. The symmetry of the PE conductor is achieved using a conductor surrounding all phase conductors or using a cable with a symmetrical arrangement of the three phase conductors and three earth conductors.
- By means of their closed-loop control, the converters limit the load current (motor and earth fault currents) to an rms value corresponding to the rated current. Because of this, we recommend use of an outer conductor cross-section analogous to the outer conductor cross-section for earthing the control cabinet.

SINAMICS S150

Drive converter cabinet units

75 kW to 1200 kW

Selection and ordering data

Small overload						High overload			Power loss			Cooling air req.	Sound pressure level		Drive converter cabinet units SINAMICS S150 Order No.
Output at 400 V	at 460 V (60 Hz)	at 690 V	Rated input current ¹⁾	Rated output current I_N	Basic load current $I_L^{(2)}$	Output to I_H	Basic load current $I_H^{(3)}$	at 400 V (50 Hz)	at 460 V (60 Hz)	at 690 V (50 Hz)	L_{pA} (1 m) at 50 Hz		L_{pA} (1 m) at 60 Hz		
kW	hp	kW	A	A	A	kW	hp	A	kW	kW	kW	m ³ /s	dB	dB	
Supply voltage 3 AC 50 Hz 380 V to 440 V / 3 AC 60 Hz 460 V to 480 V															
110	150	-	197	210	205	90	125	178	5.6	6.1	-	0.58	71	73	6SL3710-7LE32-1AA0
132	200	-	242	260	250	110	150	233	6.6	7.3	-	0.70	71	73	6SL3710-7LE32-6AA0
160	250	-	286	310	302	132	200	277	8.5	9.4	-	1.19	72	74	6SL3710-7LE33-1AA0
200	300	-	349	380	370	160	250	340	9.3	10.2	-	1.19	72	74	6SL3710-7LE33-8AA0
250	400	-	447	490	477	200	350	438	11.7	13.0	-	1.19	72	74	6SL3710-7LE35-0AA0
315	500	-	549	605	590	250	400	460	15.9	17.5	-	1.96	77	79	6SL3710-7LE36-1AA0
400	600	-	674	745	725	315	500	570	18.0	20.0	-	1.96	77	79	6SL3710-7LE37-5AA0
450	700	-	759	840	820	400	600	700	18.4	20.4	-	1.96	77	79	6SL3710-7LE38-4AA0
560	800	-	888	985	960	450	700	860	24.4	26.8	-	2.6	77	79	6SL3710-7LE41-0AA0
710	900	-	1133	1260	1230	560	800	1127	28.2	31.4	-	2.6	78	80	6SL3710-7LE41-2AA0
800	1000	-	1262	1405	1370	710	900	1257	30.3	33.8	-	2.6	78	80	6SL3710-7LE41-4AA0
Supply voltage 3 AC 50 Hz 660 V to 690 V															
-	-	75	86	85	80	55	-	76	-	-	4.5	0.58	71	73	6SL3710-7LH28-5AA0
-	-	90	99	100	95	75	-	89	-	-	4.9	0.58	71	73	6SL3710-7LH31-0AA0
-	-	110	117	120	115	90	-	107	-	-	5.2	0.58	71	73	6SL3710-7LH31-2AA0
-	-	132	144	150	142	110	-	134	-	-	5.8	0.58	71	73	6SL3710-7LH31-5AA0
-	-	160	166	175	170	132	-	157	-	-	9.5	1.19	75	77	6SL3710-7LH31-8AA0
-	-	200	202	215	208	160	-	192	-	-	10.4	1.19	75	77	6SL3710-7LH32-2AA0
-	-	250	242	260	250	200	-	233	-	-	11.1	1.19	75	77	6SL3710-7LH32-6AA0
-	-	315	304	330	320	250	-	280	-	-	12.5	1.19	75	77	6SL3710-7LH33-3AA0
-	-	400	375	410	400	315	-	367	-	-	17.7	1.96	77	79	6SL3710-7LH34-1AA0
-	-	450	424	465	452	400	-	416	-	-	18.9	1.96	77	79	6SL3710-7LH34-7AA0
-	-	560	522	575	560	450	-	514	-	-	22.4	1.96	77	79	6SL3710-7LH35-8AA0
-	-	710	665	735	710	630	-	657	-	-	28.3	2.6	77	79	6SL3710-7LH37-4AA0
-	-	800	732	810	790	710	-	724	-	-	31.6	2.6	77	79	6SL3710-7LH38-1AA0
-	-	900	821	910	880	800	-	814	-	-	32.5	2.6	77	79	6SL3710-7LH38-8AA0
-	-	1000	923	1025	1000	900	-	917	-	-	35.6	2.6	77	79	6SL3710-7LH41-0AA0
-	-	1200	1142	1270	1230	1000	-	1136	-	-	40.1	2.6	77	79	6SL3710-7LH41-3AA0

- 1) The currents listed here are based on a line power factor of $\cos \phi = 1$. These currents include 10 A for the external auxiliaries as required for options **L19** and **B03**, for example.
- 2) The basic load current I_L is based on a duty cycle of 110% for 60 s or 150% for 10 s with a duration of 300 s (see → Technical data → overload capability).
- 3) The basic load current I_H is based on a duty cycle of 150% for 60 s or 160% for 10 s with a duration of 300 s (see → Technical data → overload capability).

SINAMICS S150

Drive converter cabinet units

75 kW to 1200 kW

Accessoires

Drive converter cabinet unit	Cable protection fuse			Cable protection fuse (incl. semiconductor protection)		
	with existing fuse switch-disconnector	Rated current	Frame size acc. to DIN 43 620-1	without fuse switch-disconnector ¹⁾	Rated current	Frame size acc. to DIN 43 620-1
Type	Order No.	A		Order No.	A	

Supply voltage AC 380 V to 480 V

6SL3710-7LE32-1AA0	3NA3 252	315	2	3NE1 230-2	315	1
6SL3710-7LE32-6AA0	3NA3 254	355	2	3NE1 331-2	350	2
6SL3710-7LE33-1AA0	3NA3 365	500	3	3NE1 334-2	500	2
6SL3710-7LE33-8AA0	3NA3 365	500	3	3NE1 334-2	500	2
6SL3710-7LE35-0AA0	3NA3 372	630	3	3NE1 436-2	630	3
6SL3710-7LE36-1AA0	3NA3 475	800	4	3NE1 438-2	800	3
6SL3710-7LE37-5AA0	3NA3 475	800	4	3NE1 448-2	850	3
6SL3710-7LE38-4AA0	Circuit-breaker	-	-	Circuit-breaker	-	-
6SL3710-7LE41-0AA0	Circuit-breaker	-	-	Circuit-breaker	-	-
6SL3710-7LE41-2AA0	Circuit-breaker	-	-	Circuit-breaker	-	-
6SL3710-7LE41-4AA0	Circuit-breaker	-	-	Circuit-breaker	-	-

Supply voltage AC 660 V to 690 V

6SL3710-7LH28-5AA0	3NA3 132-6	125	1	3NE1 022-2	125	00
6SL3710-7LH31-0AA0	3NA3 132-6	125	1	3NE1 022-2	125	00
6SL3710-7LH31-2AA0	3NA3 136-6	160	1	3NE1 224-2	160	1
6SL3710-7LH31-5AA0	3NA3 240-6	200	2	3NE1 225-2	200	1
6SL3710-7LH31-8AA0	3NA3 244-6	250	2	3NE1 227-2	250	1
6SL3710-7LH32-2AA0	3NA3 252-6	315	2	3NE1 230-2	315	1
6SL3710-7LH32-6AA0	3NA3 354-6	355	3	3NE1 331-2	350	2
6SL3710-7LH33-3AA0	3NA3 365-6	500	3	3NE1 334-2	500	2
6SL3710-7LH34-1AA0	3NA3 365-6	500	3	3NE1 334-2	500	2
6SL3710-7LH34-7AA0	3NA3 352-6	2x315	2	3NE1 435-2	560	3
6SL3710-7LH35-8AA0	3NA3 354-6	2x355	3	3NE1 447-2	670	3
6SL3710-7LH37-4AA0	3NA3 365-6	2x500	3	3NE1 448-2	850	3
6SL3710-7LH38-1AA0	Circuit-breaker	-	-	Circuit-breaker	-	-
6SL3710-7LH38-8AA0	Circuit-breaker	-	-	Circuit-breaker	-	-
6SL3710-7LH41-0AA0	Circuit-breaker	-	-	Circuit-breaker	-	-
6SL3710-7LH41-3AA0	Circuit-breaker	-	-	Circuit-breaker	-	-

1) If the drive converter cabinet units ($I < 800$ A) are used without option **L26**, the user must ensure that relevant precautions considering cable and semiconductor protection are taken on the plant side. The combined fuses 3NE1... are recommended for currents up to 800 A. These fuses with the utilization category gS are designed for overload and short-circuit protection of cables, conductors and busbars in addition to semiconductor protection.

SINAMICS S150

Drive converter cabinet units

75 kW to 1200 kW

Options

When ordering a converter with options, add "-Z" to the Order No. of the converter followed by the Order code(s) for the desired option(s).

Example:
6SL3710-7LE32-1AA0-Z
+M07+D60+...

See ordering examples.

Available options	Order code
Input side	
Main control switch incl. fuses for output currents < 800 A	L26
EMC shield bus (cable connection from below) ¹⁾	M70
Output side	
Sinusoidal filter (only for voltage range 380 V to 480 V, up to 200 kW) (on request)	L15
EMC shield bus (cable connection from below) ¹⁾	M70
Motor protection and safety functions	
EMERGENCY STOP button in the cabinet door	L45
EMERGENCY STOP category 0, AC 230 V or DC 24 V, uncontrolled stop	L57
EMERGENCY STOP category 1, AC 230 V, controlled stop	L59
EMERGENCY STOP category 1, DC 24 V, controlled stop	L60
Thermistor motor protection unit with PTB approval (alarm)	L83
Thermistor motor protection unit with PTB approval (shutdown)	L84
PT100 evaluation unit (for 6 PT100)	L86
Insulation monitoring	L87
Additional shock protection	M60
Increase in degree of protection	
IP21 degree of protection	M21
IP23 degree of protection	M23
IP54 degree of protection	M54
Mechanical options	
Plinth 100 mm high, RAL 7022	M06
Cable connection area 200 mm high, RAL 7035	M07
Line connection from above	M13
Motor connection from above	M78
Top-mounted crane transport assembly for cabinets	M90

1) This option is listed for the input and output side options, but is only required once.

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

Available options	Order code
Miscellaneous options	
Customer terminal block extension	G61
SMC30 sensor module cabinet mounted for recording the actual motor speed	K50
Connection for external auxiliary equipment (controlled max. 10 A)	L19
Cabinet illumination with service socket	L50
Anti-condensation heating for cabinet	L55
100 kW braking unit (on request)	L61
200 kW braking unit (on request)	L62
Special cabinet paint finish ²⁾	Y09
Languages	
Documentation in English/French	D58
Documentation in English/Spanish	D60
Documentation in English/Italian	D80
Rating plate and operator panel in English/French	T58
Rating plate and operator panel in English/Spanish	T60
Rating plate and operator panel in English/Italian	T80
Options specific to chemical industry	
NAMUR terminal block	B00
Protective separation for 24 V supply (PELV)	B02
Separate output for external auxiliaries (uncontrolled)	B03
Converter acceptance inspections in presence of customer	
Visual inspection	F03
Function test of converter without motor connected	F71
Function test of converter with test bay motor (no load)	F75
Converter insulation test	F77
Customer-specific converter acceptance inspections (on request)	F97

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

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SINAMICS S150

Drive converter cabinet units

75 kW to 1200 kW

Options (continued)

Option selection matrix

Certain options are mutually excluding

✓	Possible combination
–	Combination not possible

Electrical options

	L15	L57	L59	L60	L87
L15		✓	✓	✓	✓
L57	✓		–	–	✓
L59	✓	–		–	✓
L60	✓	–	–		✓
L87	✓	✓	✓	✓	

Mechanical options/electrical options

	M06	M07	M13	M21	M23	M54	M60	M70	M78
M06		–	✓	✓	✓	✓	✓	✓	✓
M07	–		✓	✓	✓	✓	✓	✓	✓
M13	✓	✓		–	✓	✓	–	1)	✓
M21	✓	✓	–		–	–	2)	✓	–
M23	✓	✓	✓	–		–	–	✓	✓
M54	✓	✓	✓	–	–		–	✓	✓
M60	✓	✓	–	2)	–	–		✓	–
M70	✓	✓	1)	✓	✓	✓	✓		1)
M78	✓	✓	✓	–	✓	✓	–	1)	

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

2) Only selectable for converters in the voltage range 400 V to 250 kW and 690 V to 315 kW. The option **M60** is already present as standard for higher power ratings.

Rating plate data

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

Options (continued)

Ordering examples

Example 1

Task:

A drive system is required for a vehicle chassis dynamometer for exhaust analysis with which driving profiles and cycles can be simulated as encountered in everyday traffic. This means for the drive system that both motor-driven and generator-driven operation are required by the load machine.

Since generator-driven operation predominates and dynamic switching operations are required, a drive with regeneration is necessary.

The max. generator output is 200 kW. The converter must be designed with IP54 degree of protection because of the environmental conditions. The installation altitude is < 1000 m, and 45 °C is the max. expected ambient temperature. The windings should be equipped with PT100 resistance thermometers, and monitored by the converter for alarm and switch-off. A switch-disconnector must be provided to disconnect the converter from the 400 V power supply. In addition, the cabinet is to be specially painted in RAL 3002.

Solution:

Taking into account the derating factors for IP54 degree of protection and the increased ambient temperature of 45 °C, a converter with an output of at least 223 kW should be planned.

A converter is selected with an output of 250 kW and the options **M54** (IP54 degree of protection), **L26** (main control switch incl. fuses), **L86** (PT100 evaluation unit) and **Y09** (special paint).

The associated Order No. is:

6SL3710-7LE35-0AA0-Z
+M54 +L26+L86+Y09
Cabinet color RAL 3002

Example 2

Task:

A drive system is required for a conveyor belt in a brown coal open-cut mine which allows both motor-driven and generator-driven operation. Since the conveyor belt must also be started with bulk material on it following a fault, or it is possible for peak loads to occur where 1.5 times the output is required for up to 60 s, the drive system must be designed according to the overload requirements of such cases. Because of the environmental conditions encountered with open-cut mining, the converter is installed in an air-conditioned container. The installation altitude is 320 m above sea level, and the max. ambient temperature in the container is 35 °C. The supply to the drive is from the medium-voltage network via a converter transformer. The drive is operated in an isolated network and is to be provided with insulation monitoring. Since a high load torque is placed on the motor when starting up and at low speed, a motor with separately driven fan is selected in this case. The supply voltage to the fan is 690 V and is to be obtained from the converter.

The required motor output is 420 kW.

Solution:

Since the converter is installed in an air-conditioned container, it can be designed with IP20 degree of protection. The ambient temperature of 35 °C does not necessitate additional derating. However, the required overload conditions mean that the base load current I_{G2} must be used for the calculation. This results in an output of approx. 520 kW for the converter. The converter with Order No. 6SL3710-7LH35-8AA0 must be ordered.

The option **L87** (insulation monitoring) must be selected for insulation monitoring.

The option **L19** (connection for external auxiliaries) must be selected for the controlled outgoing circuit to the power supply.

The associated Order No. is:

6SL3710-7LH35-8AA0-Z
+L19+L87

SINAMICS S150

Drive converter cabinet units

75 kW to 1200 kW

Description of Options

B00, B02, B03

Options according to NAMUR requirements

Exclusion list to other options:

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

Not permissible with option	Reason
L45, L57, L59, L60	An EMERGENCY STOP of category 0 is already included in the NAMUR version. Access to the forced power supply disconnection is at the terminals -A1-X2: 17, 18.
L83, L84	The option B00 already provides a PTC thermistor evaluation unit (shutdown) as standard.
L19	The option B03 must be selected as an alternative. A reduced scope is then available 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.

B00

NAMUR terminal block

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

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

Terminal -A1-X2:	Meaning	Preassignment	Comment
10	DI	ON (dynamic)/ ON/OFF (static)	The effective mode can be coded using a wire jumper on the terminal -A1-400:9; 10.
11	DI	OFF (dynamic)	
12	DI	Faster	
13	DI	Slower	
14	DI	RESET	
15	DI	Interlocking	
16	DI	Counterclockwise	"0" signal for CW phase sequence "1" signal for CCW phase sequence
17, 18		PS disconnection	EMERGENCY STOP sequence
30, 31		Ready to run	Relay output (NO contact)
32, 33		Motor rotates	Relay output (NO contact)

Terminal -A1-X2:	Meaning	Preassignment	Comment
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 reprogrammed for other variables

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

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

For temperature monitoring of explosion-proof motors, the 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

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 is omitted).

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

B03

Separate output for external auxiliaries (uncontrolled)

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

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

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

Description of options (continued)

F03, F71, F75, F77, F97

Converter acceptance inspections in presence of customer

Order code	Description	Description
F03	Visual inspection	<p>The scope of the acceptance inspection comprises:</p> <ul style="list-style-type: none"> • Checking the degree of protection • Checking the equipment (components) • Checking the equipment identifier • Checking the clearance and creepage distances • Checking the cables • Checking the customer documentation • Submitting the acceptance report <p>The checks are carried out with the converter deenergized.</p>
F71	Functional test of the converter without connected motor	<p>The scope of the acceptance inspection comprises:</p> <ul style="list-style-type: none"> • Visual inspection as described for option F03 • Check of power supply • Check of protective and monitoring devices (simulation) • Check of fans • Precharging test • Functional test <u>without</u> connected motor • Submitting of the acceptance report <p>After the visual inspection with the converter switched off, the converter is connected to rated voltage. <u>No</u> current flows at the converter's output.</p>
F75	Functional test of the converter with test-bay motor (no load)	<p>The scope of the acceptance inspection comprises:</p> <ul style="list-style-type: none"> • Visual inspection as described for option F03 • Check of power supply • Check of protective and monitoring devices (simulation) • Check of fans • Precharging test • Functional test <u>with</u> test-bay motor (no load) • Submitting of the acceptance report <p>After the visual inspection with the converter off, the converter is connected to the rated voltage. A low-level current flows at the converter's output in order to operate the test-bay motor (no load).</p>
F77	Insulation test of converter	<p>The scope of the acceptance inspection comprises:</p> <ul style="list-style-type: none"> • High-voltage test • Measurement of insulation resistance
F97	Customer-specific converter acceptance inspection (on request)	<p>If acceptances are desired which are not covered by the options F03, F71, F75 or F77, customer specific acceptance inspections/supplementary tests can be ordered using the Order code F97 on request and following technical clarification.</p>

G61

Customer terminal block expansion

In the standard version, the SINAMICS S150 cabinet units already include a TM31 interface module (customer terminal block). 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 by:

- 8 digital inputs
- 4 bidirectional digital inputs/outputs
- 2 relay outputs with changeover contact
- 2 analog inputs
- 2 analog outputs
- 1 temperature sensor input (KTY84-130/PTC)

The second TM31 must be connected on the plant side. A default setting is not provided.

K50

SMC30 sensor module cabinet mounted for recording the actual motor speed

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

The following encoders are supported by the SMC30:

- TTL encoders
- HTL encoders

L15

Sinusoidal filter (on request)

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

The sinusoidal filter at the converter output supply almost 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 max. length of the motor cable is limited to 300 m.

Attention: In conjunction with the option **L15**, the pulse frequency of the converter must be increased. This reduces the available converter output (derating factor 0.88).

SINAMICS S150

Drive converter cabinet units

75 kW to 1200 kW

Description of options (continued)

L19

Connection for external auxiliary equipment

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

The voltage is tapped at the converter input prior to the main contactor/circuit-breaker and, therefore, has the same level as the supply voltage.

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

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

L26

Main control switch (incl. fuses/circuit-breakers)

Up to 800 A, a switch-disconnector with externally mounted fuses is offered as the main control switch. At currents above 800 A, the circuit-breaker present as standard handles the power isolation function. The circuit-breaker is energized and supplied within the converter.

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

L45

EMERGENCY STOP button

The option **L45** only contains the EMERGENCY STOP button which is fitted with a protective collar in the cabinet door of the converter. The button contacts are available in a terminal board.

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 from EMERGENCY STOP button in cabinet door
2	Checkback contact from EMERGENCY STOP button in cabinet door
3	Checkback contact from EMERGENCY STOP button in cabinet door *)
4	Checkback contact from EMERGENCY STOP button in cabinet door *)

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

L50

Cabinet illumination with service socket

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

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

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

L55

Anti-condensation heating for cabinet

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

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

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

L57

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

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

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

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

Description of options (continued)

L59 EMERGENCY STOP category 1 (AC 230 V)

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

The function includes rapid shutdown of the drive via fast stop using a deceleration ramp which is programmed by the user. This is followed by voltage disconnection as described for the EMERGENCY STOP category 0 (option L57).

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

L60 EMERGENCY STOP category 1 (DC 24 V)

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

The function includes rapid stopping of the drive using a deceleration ramp to be parameterized by the user. This is followed by voltage disconnection as described for the EMERGENCY STOP category 0 (option L57).

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

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 60 204-1 (VDE 0113). Auxiliary voltages such as separately driven fan or anti-condensation heating can 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.

L61, L62 Braking units (on request)

In correct operation, the energy produced when braking is returned to the supply system. However, if it is necessary to specifically stop the drive in the event of a power supply failure, additional braking units are required which can cover this operating state.

A braking unit comprises two components: a braking module fitted in the converter, 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 an 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. 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

L61: Braking unit $P_{20} = 100$ kW

L62: Braking unit $P_{20} = 200$ kW

L83 Thermistor motor protection unit (alarm)

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

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

L84 Thermistor motor protection unit (switch-off)

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

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

SINAMICS S150

Drive converter cabinet units

75 kW to 1200 kW

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

The output relays are integrated into the internal fault and shutdown sequence of the converter. The signals can also be picked up by the customer via two spare fault signalling 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 control.

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 be connected in addition (x = 1, 2, ..., 6)	
51, 52, 54	Relay output Limit for group 1 reached; (changeover contact)
61, 62, 64	Relay output Limit for group 2 reached; (changeover contact)
Ground (OUT 1)	Analog output OUT 1; sensor group 1
U1 (OUT 1)	Analog output OUT 1; sensor group 1
I1 (OUT 1)	Analog output OUT 1; sensor group 1
Ground (OUT 2)	Analog output OUT 2; sensor group 2
U2 (OUT 2)	Analog output OUT 2; sensor group 2
I2 (OUT 2)	Analog output OUT 2; sensor group 2

L87 Insulation monitoring

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

An alarm is output by the insulation monitor in the event of a fault.

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

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

Terminal -A1-A101:	Meaning
11	Alarm relay ALARM 1 Base
12	Alarm relay ALARM 1 NC contact
14	Alarm relay ALARM 1 NO contact
21	Alarm relay ALARM 2 Base
22	Alarm relay ALARM 2 NC contact
24	Alarm relay ALARM 2 NO contact
M+	External kΩ display 0 A to 400 μA
M-	External kΩ display 0 μA to 400 μA
R1	External reset key (NC contact or wire jumper otherwise the fault code is not stored)
R2	External reset key (NC contact or wire jumper)
T1	External test button
T2	External test button

M06 Plinth 100 mm high, RAL 7022

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

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

M07 Cable connection area 200 mm high, RAL 7035

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

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

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

A non-drilled mounting plate made of aluminium (5 mm thick) should be provided in the top of the hood for introduction of 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 attaching cable glands for feeding into the cables.

Note: The control cables are still connected from below. With option **M13** the straps for line connection from below are not available.

The hoods have IP21 degree of protection. In combination with the 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 the option **M60** are included in the scope of delivery.

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 IP23 degree of protection are supplied with additional hoods and plastic ventilation grilles in the air inlet and outlet. The cabinet height is then increased by 400 mm. The covers used with the option **M60** are included in the scope of delivery. For transport reasons, the hoods are delivered separately and must be fitted on site.

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

M54

IP54 degree of protection

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

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

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.

M60

Additional shock protection

The drive converter cabinet units are designed as standard according to BGV A2. The option **M60** provides additional covers (outside normal arm's reach) in the vicinity of the AC rails and above the power section (only selectable as option with the converters up to 250 kW in the 400 V range and with the converters up to 315 kW in the 690 V range in IP20 and IP21 degrees of protection; otherwise present as standard).

M70

EMC shield bus (cable connection from below)

The EMC shield bus is used to connect shielded power cables for power supply and motor infeed. With options **M13** and **M78**, the EMC shield bus is already included as standard in the connection rails underneath the hoods.

SINAMICS S150

Drive converter cabinet units

75 kW to 1200 kW

Description of options (continued)

M78

Motor connection from above

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

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

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

Note: The control cables are still connected from below. With option **M78** the straps present as standard for connection of the motor from below are not available.

The hoods have IP21 degree of protection. In combination with the 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 (code **Y09**), the hoods are also painted in this color. Ventilation grilles used with IP23 and IP54 degrees of protection are colored RAL 7035 and cannot be painted.

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

M90

Top-mounted crane transport assembly for cabinets

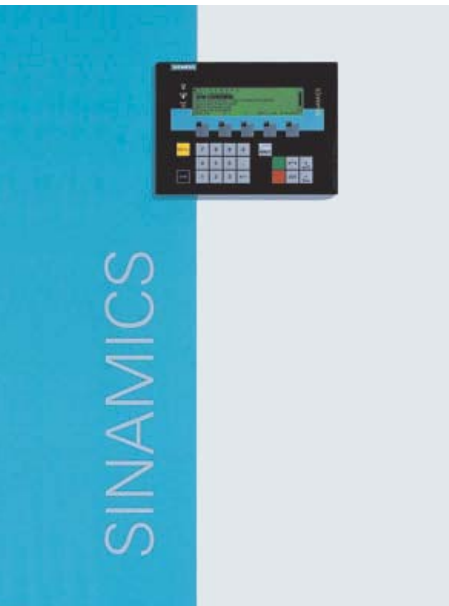
In the case of single cabinets up to a width of 600 mm, the crane transport assembly has transport eyebolts. With a cabinet width of 800 mm or more, transport rails are used.

Y09

Special cabinet paint finish

The drive converter cabinet units are colored RAL 7035 as standard. The special color must be specified in plain text when ordering. All RAL colors can be selected which are available as powdered coatings. If options such as cable 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.

Dimension drawings



3/2	Drive converter cabinet units
3/2	380 V to 480 V, 110 kW to 132 kW 660 V to 690 V, 75 kW to 132 kW
3/6	380 V to 480 V, 160 kW 660 V to 690 V, 160 kW to 315 kW
3/10	380 V to 480 V, 200 kW to 250 kW
3/14	380 V to 480 V, 315 kW to 450 kW 660 V to 690 V, 400 kW to 560 kW
3/18	380 V to 480 V, 560 kW to 800 kW 660 V to 690 V, 710 kW to 1200 kW

3/22	Mechanical connection data
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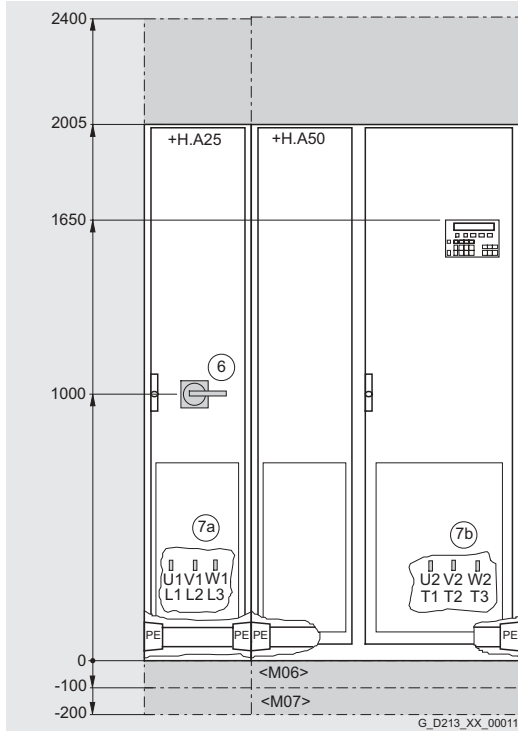
Drive converter cabinet units

75 kW to 1200 kW

Dimension drawings

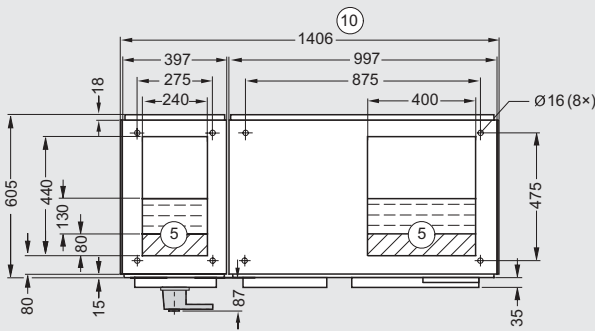
380 V to 480 V, 110 kW to 132 kW
660 V to 690 V, 75 kW to 132 kW

Line connection from below
Motor connection from below

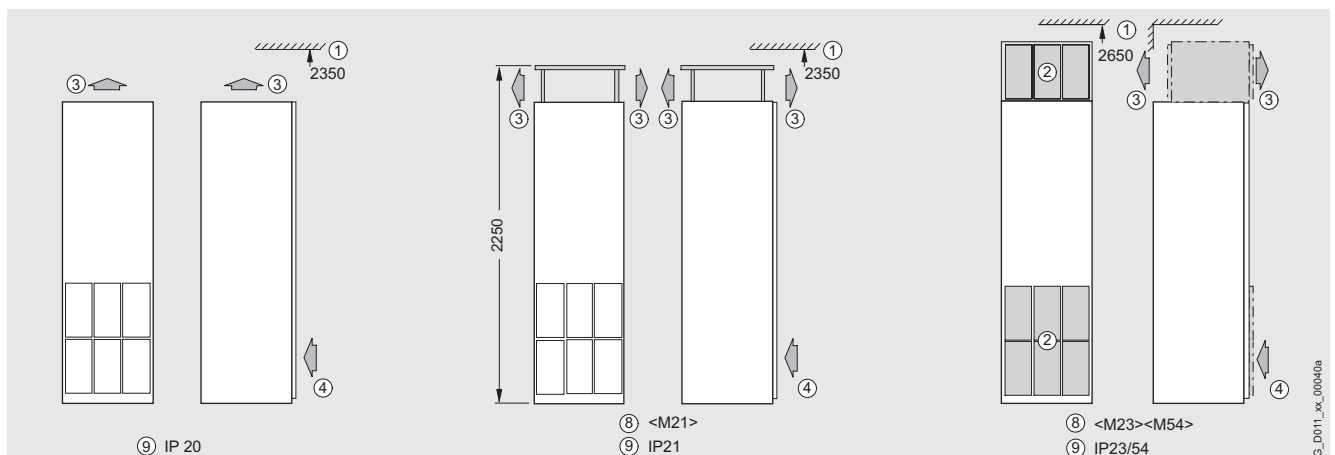


- ① Minimum ceiling height with wall mounting
- ② Ventilation grille
- ③ Air outlet area
- ④ Air inlet area
- ⑤ Cable inlet from below possible within the shaded area
- ⑥ Main control switch (see option **L26**)
- ⑦ Power connection (7a: power supply, 7b: motor)
- ⑧ Option for degrees of protection
- ⑨ Degrees of protection
IP20
IP21 option **M21**
IP23 option **M23**
IP54 option **M54**
- ⑩ Transport unit

Options have a gray background.



Degrees of protection



SINAMICS S150

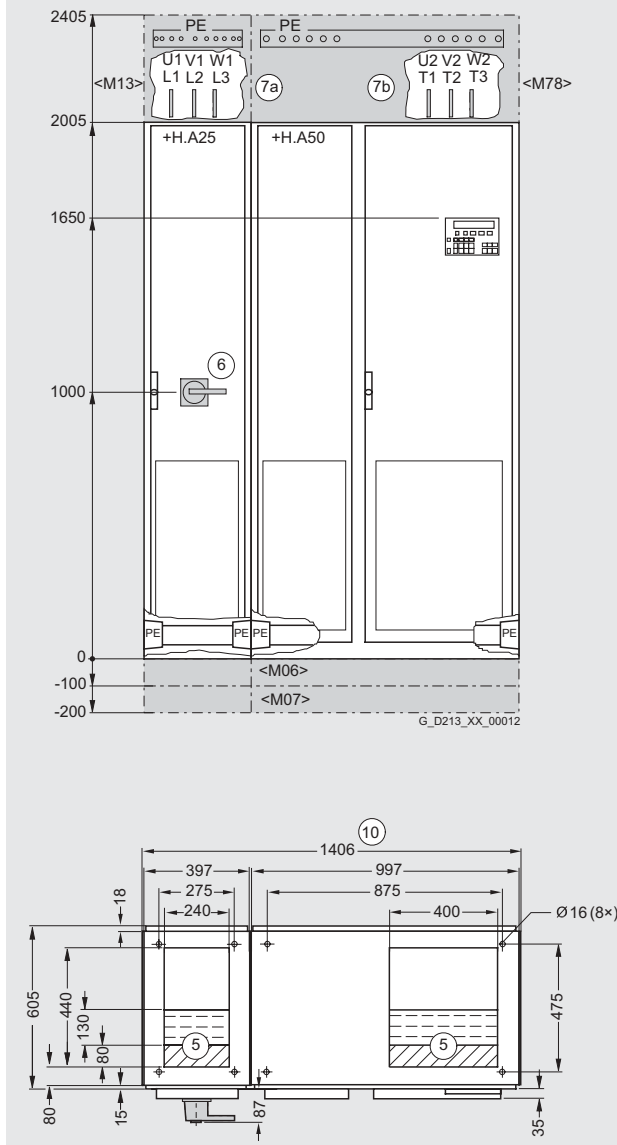
Drive converter cabinet units

75 kW to 1200 kW

Dimension drawings (continued)

380 V to 480 V, 110 kW to 132 kW
660 V to 690 V, 75 kW to 132 kW

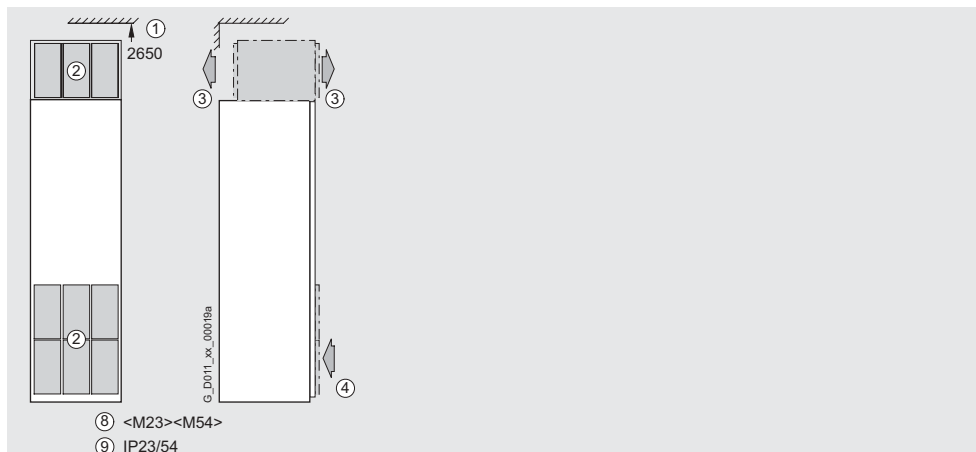
Line connection from above (option **M13**)
Motor connection from above (option **M78**)



- ① Minimum ceiling height with wall mounting
- ② Ventilation grille
- ③ Air outlet area
- ④ Air inlet area
- ⑤ Cable inlet from below possible within the shaded area
- ⑥ Main control switch (see option **L26**)
- ⑦ Power connection (7a: power supply, 7b: motor)
- ⑧ Option for degrees of protection
- ⑨ Degrees of protection IP21
IP23 option **M23**
IP54 option **M54**
- ⑩ Transport unit

Options have a gray background.

Degrees of protection



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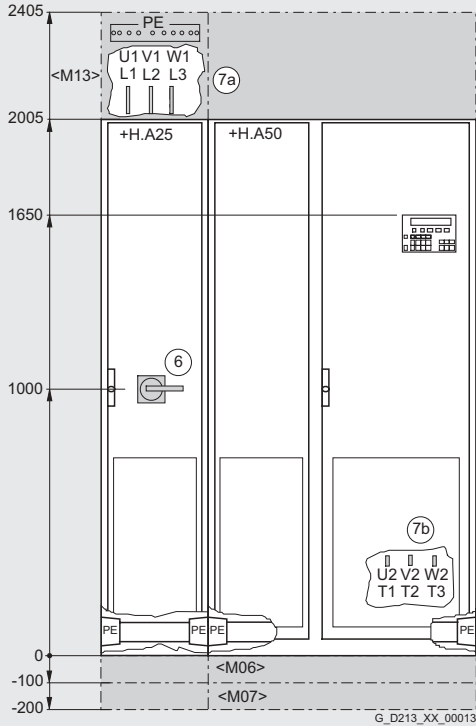
Drive converter cabinet units

75 kW to 1200 kW

Dimension drawings (continued)

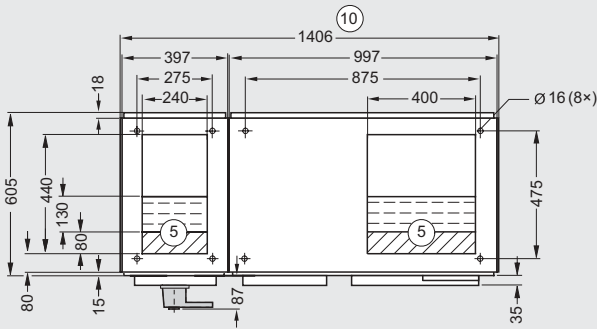
380 V to 480 V, 110 kW to 132 kW
660 V to 690 V, 75 kW to 132 kW

Line connection from above (option **M13**)
Motor connection from below

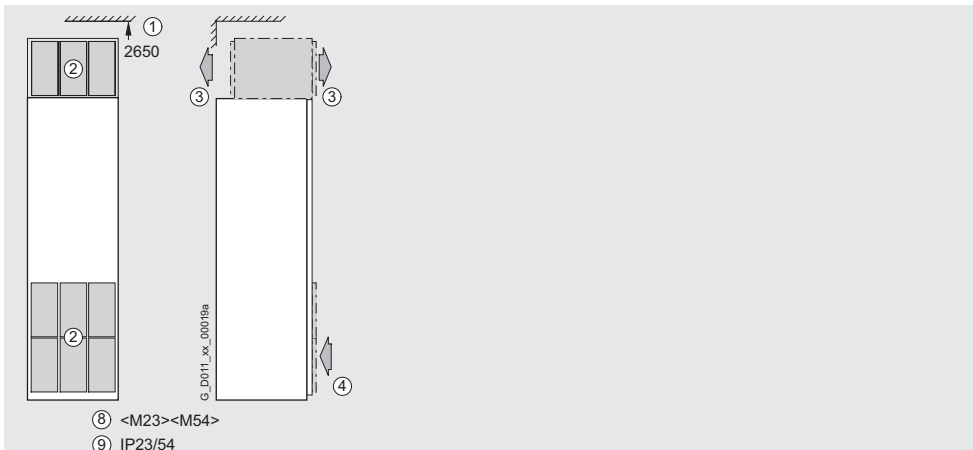


- ① Minimum ceiling height with wall mounting
- ② Ventilation grille
- ③ Air outlet area
- ④ Air inlet area
- ⑤ Cable inlet from below possible within the shaded area
- ⑥ Main control switch (see option **L26**)
- ⑦ Power connection (7a: power supply, 7b: motor)
- ⑧ Option for degrees of protection
- ⑨ Degrees of protection IP21
IP23 option **M23**
IP54 option **M54**
- ⑩ Transport unit

Options have a gray background.



Degrees of protection



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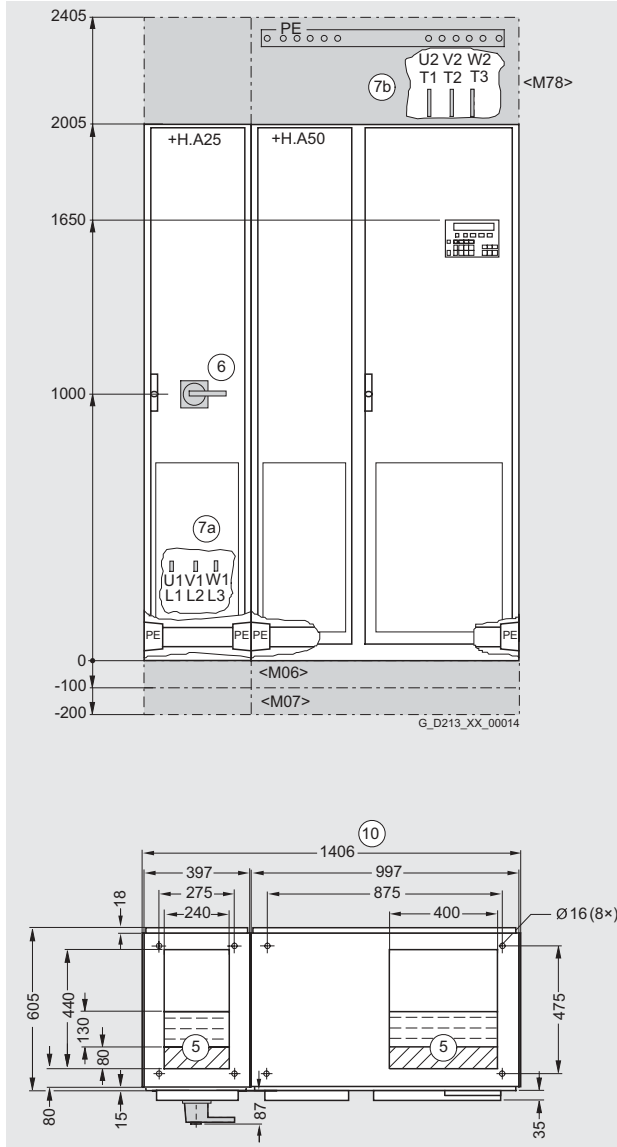
Drive converter cabinet units

75 kW to 1200 kW

Dimension drawings (continued)

380 V to 480 V, 110 kW to 132 kW
660 V to 690 V, 75 kW to 132 kW

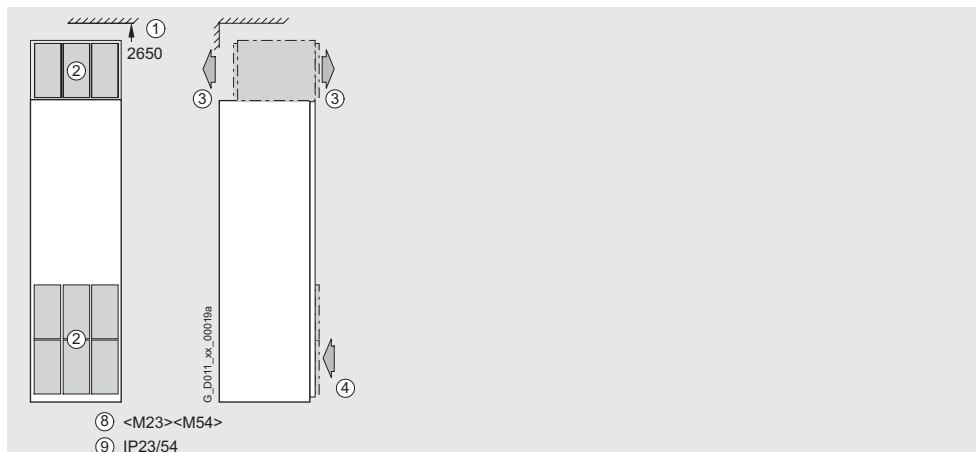
Line connection from below
Motor connection from above (option **M78**)



- ① Minimum ceiling height with wall mounting
- ② Ventilation grille
- ③ Air outlet area
- ④ Air inlet area
- ⑤ Cable inlet from below possible within the shaded area
- ⑥ Main control switch (see option **L26**)
- ⑦ Power connection (7a: power supply, 7b: motor)
- ⑧ Option for degrees of protection
- ⑨ Degrees of protection IP21
IP23 option **M23**
IP54 option **M54**
- ⑩ Transport unit

Options have a gray background.

Degrees of protection



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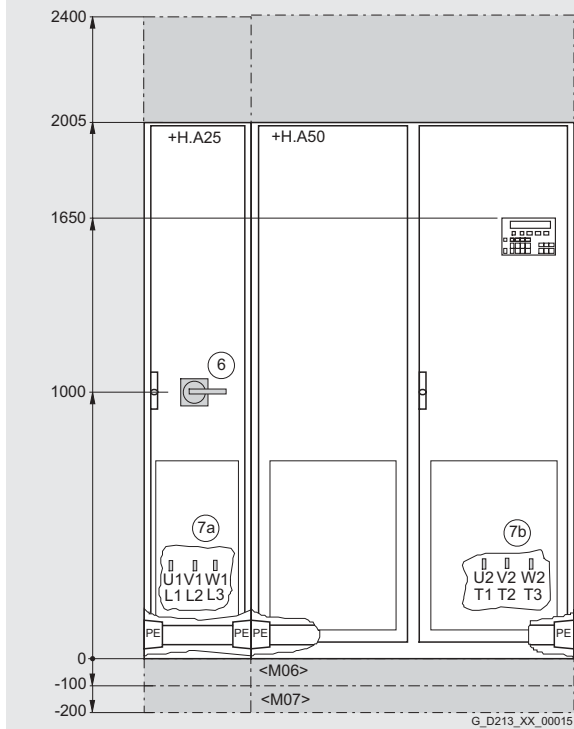
Drive converter cabinet units

75 kW to 1200 kW

Dimension drawings (continued)

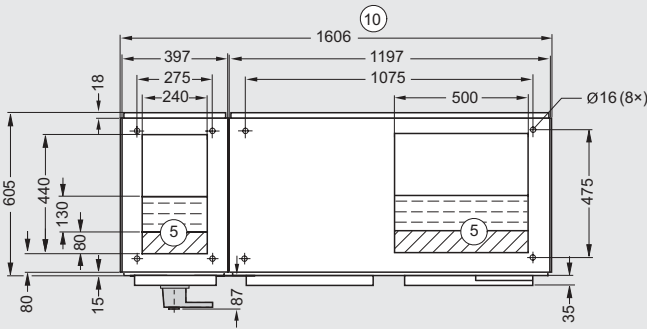
380 V to 480 V, 160 kW
660 V to 690 V, 160 kW to 315 kW

Line connection from below
Motor connection from below

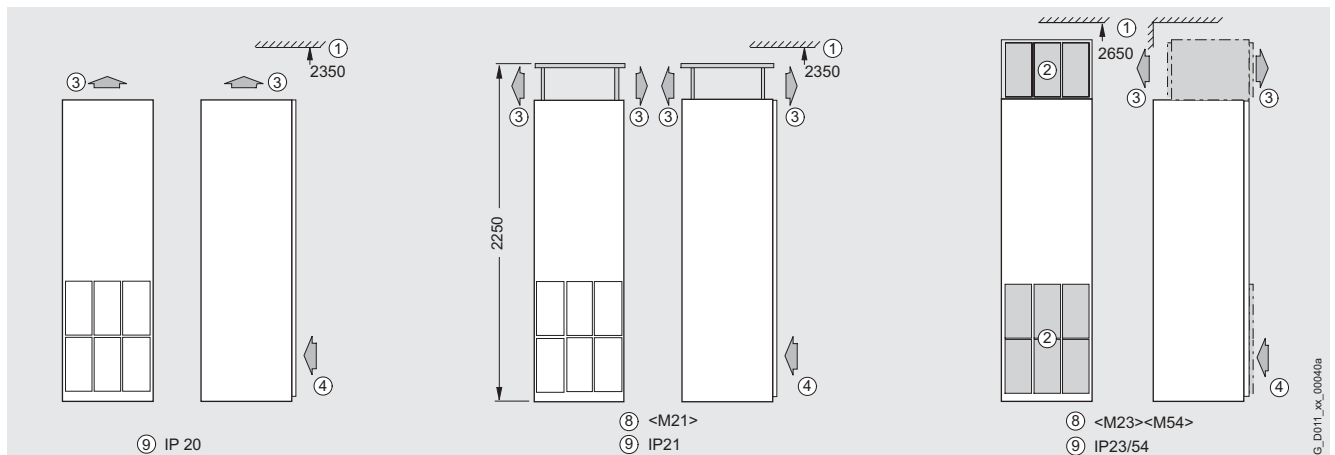


- ① Minimum ceiling height with wall mounting
- ② Ventilation grille
- ③ Air outlet area
- ④ Air inlet area
- ⑤ Cable inlet from below possible within the shaded area
- ⑥ Main control switch (see option **L26**)
- ⑦ Power connection (7a: power supply, 7b: motor)
- ⑧ Option for degrees of protection
- ⑨ Degrees of protection
IP20
IP21 option **M21**
IP23 option **M23**
IP54 option **M54**
- ⑩ Transport unit

Options have a gray background.



Degrees of protection



SINAMICS S150

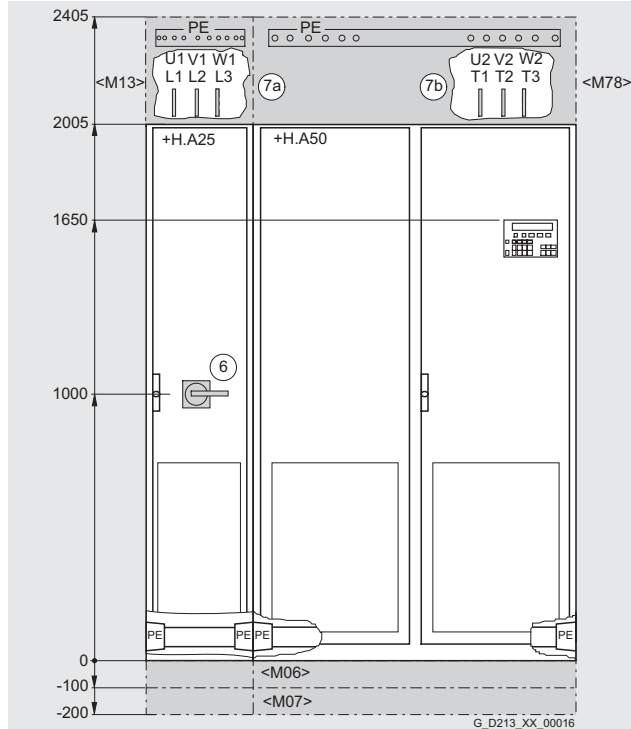
Drive converter cabinet units

75 kW to 1200 kW

Dimension drawings (continued)

380 V to 480 V, 160 kW
660 V to 690 V, 160 kW to 315 kW

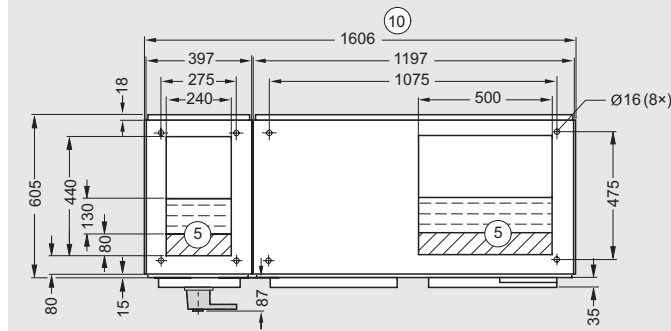
Line connection from above (option **M13**)
Motor connection from above (option **M78**)



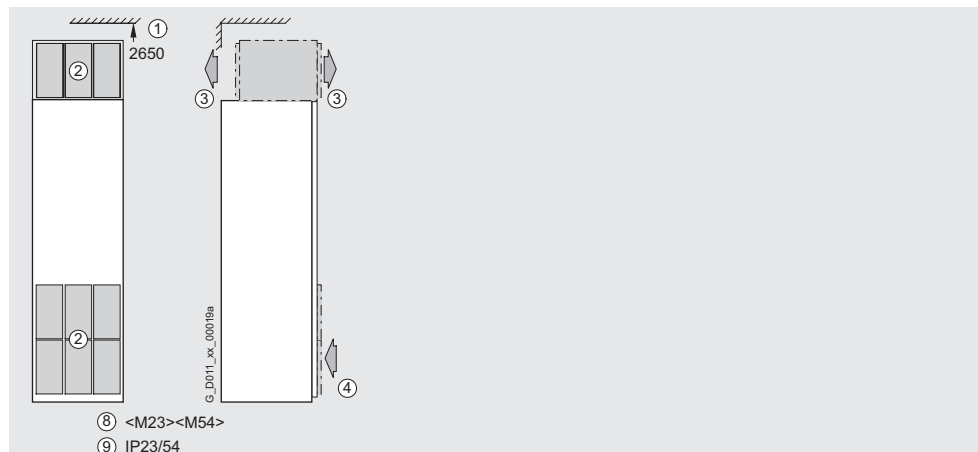
- ① Minimum ceiling height with wall mounting
- ② Ventilation grille
- ③ Air outlet area
- ④ Air inlet area
- ⑤ Cable inlet from below possible within the shaded area
- ⑥ Main control switch (see option **L26**)
- ⑦ Power connection (7a: power supply, 7b: motor)
- ⑧ Option for degrees of protection
- ⑨ Degrees of protection IP21
IP23 option **M23**
IP54 option **M54**
- ⑩ Transport unit

Options have a gray background.

3



Degrees of protection



SINAMICS S150

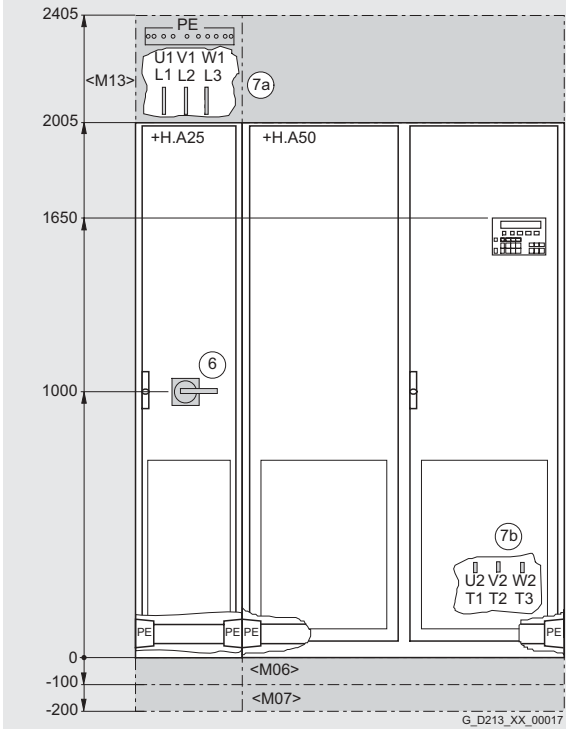
Drive converter cabinet units

75 kW to 1200 kW

Dimension drawings (continued)

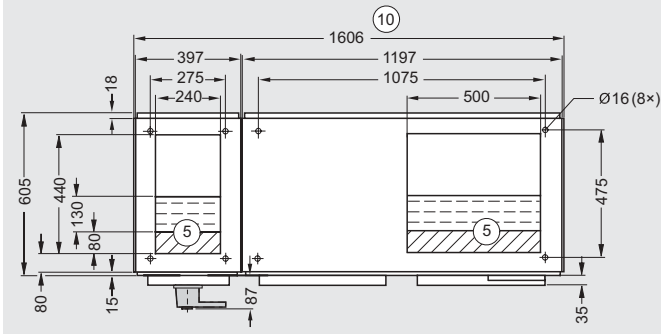
380 V to 480 V, 160 kW
660 V to 690 V, 160 kW to 315 kW

Line connection from above (option **M13**)
Motor connection from below

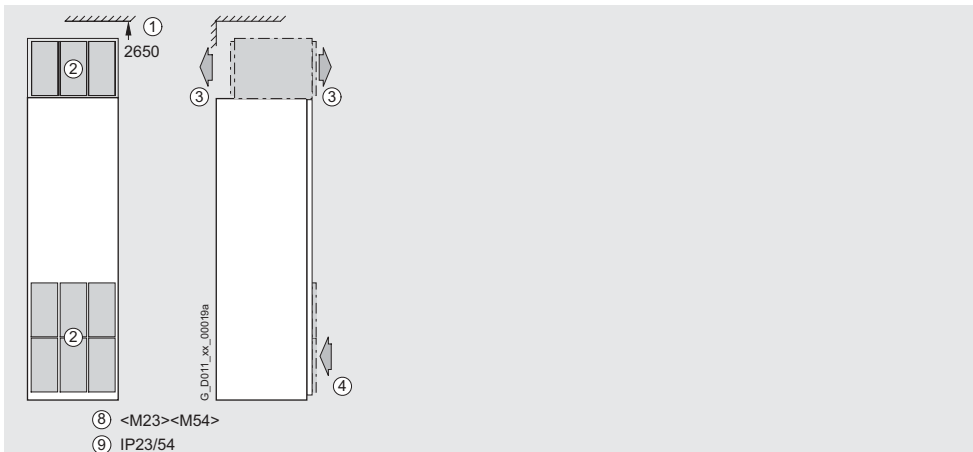


- ① Minimum ceiling height with wall mounting
- ② Ventilation grille
- ③ Air outlet area
- ④ Air inlet area
- ⑤ Cable inlet from below possible within the shaded area
- ⑥ Main control switch (see option **L26**)
- ⑦ Power connection (7a: power supply, 7b: motor)
- ⑧ Option for degrees of protection
- ⑨ Degrees of protection IP21
IP23 option **M23**
IP54 option **M54**
- ⑩ Transport unit

Options have a gray background.



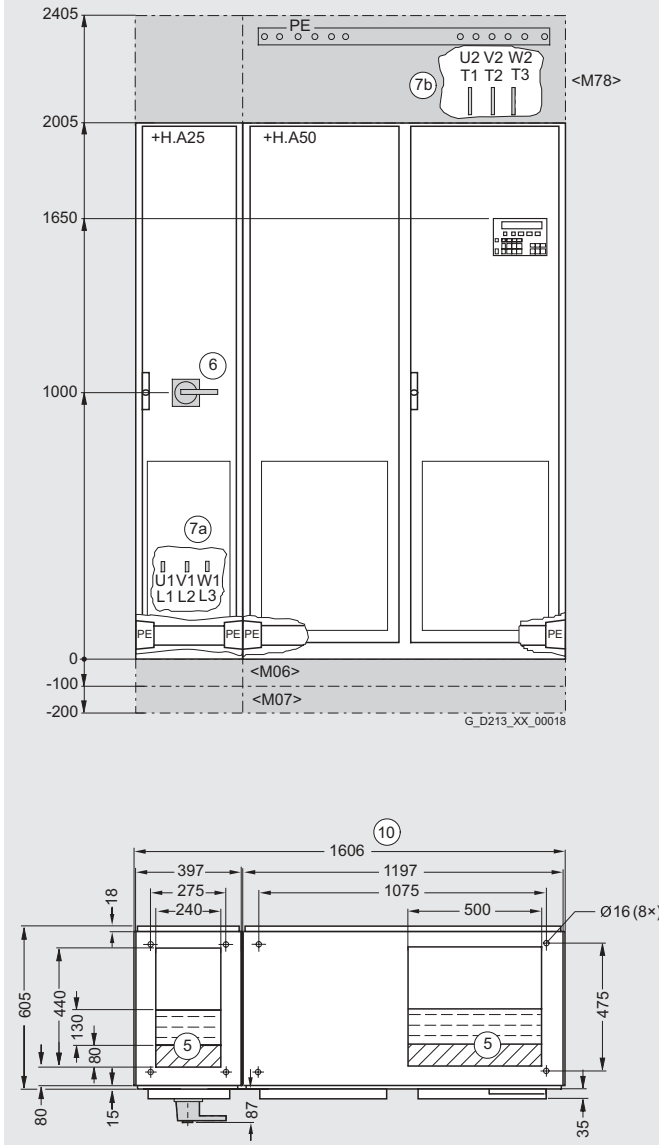
Degrees of protection



Dimension drawings (continued)

380 V to 480 V, 160 kW
660 V to 690 V, 160 kW to 315 kW

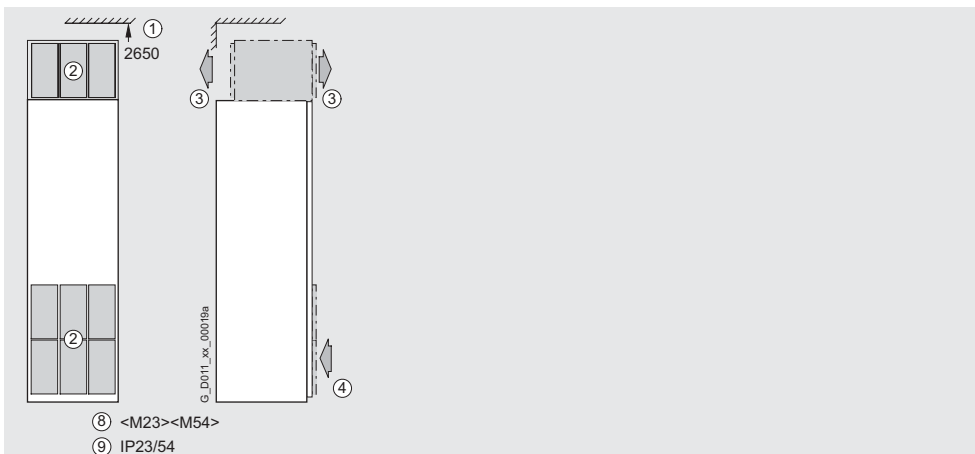
Line connection from below
Motor connection from above (option **M78**)



- ① Minimum ceiling height with wall mounting
- ② Ventilation grille
- ③ Air outlet area
- ④ Air inlet area
- ⑤ Cable inlet from below possible within the shaded area
- ⑥ Main control switch (see option **L26**)
- ⑦ Power connection (7a: power supply, 7b: motor)
- ⑧ Option for degrees of protection
- ⑨ Degrees of protection IP21
IP23 option **M23**
IP54 option **M54**
- ⑩ Transport unit

Options have a gray background.

Degrees of protection



- ⑧ <M23><M54>
- ⑨ IP23/54

SINAMICS S150

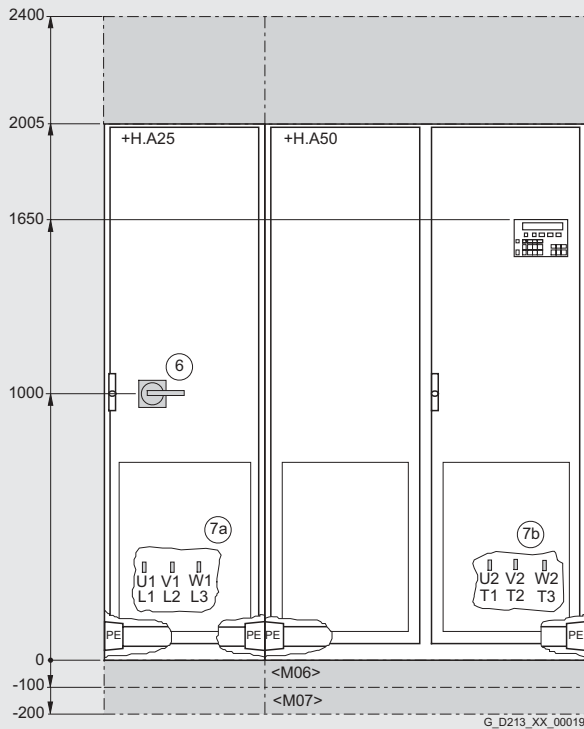
Drive converter cabinet units

75 kW to 1200 kW

Dimension drawings (continued)

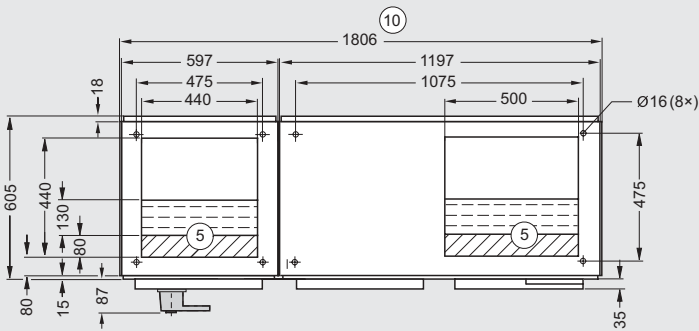
380 V to 480 V, 200 kW to 250 kW

Line connection from below
Motor connection from below

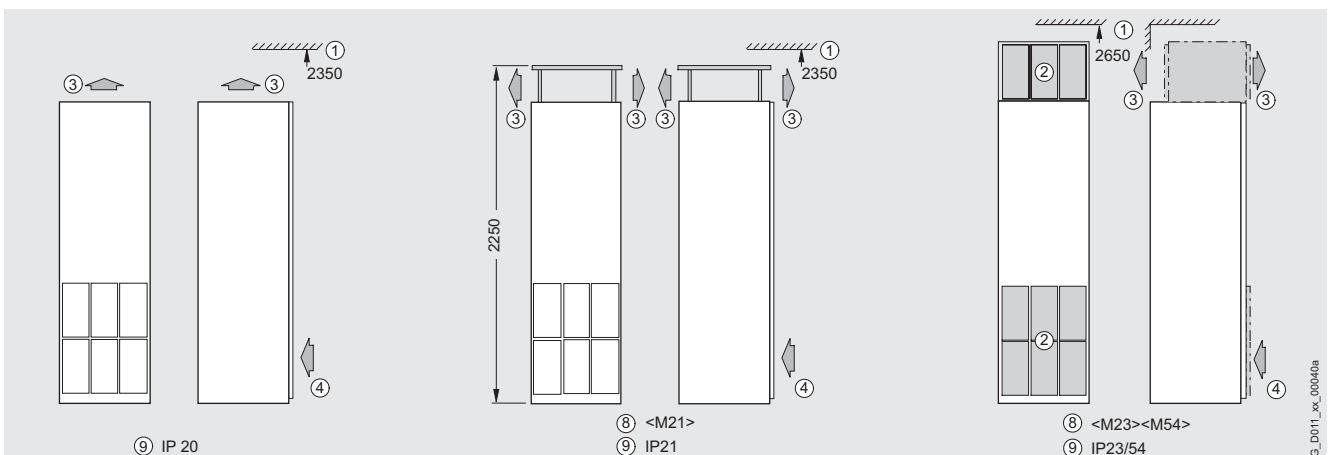


- ① Minimum ceiling height with wall mounting
- ② Ventilation grille
- ③ Air outlet area
- ④ Air inlet area
- ⑤ Cable inlet from below possible within the shaded area
- ⑥ Main control switch (see option **L26**)
- ⑦ Power connection (7a: power supply, 7b: motor)
- ⑧ Option for degrees of protection
- ⑨ Degrees of protection
IP20
IP21 option **M21**
IP23 option **M23**
IP54 option **M54**
- ⑩ Transport unit

Options have a gray background.



Degrees of protection



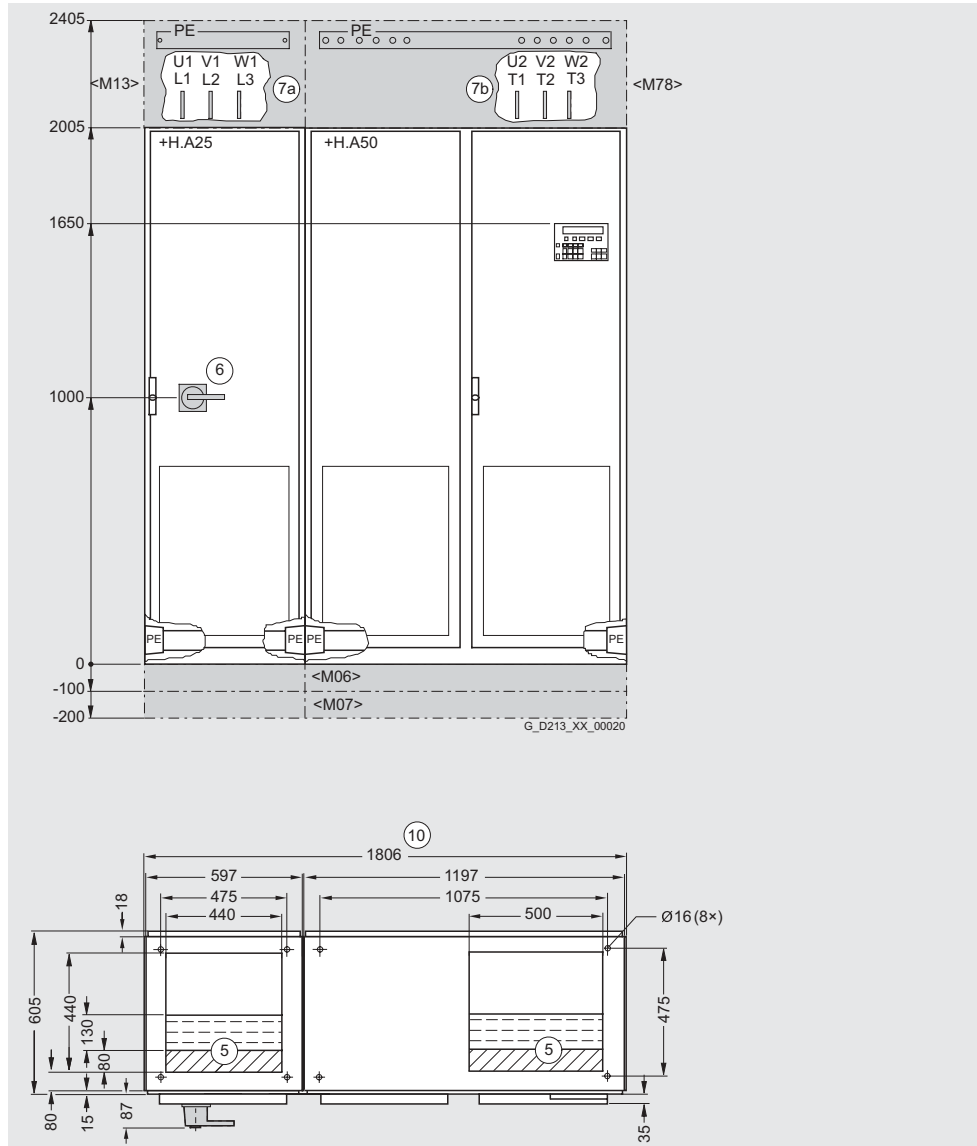
SINAMICS S150 Drive converter cabinet units

75 kW to 1200 kW

Dimension drawings (continued)

380 V to 480 V, 200 kW to 250 kW

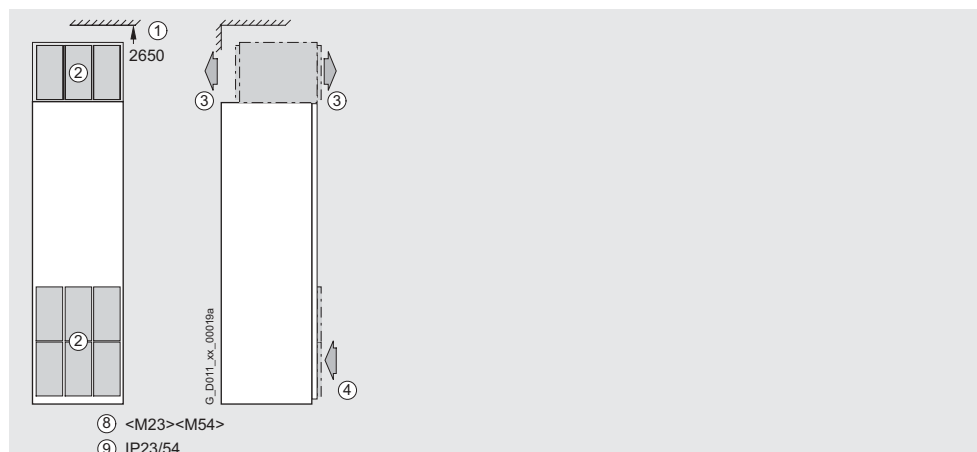
Line connection from above (option **M13**)
Motor connection from above (option **M78**)



- ① Minimum ceiling height with wall mounting
- ② Ventilation grille
- ③ Air outlet area
- ④ Air inlet area
- ⑤ Cable inlet from below possible within the shaded area
- ⑥ Main control switch (see option **L26**)
- ⑦ Power connection (7a: power supply, 7b: motor)
- ⑧ Option for degrees of protection
- ⑨ Degrees of protection IP21
IP23 option **M23**
IP54 option **M54**
- ⑩ Transport unit

Options have a gray background.

Degrees of protection



SINAMICS S150

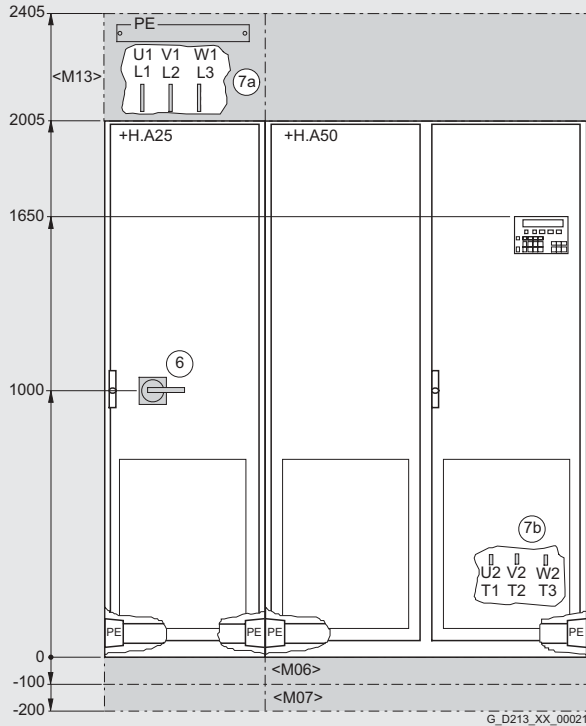
Drive converter cabinet units

75 kW to 1200 kW

Dimension drawings (continued)

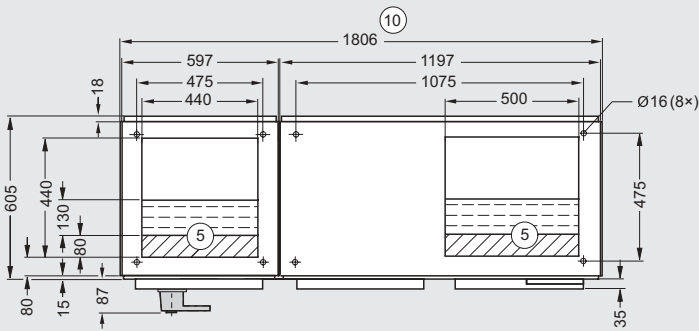
380 V to 480 V, 200 kW to 250 kW

Line connection from above (option **M13**)
Motor connection from below

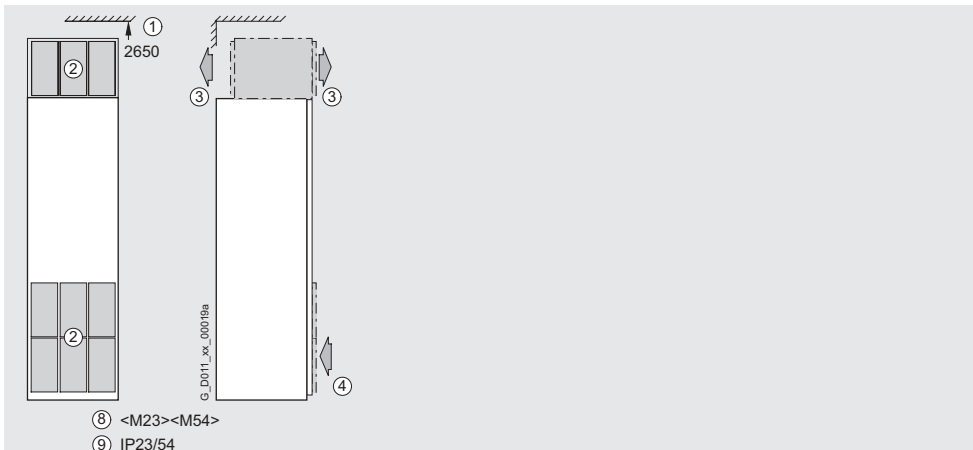


- ① Minimum ceiling height with wall mounting
- ② Ventilation grille
- ③ Air outlet area
- ④ Air inlet area
- ⑤ Cable inlet from below possible within the shaded area
- ⑥ Main control switch (see option **L26**)
- ⑦ Power connection (7a: power supply, 7b: motor)
- ⑧ Option for degrees of protection
- ⑨ Degrees of protection IP21
IP23 option **M23**
IP54 option **M54**
- ⑩ Transport unit

Options have a gray background.



Degrees of protection



SINAMICS S150

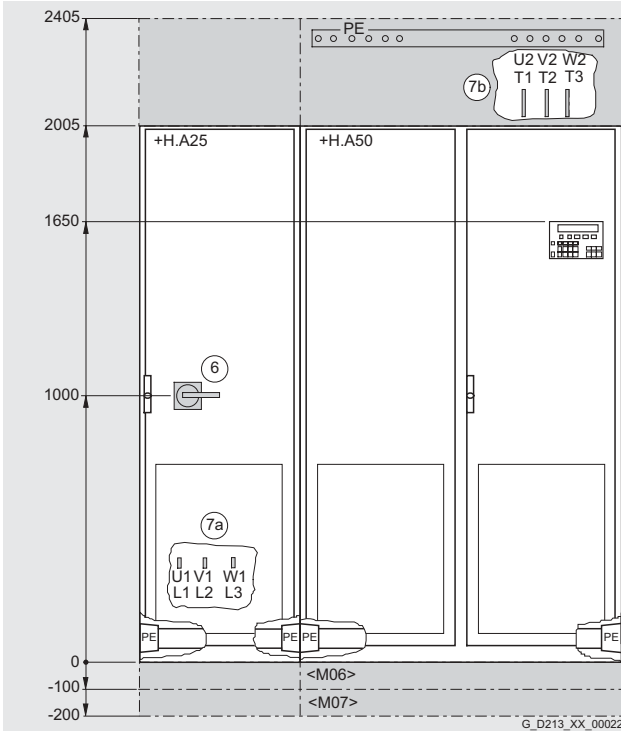
Drive converter cabinet units

75 kW to 1200 kW

Dimension drawings (continued)

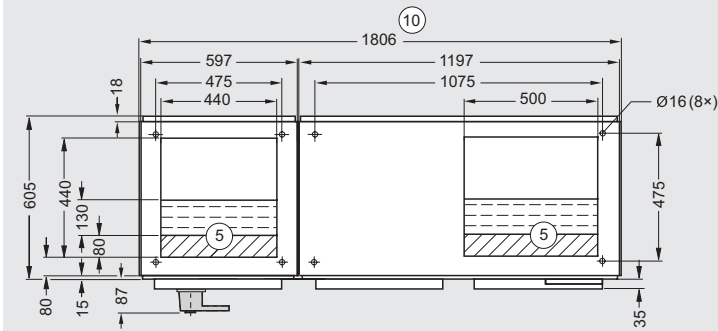
380 V to 480 V, 200 kW to 250 kW

Line connection from below
Motor connection from above (option **M78**)

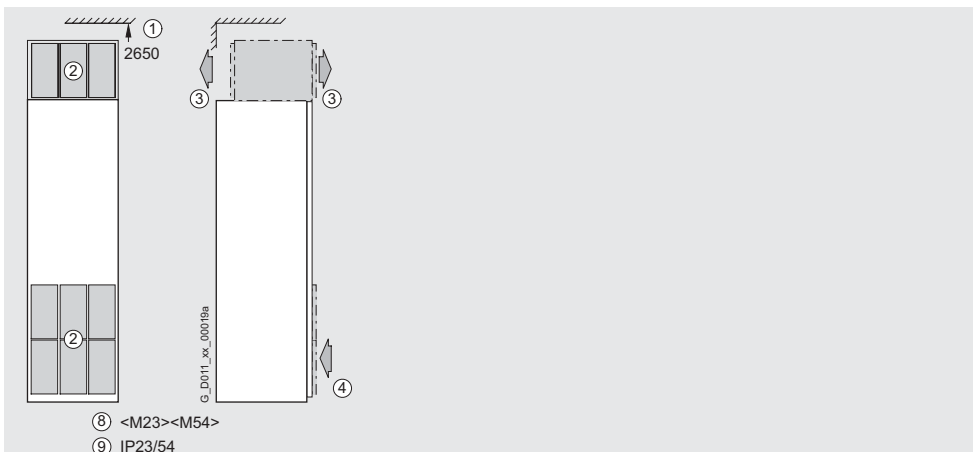


- ① Minimum ceiling height with wall mounting
- ② Ventilation grille
- ③ Air outlet area
- ④ Air inlet area
- ⑤ Cable inlet from below possible within the shaded area
- ⑥ Main control switch (see option **L26**)
- ⑦ Power connection (7a: power supply, 7b: motor)
- ⑧ Option for degrees of protection
- ⑨ Degrees of protection IP21
IP23 option **M23**
IP54 option **M54**
- ⑩ Transport unit

Options have a gray background.



Degrees of protection



SINAMICS S150

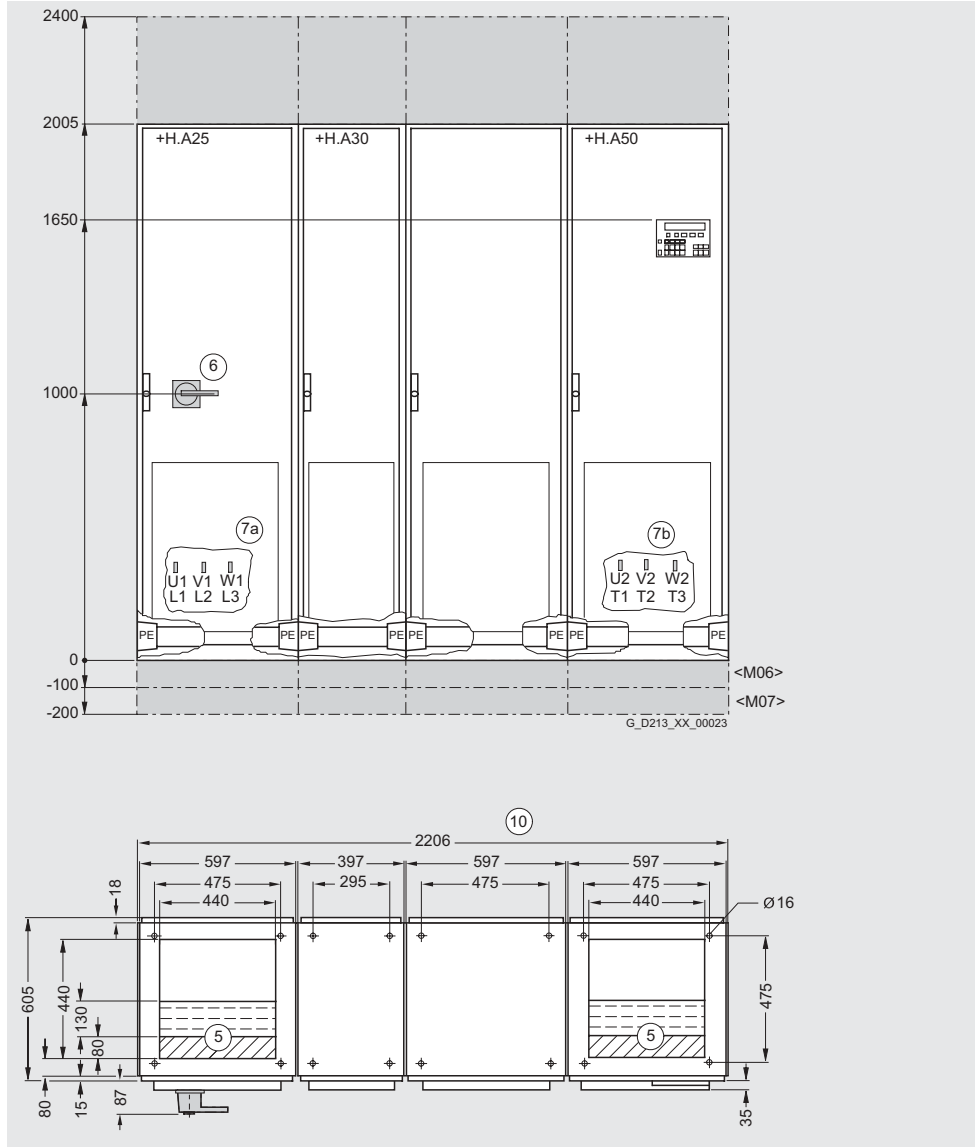
Drive converter cabinet units

75 kW to 1200 kW

Dimension drawings (continued)

380 V to 480 V, 315 kW to 450 kW
660 V to 690 V, 400 kW to 560 kW

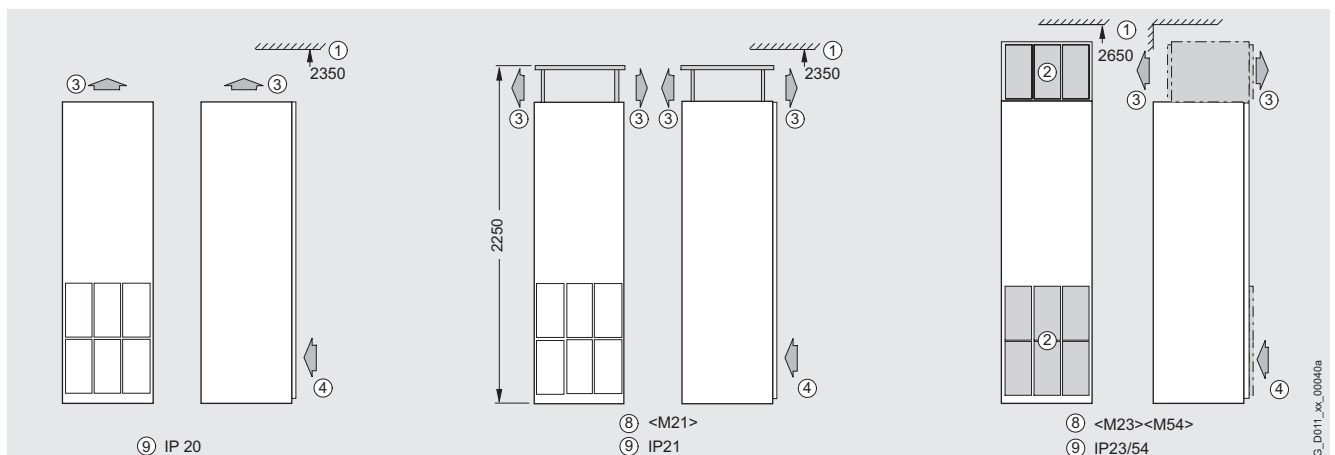
Line connection from below
Motor connection from below



- ① Minimum ceiling height with wall mounting
- ② Ventilation grille
- ③ Air outlet area
- ④ Air inlet area
- ⑤ Cable inlet from below possible within the shaded area
- ⑥ Main control switch (see option **L26**)
- ⑦ Power connection (7a: power supply, 7b: motor)
- ⑧ Option for degrees of protection
- ⑨ Degrees of protection
IP20
IP21 option **M21**
IP23 option **M23**
IP54 option **M54**
- ⑩ Transport unit

Options have a gray background.

Degrees of protection



SINAMICS S150

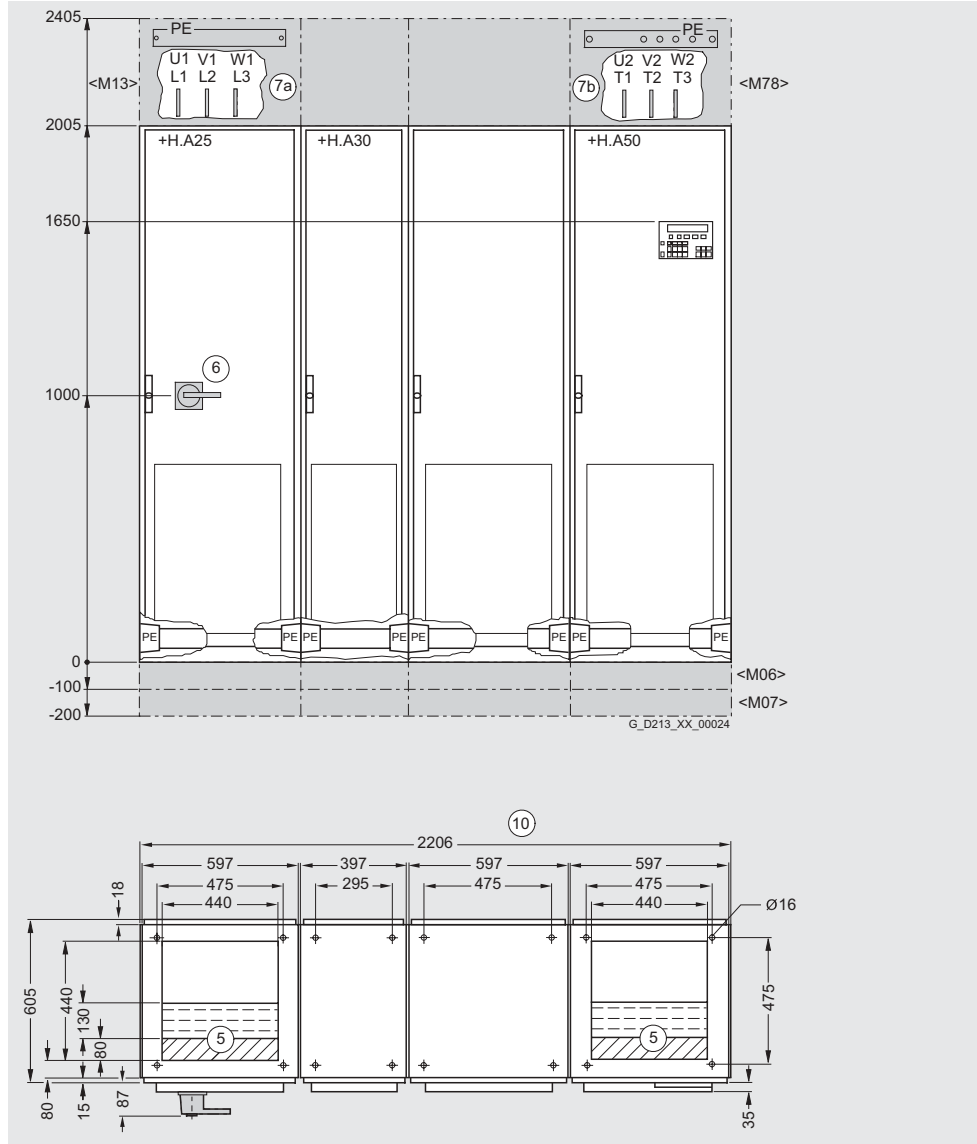
Drive converter cabinet units

75 kW to 1200 kW

Dimension drawings (continued)

380 V to 480 V, 315 kW to 450 kW
660 V to 690 V, 400 kW to 560 kW

Line connection from above (option **M13**)
Motor connection from above (option **M78**)

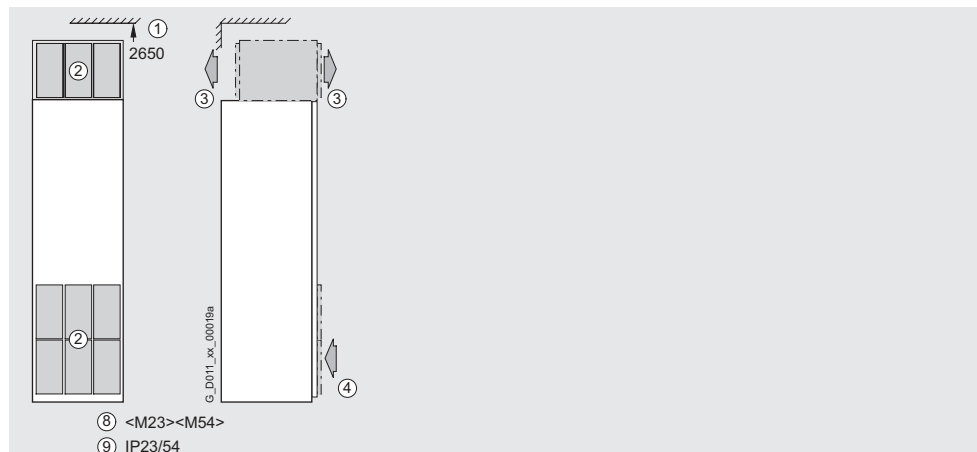


- ① Minimum ceiling height with wall mounting
- ② Ventilation grille
- ③ Air outlet area
- ④ Air inlet area
- ⑤ Cable inlet from below possible within the shaded area
- ⑥ Main control switch (see option **L26**)
- ⑦ Power connection (7a: power supply, 7b: motor)
- ⑧ Option for degrees of protection
- ⑨ Degrees of protection IP21
IP23 option **M23**
IP54 option **M54**
- ⑩ Transport unit

Options have a gray background.

3

Degrees of protection



SINAMICS S150

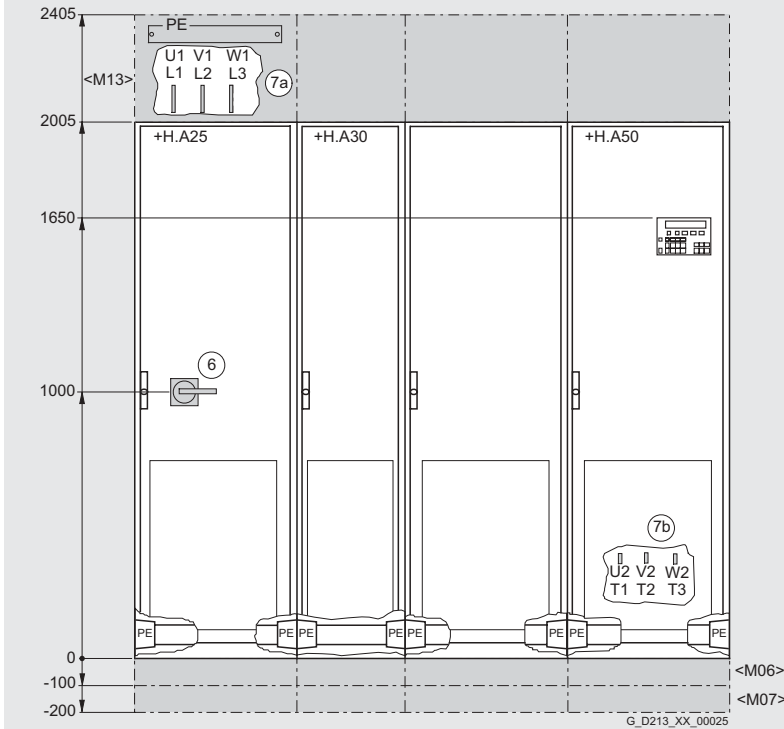
Drive converter cabinet units

75 kW to 1200 kW

Dimension drawings (continued)

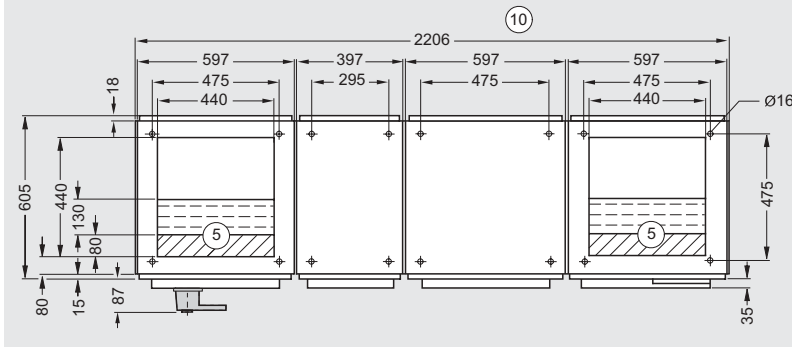
380 V to 480 V, 315 kW to 450 kW
660 V to 690 V, 400 kW to 560 kW

Line connection from above (option **M13**)
Motor connection from below

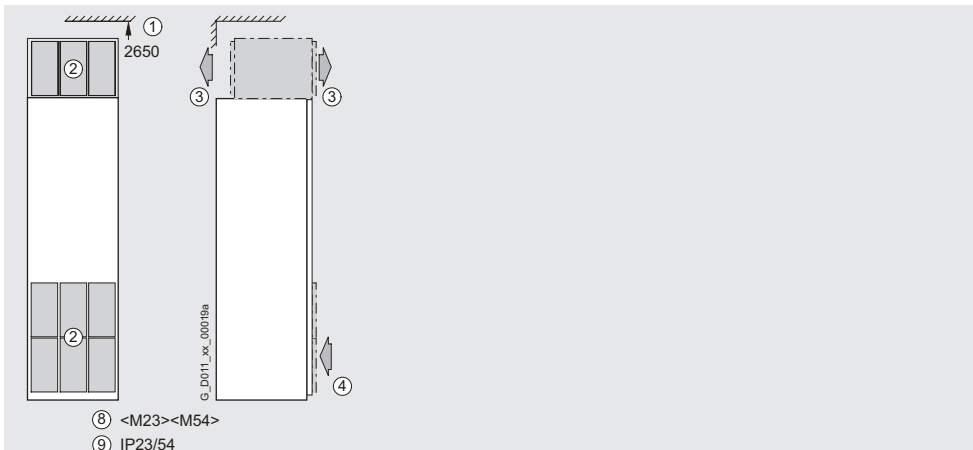


- ① Minimum ceiling height with wall mounting
- ② Ventilation grille
- ③ Air outlet area
- ④ Air inlet area
- ⑤ Cable inlet from below possible within the shaded area
- ⑥ Main control switch (see option **L26**)
- ⑦ Power connection (7a: power supply, 7b: motor)
- ⑧ Option for degrees of protection
- ⑨ Degrees of protection IP21
IP23 option **M23**
IP54 option **M54**
- ⑩ Transport unit

Options have a gray background.



Degrees of protection



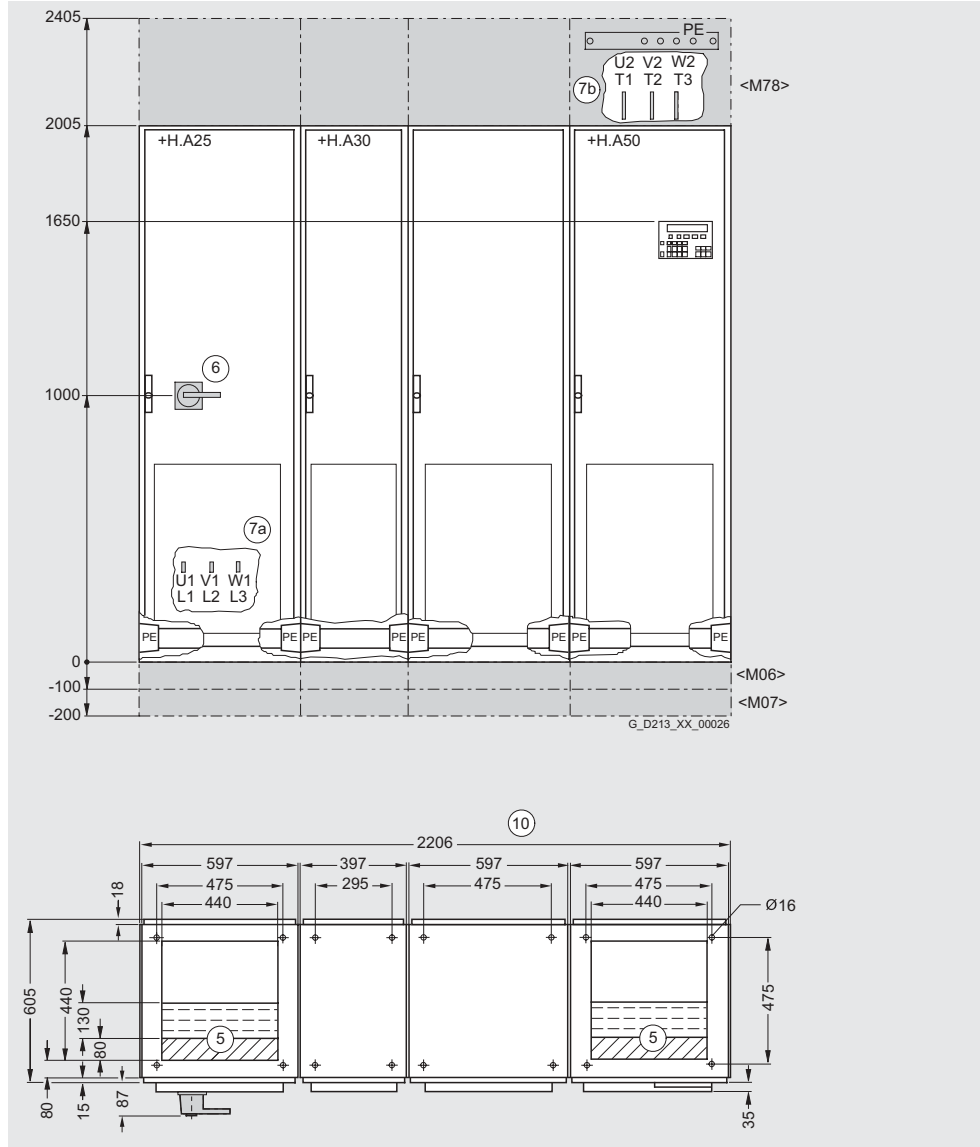
SINAMICS S150 Drive converter cabinet units

75 kW to 1200 kW

Dimension drawings (continued)

380 V to 480 V, 315 kW to 450 kW
660 V to 690 V, 400 kW to 560 kW

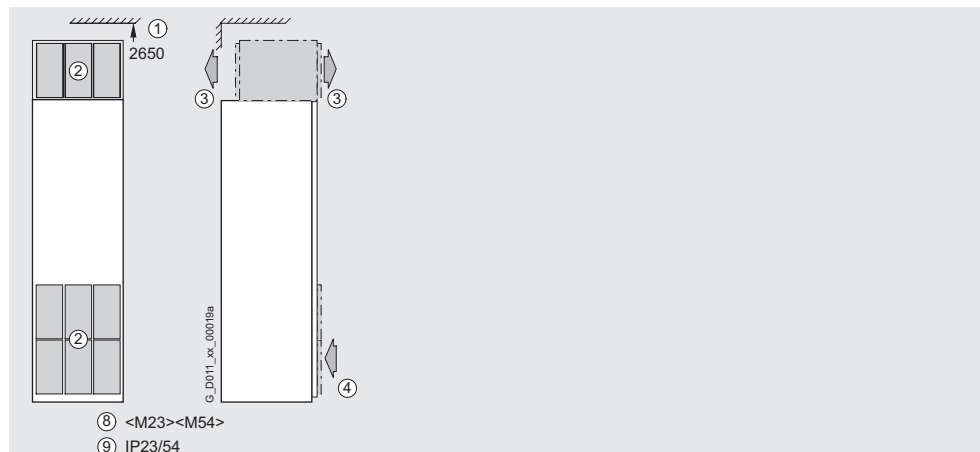
Line connection from below
Motor connection from above (option **M78**)



- ① Minimum ceiling height with wall mounting
- ② Ventilation grille
- ③ Air outlet area
- ④ Air inlet area
- ⑤ Cable inlet from below possible within the shaded area
- ⑥ Main control switch (see option **L26**)
- ⑦ Power connection (7a: power supply, 7b: motor)
- ⑧ Option for degrees of protection
- ⑨ Degrees of protection IP21
IP23 option **M23**
IP54 option **M54**
- ⑩ Transport unit

Options have a gray background.

Degrees of protection



SINAMICS S150

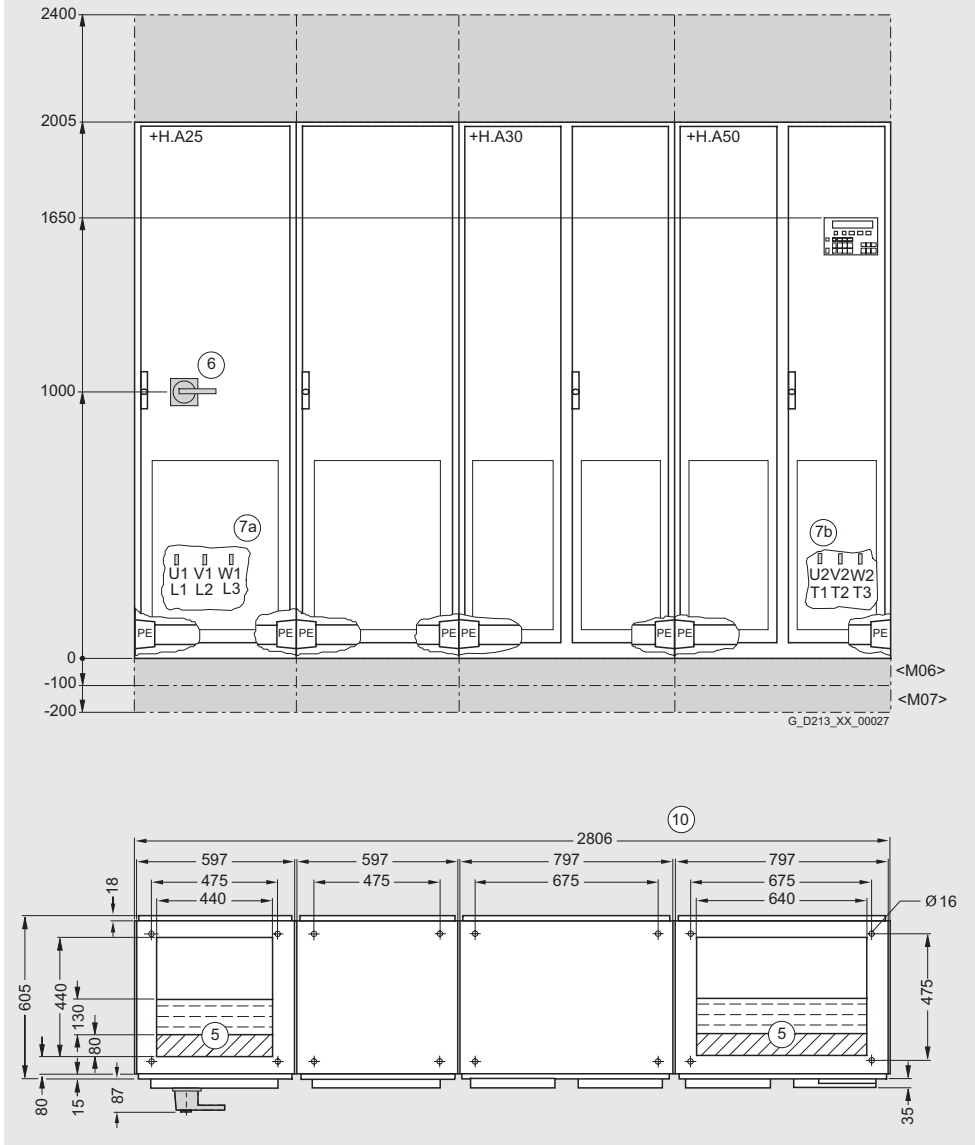
Drive converter cabinet units

75 kW to 1200 kW

Dimension drawings (continued)

380 V to 480 V, 560 kW to 800 kW
660 V to 690 V, 710 kW to 1200 kW

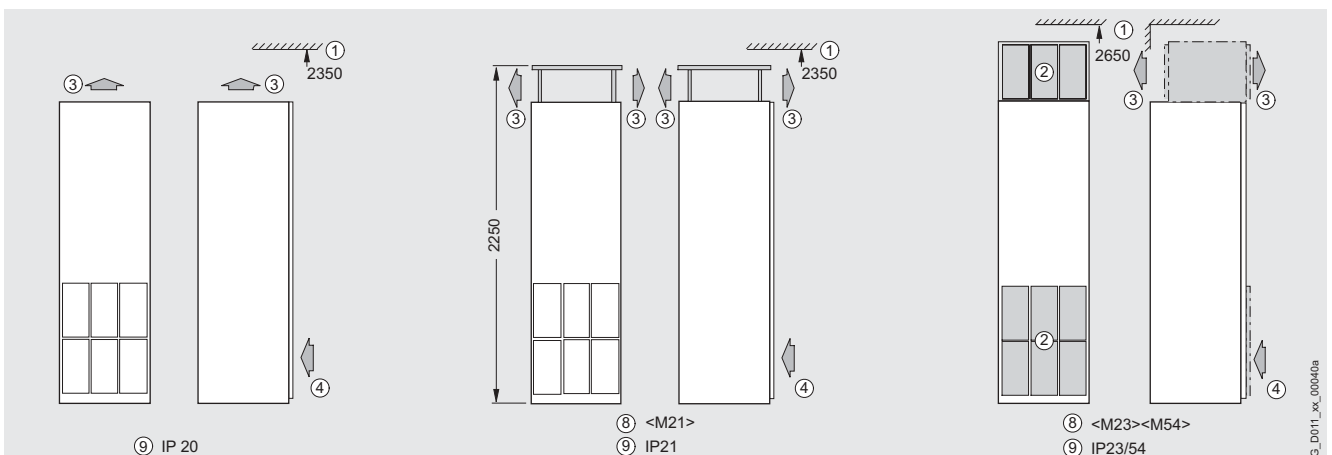
Line connection from below
Motor connection from below



- ① Minimum ceiling height with wall mounting
- ② Ventilation grille
- ③ Air outlet area
- ④ Air inlet area
- ⑤ Cable inlet from below possible within the shaded area
- ⑥ Main control switch (see option **L26**)
- ⑦ Power connection (7a: power supply, 7b: motor)
- ⑧ Option for degrees of protection
- ⑨ Degrees of protection
IP20
IP21 option **M21**
IP23 option **M23**
IP54 option **M54**
- ⑩ Transport unit

Options have a gray background.

Degrees of protection



G_D011_XX_00040a

SINAMICS S150

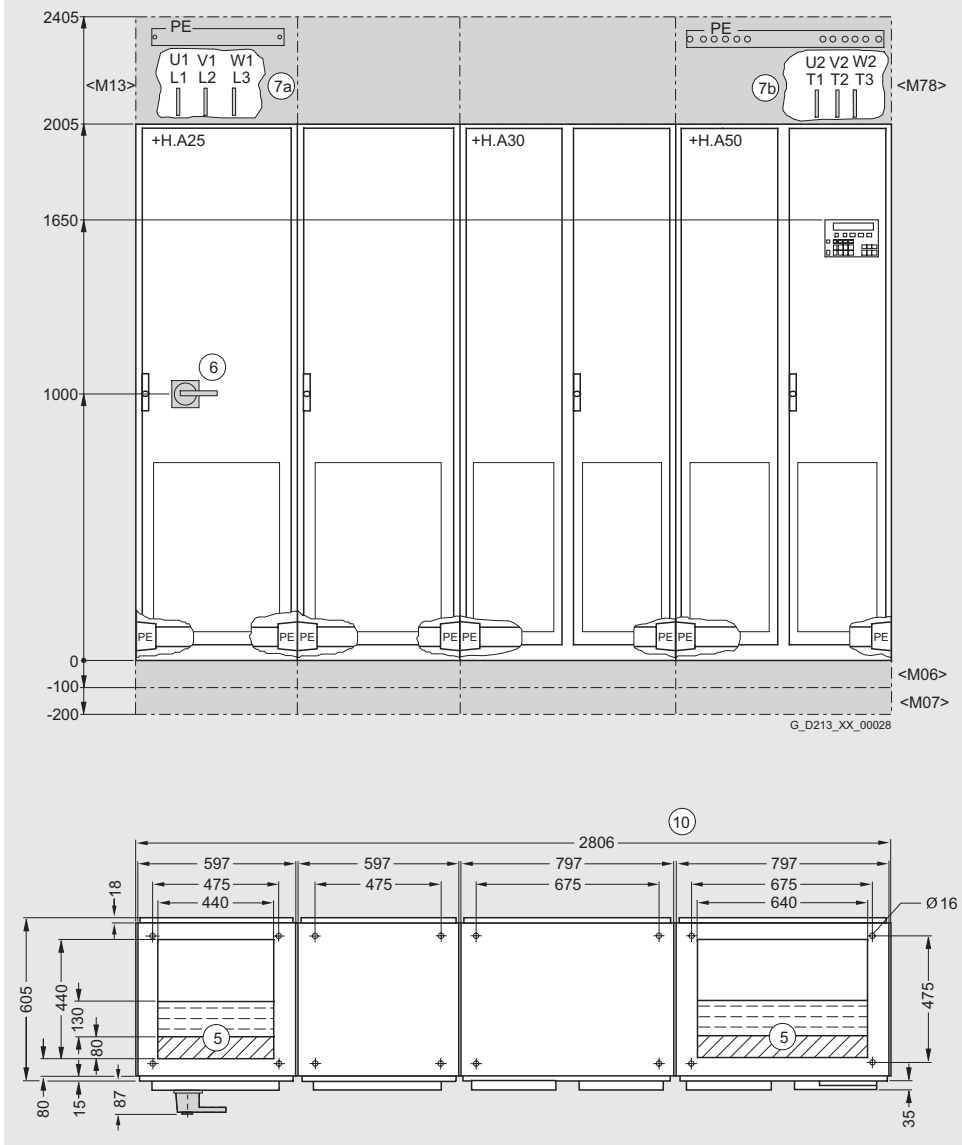
Drive converter cabinet units

75 kW to 1200 kW

Dimension drawings (continued)

380 V to 480 V, 560 kW to 800 kW
660 V to 690 V, 710 kW to 1200 kW

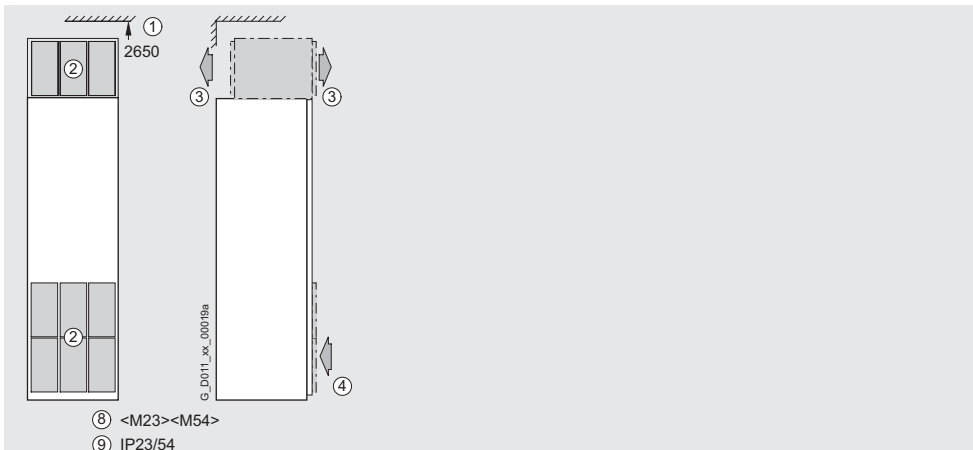
Line connection from above (option **M13**)
Motor connection from above (option **M78**)



- ① Minimum ceiling height with wall mounting
- ② Ventilation grille
- ③ Air outlet area
- ④ Air inlet area
- ⑤ Cable inlet from below possible within the shaded area
- ⑥ Main control switch (see option **L26**)
- ⑦ Power connection (7a: power supply, 7b: motor)
- ⑧ Option for degrees of protection
- ⑨ Degrees of protection IP21
IP23 option **M23**
IP54 option **M54**
- ⑩ Transport unit

Options have a gray background.

Degrees of protection



SINAMICS S150

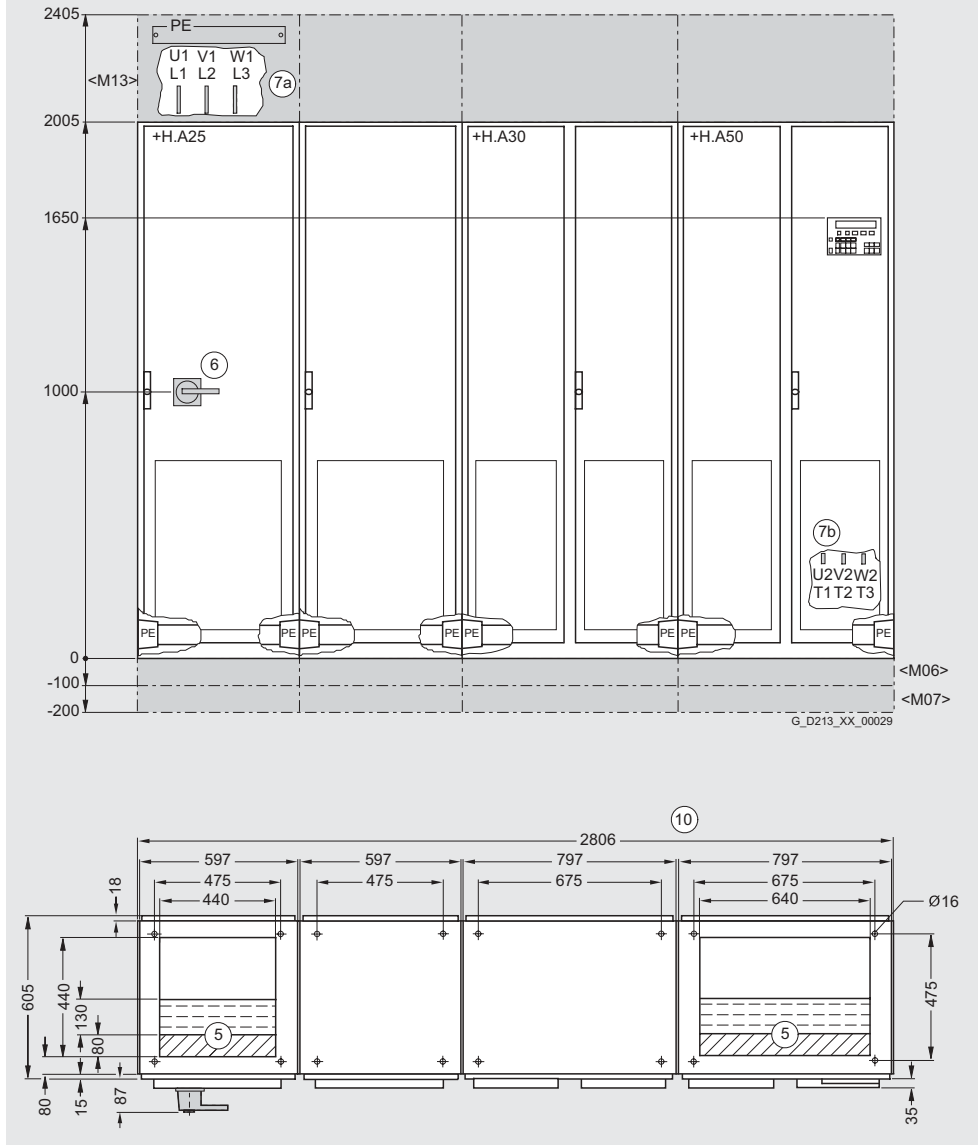
Drive converter cabinet units

75 kW to 1200 kW

Dimension drawings (continued)

380 V to 480 V, 560 kW to 800 kW
660 V to 690 V, 710 kW to 1200 kW

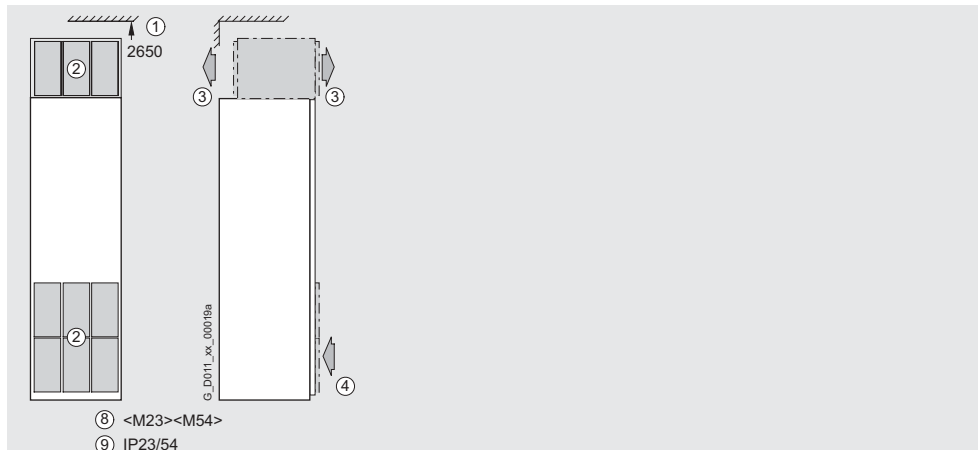
Line connection from above (option **M13**)
Motor connection from below



- ① Minimum ceiling height with wall mounting
- ② Ventilation grille
- ③ Air outlet area
- ④ Air inlet area
- ⑤ Cable inlet from below possible within the shaded area
- ⑥ Main control switch (see option **L26**)
- ⑦ Power connection (7a: power supply, 7b: motor)
- ⑧ Option for degrees of protection
- ⑨ Degrees of protection IP21
IP23 option **M23**
IP54 option **M54**
- ⑩ Transport unit

Options have a gray background.

Degrees of protection



- ⑧ <M23><M54>
- ⑨ IP23/54

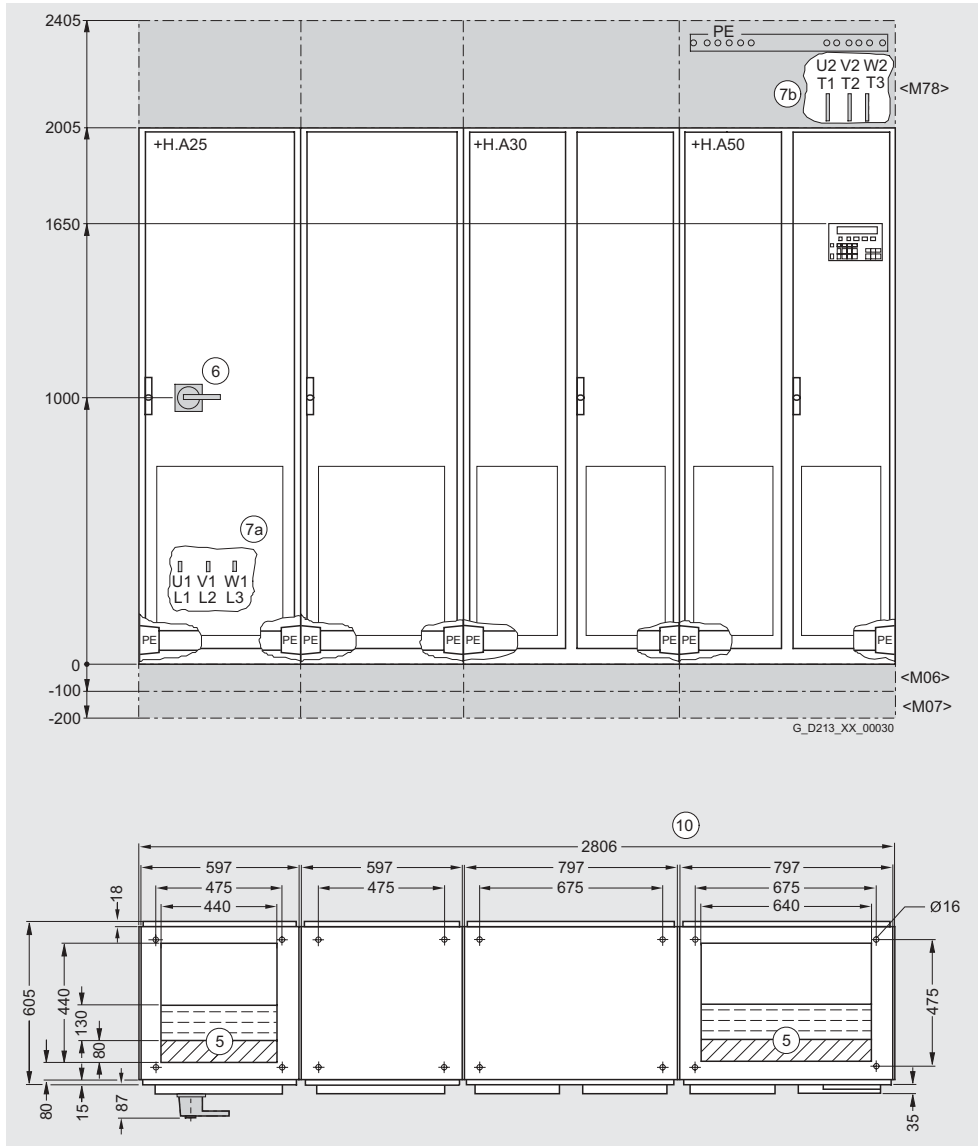
SINAMICS S150 Drive converter cabinet units

75 kW to 1200 kW

Dimension drawings (continued)

380 V to 480 V, 560 kW to 800 kW
660 V to 690 V, 710 kW to 1200 kW

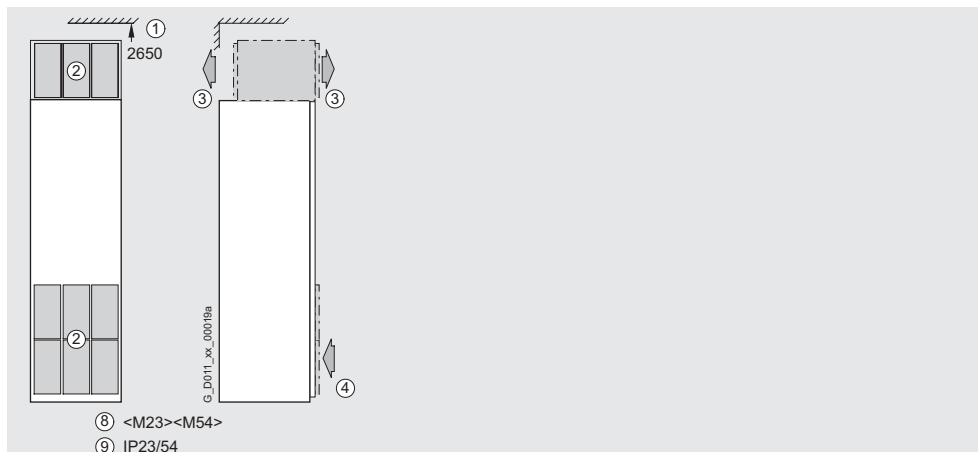
Line connection from below
Motor connection from above (option **M78**)



- ① Minimum ceiling height with wall mounting
- ② Ventilation grille
- ③ Air outlet area
- ④ Air inlet area
- ⑤ Cable inlet from below possible within the shaded area
- ⑥ Main control switch (see option **L26**)
- ⑦ Power connection (7a: power supply, 7b: motor)
- ⑧ Option for degrees of protection
- ⑨ Degrees of protection IP21
IP23 option **M23**
IP54 option **M54**
- ⑩ Transport unit

Options have a gray background.

Degrees of protection



SINAMICS S150

Drive converter cabinet units

75 kW to 1200 kW

Mechanical connection data

The following table shows the recommended or maximum permissible supply system and motor cable connections.

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

In the case of different conditions (cable routing, bundling of cables, ambient temperature), the engineering information for cable routing must be taken into account.

Output		Converter	Wght. (standard version) kg	Line connection					Motor connection					Cabinet earthing	
at 400 V or 690 V	at 460 V (60 Hz)			Recommended cross-section		Maximum conductor cross-section		Mounting screw M12	Recommended cross-section		Maximum conductor cross-section		Mounting screw M12	Mounting screw M12	Remarks
kW	hp	Type	DIN VDE mm ²	AWG/MCM	DIN VDE mm ²	AWG/MCM	(No. of holes)	DIN VDE mm ²	AWG/MCM	DIN VDE mm ²	AWG/MCM	(No. of holes)	(No. of holes)		
380 V to 480 V															
110	150	-7LE32-1AA0	708	2x70	2x(000)	4x240	4x600	(2)	2x70	2x(000)	2x150	2x(400)	(2)	(2)	
132	200	-7LE32-6AA0	708	2x95	2x(4/0)	4x240	4x600	(2)	2x95	2x(4/0)	2x150	2x(400)	(2)	(2)	
160	250	-7LE33-1AA0	892	2x120	2x(300)	4x240	4x600	(2)	2x120	2x(300)	2x150	2x(400)	(2)	(2)	
200	300	-7LE33-8AA0	980	2x120	2x(300)	4x240	4x600	(2)	2x120	2x(300)	2x150	2x(400)	(2)	(2)	
250	400	-7LE35-0AA0	980	2x185	2x(500)	4x240	4x600	(2)	2x185	2x(500)	2x240	2x600	(2)	(2)	
315	500	-7LE36-1AA0	1716	2x240	2x(600)	4x240	4x600	(2)	2x240	2x600	4x240	4x600	(2)	(2)	
400	600	-7LE37-5AA0	1731	2x300	2x(800)	4x240	4x600	(2)	2x300	2x(800)	4x240	4x600	(2)	(10) Cu rail	
450	700	-7LE38-4AA0	1778	4x150	4x(400)	8x240	8x600	(4)	4x150	4x(400)	4x240	4x600	(2)	(16) Cu rail	
560	800	-7LE41-0AA0	2408	4x185	4x(500)	8x240	8x600	(4)	4x185	4x(500)	6x240	6x600	(3)	(18) Cu rail	
710	900	-7LE41-2AA0	2408	4x240	4x600	8x240	8x600	(4)	4x240	4x600	6x240	6x600	(3)	(18) Cu rail	
800	1000	-7LE41-4AA0	2408	6x185	6x(500)	8x240	8x600	(4)	6x185	6x(500)	6x240	6x600	(3)	(18) Cu rail	
660 V to 690 V															
75	-	-7LH28-5AA0	708	50	(00)	4x240	4x600	(2)	50	(00)	2x70	2x(000)	(2)	(2)	
90	-	-7LH31-0AA0	708	50	(00)	4x240	4x600	(2)	50	(00)	2x150	2x(400)	(2)	(2)	
110	-	-7LH31-2AA0	708	70	(000)	4x240	4x600	(2)	70	(000)	2x150	2x(400)	(2)	(2)	
132	-	-7LH31-5AA0	708	95	(4/0)	4x240	4x600	(2)	95	(4/0)	2x150	2x(400)	(2)	(2)	
160	-	-7LH31-8AA0	892	120	(300)	4x240	4x600	(2)	120	(300)	2x150	2x(400)	(2)	(2)	
200	-	-7LH32-2AA0	892	2x70	2x(000)	4x240	4x600	(2)	2x70	2x(000)	2x150	2x(400)	(2)	(2)	
250	-	-7LH32-6AA0	892	2x95	2x(4/0)	4x240	4x600	(2)	2x95	2x(4/0)	2x185	2x(500)	(2)	(2)	
315	-	-7LH33-3AA0	892	2x120	2x(300)	4x240	4x600	(2)	2x120	2x(300)	2x240	2x(600)	(2)	(2)	
400	-	-7LH34-1AA0	1716	2x185	2x(500)	4x240	4x600	(2)	2x185	2x(500)	4x240	4x600	(2)	(2)	
450	-	-7LH34-7AA0	1716	2x185	2x(500)	4x240	4x600	(2)	2x185	2x(500)	4x240	4x600	(2)	(2)	
560	-	-7LH35-8AA0	1716	2x240	2x(600)	4x240	4x600	(2)	2x240	2x(600)	4x240	4x600	(2)	(2)	
710	-	-7LH37-4AA0	2300	3x185	3x(500)	8x240	8x600	(4)	3x185	3x(500)	6x240	6x600	(3)	(18) Cu rail	
800	-	-7LH38-1AA0	2408	4x150	4x(400)	8x240	8x600	(4)	4x150	4x(400)	6x240	6x600	(3)	(18) Cu rail	
900	-	-7LH38-8AA0	2408	4x150	4x(400)	8x240	8x600	(4)	4x150	4x(400)	6x240	6x600	(3)	(18) Cu rail	
1000	-	-7LH41-0AA0	2408	4x185	4x(500)	8x240	8x600	(4)	4x185	4x(500)	6x240	6x600	(3)	(18) Cu rail	
1200	-	-7LH41-3AA0	2408	4x240	4x600	8x240	8x600	(4)	4x240	4x600	6x240	6x600	(3)	(18) Cu rail	



SINAMICS

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SINAMICS S150

Drive converter cabinet units

Customer's terminal block

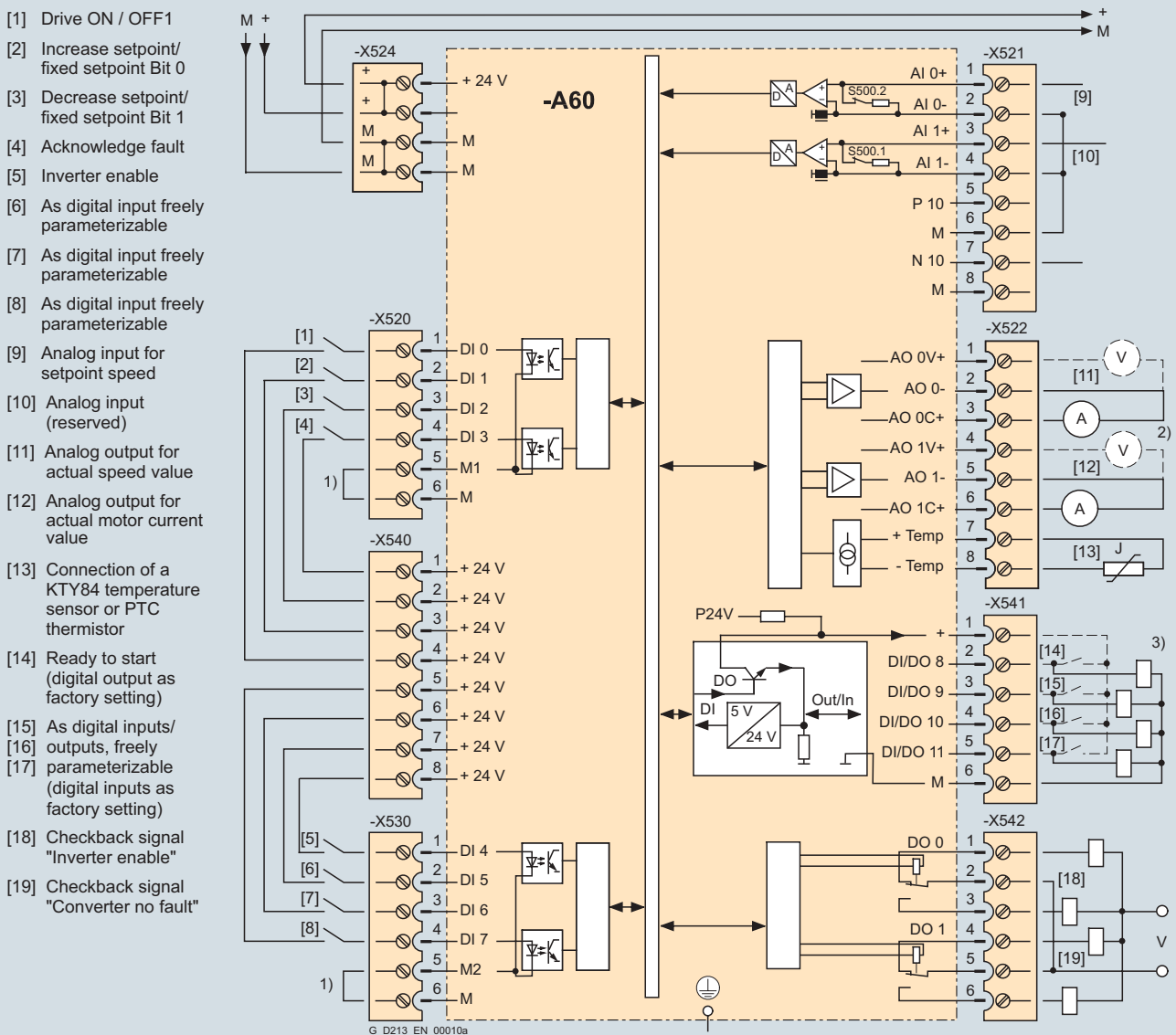
Engineering information

A PROFIBUS interface on the control unit and the customer's terminal block are available as standard interfaces to the controller on the customer side.

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

The customer's terminal block contains:

- 8 digital inputs (DI)
- 4 bidirectional inputs/outputs (DI/DO)
- 2 analog inputs (differential) (AI)
- 2 analog outputs (AO)
- 2 relay outputs (changeover contact) (DO)
- 1 input for KTY84 temperature sensor or PTC thermistor
- Auxiliary voltage output ± 10 V for analog setpoint input
- Auxiliary voltage output +24 V for digital inputs



- [1] Drive ON / OFF1
- [2] Increase setpoint/ fixed setpoint Bit 0
- [3] Decrease setpoint/ fixed setpoint Bit 1
- [4] Acknowledge fault
- [5] Inverter enable
- [6] As digital input freely parameterizable
- [7] As digital input freely parameterizable
- [8] As digital input freely parameterizable
- [9] Analog input for setpoint speed
- [10] Analog input (reserved)
- [11] Analog output for actual speed value
- [12] Analog output for actual motor current value
- [13] Connection of a KTY84 temperature sensor or PTC thermistor
- [14] Ready to start (digital output as factory setting)
- [15] As digital inputs/ outputs, freely parameterizable (digital inputs as factory setting)
- [16] As digital inputs/ outputs, freely parameterizable (digital inputs as factory setting)
- [17] As digital inputs/ outputs, freely parameterizable (digital inputs as factory setting)
- [18] Checkback signal "Inverter enable"
- [19] Checkback signal "Converter no fault"

- 1) The jumpers must be inserted for this circuit example (M: ground, internal; M1 or M2: external)
- 2) Parameterizable as current or voltage source
- 3) Parameterizable individually as digital input/digital output (factory setting: set as output by default)

Customer's Terminal Block

Engineering information (continued)

Customer's terminal block according to factory setting

Terminal	No.	Type	Factory setting	Remarks
X540: 1-8	P24	24 V DC supply voltage for inputs DI0 to DI7 and DI/DO8 to DI/DO11		
X520: 1	DI0	Digital input electrically isolated via opto-coupler	On/Off 1	Inputs are freely parameterizable
X520: 2	DI1		Increase setpoint/fix setpoint bit 0	
X520: 3	DI2		Decrease setpoint/fix setpoint bit 1	
X520: 4	DI3		Acknowledge fault	
X520: 5	M1	Reference ground for digital inputs DI0 to DI3		
X520: 6	M	Reference ground for P24 Auxiliary voltage for the digital inputs		
X530: 1	DI4	Digital input electrically isolated via opto-coupler	Enable inverter	Converter is at standby and is waiting for enabling
X530: 2	DI5			Inputs are freely parameterizable
X530: 3	DI6			
X530: 4	DI7			
X530: 5	M2	Reference ground for digital inputs DI4 to DI7		
X530: 6	M	Reference ground for P24 auxiliary voltage for the digital inputs		
X541: 1	P24			
X541: 2	DI/DO8	Digital inputs/digital outputs non-floating	Ready for switching on (preset as digital output)	Inputs/outputs are freely parameterizable
X541: 3	DI/DO9			Preset as input
X541: 4	DI/DO10			Preset as input
X541: 5	DI/DO11			Preset as input
X541: 6	M	Reference ground of P24 and ground of digital inputs/digital outputs		
X521: 1	AI 0 +	Analog inputs designed as differential inputs for following ranges: -10 V to +10 V +4 mA to +20 mA	Default setting for speed setpoint 0 mA to 20 mA	Positive differential input for voltage/current
X521: 2	AI 0 -			Negative differential input for voltage/current
X521: 3	AI 1 +	-20 mA to +20 mA 0 mA to +20 mA	Reserved	Positive differential input for voltage/current
X521: 4	AI 1 -			Negative differential input for voltage/current
X521: 5	P10	±10 V auxiliary voltage (10 mA) for connecting a potentiometer for input of the setpoint via an analog input		+10 V
X521: 6	M			Reference ground for ±10 V
X521: 7	N10			-10 V
X521: 8	M			Reference ground for ±10 V
X522: 1	AO 0V+	Analog outputs for following ranges: -10 V to +10 V +4 mA to +20 mA -20 mA to +20 mA 0 mA to +20 mA	Speed actual value	Analog output voltage +
X522: 2	AO 0 Ref		Default setting 0 mA to 20 mA	Common reference point for voltage/current
X522: 3	AO 0A+			Analog output current +
X522: 4	AO 1V+		Motor current actual value	Analog output voltage +
X522: 5	AO 1 Ref		Default setting 0 mA to 20 mA	Common reference point for voltage/current
X522: 6	AO 1A+			Analog output current +
X522: 7	KTY+	Temperature sensor KTY84 (0 °C to 200 °C) or PTC ($R_{cold} \leq 1.5 \text{ k}\Omega$)		The sensor type must be programmed
X522: 8	KTY-			
X542: 1	DO 0.NC	Relay output (changeover contact)	Checkback: enable inverter	NC contact
X542: 2	DO 0.COM	Max. switching voltage: AC 250 V, DC 30 V		Root
X542: 3	DO 0.NO	Max. switching capacity at AC 250 V: 2000 VA Max. switching capacity at DC 30 V: 240 W		NO contact
X542: 4	DO 1.NC	Relay output (changeover contact)	Checkback: no fault converter	NC contact
X542: 5	DO 1.COM	Max. switching voltage: AC 250 V, DC 30 V		Root
X542: 6	DO 1.NO	Max. switching capacity at AC 250 V: 2000 VA Max. switching capacity at DC 30 V: 240 W		NO contact

SINAMICS S150

Drive converter cabinet units

Dimensioning and selection information

Engineering information (continued)

Rated data and continuous operation of the converters

The SINAMICS S150 drive converter cabinet units are designed for continuous motor-driven/generator-driven operation at the rated voltages and ambient conditions specified in the technical data. Variations in the supply voltages within the tolerances (see technical data) are already taken into account here. The rated output current of the converters is dimensioned according to the rated current of standard six-pole motors from Siemens. Supply voltages of 50 Hz 400 V or 690 V, as well as 60 Hz 460 V, are used for the NEMA market.

The currents listed in the selection and ordering data are available in the complete frequency/speed adjustment range.

If the rated output current listed for the drive converter cabinet units is exceeded for a longer period of time (> 60 s), the thermal monitoring function of the converter is triggered and leads either to switching off or to automatic influencing of the controller (pulse frequency or output current if applicable) so that the thermal loading of the converter is reduced.

Degrees of protection of the drive converter cabinet units

The EN 60 529 standard covers the protection of electrical equipment by means of housings, covers or equivalent, and includes:

- Protection of persons against accidental contact with live or moving parts within the housing and protection of the equipment against the penetration of solid foreign matter (protection against accidental contact and solid matter).
- Protection of the equipment against the penetration of water (water protection)
- Abbreviations for the internationally agreed degrees of protection.

The degrees of protection are specified by abbreviations comprising the code letters IP and two digits.

Degree of protection of the drive converter cabinet unit	First digit (protection against accidental contact and solid matter)	Second digit (protection of the equipment against the penetration of water)
IP20	Protected against solid matter Diameter \geq 12.5 mm	No water protection
IP21	Protected against solid matter Diameter \geq 12.5 mm	Protected against splashing drip water Vertically falling drip water must not have a harmful effect
IP23	Protected against solid matter Diameter \geq 12.5 mm	Protected against spray water Water sprayed on both sides of the vertical at an angle of up to 60° must not have a harmful effect
IP54	Dust protected. Ingress 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 splashing water Water from a hose which is directed on the enclosure must not have a harmful effect.

EMERGENCY STOP functions

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

They are defined as follows:

- **Stop of category 0:**
Uncontrolled shutdown by immediate switching-off of power supply, motor coasts. This corresponds to immediate stopping of the inverter, in association with intrinsically-safe disconnection of the main contactors or - with higher ratings - of the circuit-breaker.
- **Stop of category 1:**
Controlled shutdown, where the power supply is retained until standstill is reached. This permits implementation of rapid stopping, in association with intrinsically-safe disconnection of the main contactors or the circuit-breaker.

Engineering information (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 IP54 degree of protection or better can be achieved for the motor terminal box without any problems because the cables are introduced into the terminal box via screwed glands and the number of possible glands is limited by the geometry of the terminal box. Single cables are less suitable.
- With three-phase cables, the summed ampere-turns over the cable outer diameter is equal to zero and they can be routed in (conductive, metal) cable ducts or racks without any noticeable currents (earth current or leakage current) being induced in these conductive, metal connections. The danger of induced leakage currents and thus of increased cable sheath losses is greater for single cables.

The cable cross-section required depends on the current transmitted in the cable. The permissible current load on cables is defined e.g. in DIN VDE 0298 Part 2/DIN VDE 0276-1000. It depends on the one hand on ambient conditions such as temperature and on the other hand on the type of routing with single cables providing relatively good cooling and common routing of cables resulting in mutual heating and much poorer ventilation. In this context, please refer to the applicable reduction factors for these boundary conditions in DIN VDE 0298 Part 2/DIN VDE 0276-1000. With an ambient temperature of 40 °C, the cross-sections of copper cables can be based on the following table.

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

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

With higher currents, cables must be connected in parallel.

SINAMICS S150

Drive converter cabinet units

Information on drive dimensioning

Engineering information (continued)

Drives with quadratic load torque

Drives with a quadratic load torque ($M \sim n^2$), such as pumps and ventilators, 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 Siemens motors, these motors can also be loaded with the full rated power even in converter mode. They are then utilized to full advantage according to temperature class F. However, if the motors may only be used to full advantage according to temperature class B, the power for the motors must be reduced by 10%.

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

Drives with constant load torque

The 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 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 output remains constant. Especially in the control modes with V/f characteristic, a sufficient interval of $\geq 30\%$ from the breakdown torque must be observed, which is reduced by $(f_n/f)^2$.

The basic load current of the converter should be selected at least as large as the motor current at full torque in the required load point.

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

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

Rated motor current greater than rated converter current:

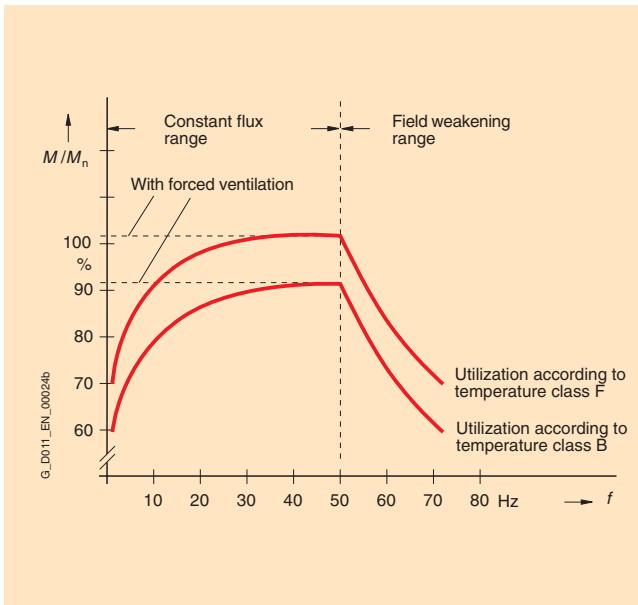
If a motor is to be used whose rated current is greater than the rated converter current, this means that the motor can only be operated at partial load. The following limit must be observed:

The maximum possible converter current (overload current = $1.5 \times I_L$) should be greater than or equal to the rated current of the connected motor.

If this dimensioning instruction is not observed, current peaks which may lead to switching-off 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 $\frac{1}{4}$ of the rated converter current. With smaller motor currents, operation using the V/f control mode is possible.



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

Engineering information (continued)

1LA and 1LG motors

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.

Detailed motor data can be found in 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 asynchronous motors are self-ventilated motors with IP55 degree of protection.

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

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

Other motors

In addition to the 1LA and 1LG motors, it is also possible to use the 1PH7/1PL6 compact asynchronous motors in the voltage range up to 415 V. These are recommended for:

- Wide speed range with high maximum speed
- 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.

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

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

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. 1LA8315-2PM).

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

Motor protection

A motor protection function can be implemented using the I^2t detection present in the converter software. More exact temperature detection, which also takes into account the influence of the ambient temperature, is possible using direct temperature detection with KTY84 sensors or PTC thermistors in the motor winding.

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

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

Evaluation of the KTY84 sensors and PTC thermistors is possible by connection to the customer's terminal block in the drive converter cabinet unit.

PT100 temperature sensors (resistance thermometers) are alternatively possible for the 1LA8 and 1LG4/1LG6 motors for monitoring the winding temperature.

When ordering the motor, either the option **A60** (3 x PT100) or **A61** (6 x PT100) must be selected.

An evaluation unit is available as option **L86** for evaluation of the PT100 temperature sensors in the drive converter cabinet unit.

With 1MJ flameproof motors, the PTC thermistors and release mechanisms (options **L83** and **L84**) approved by the PTB are absolutely essential.

SINAMICS S150

Drive converter cabinet units

Motors

Engineering information (continued)

Insulation stress of motor windings

Since the winding stressing of the motor depends very much on the type of cable used and the cable length, the maximum permissible cable lengths listed in the engineering information must be observed.

Bearing currents

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

The isolated bearing is standard for all 1L8/1PQ8 motors that are designated for converter operation.

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

Additional measures for reducing the bearing currents even further are to use shielded motor cables and good earthing of the motor housing. It is recommended to route the earth cable from the motor directly to the converter.

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

Operation of motors with flameproof enclosure

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

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

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

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

Operation with and without feedback of the actual speed value

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

If the speed control range is above 5% of the rated speed, the control accuracy of the sensorless vector control is approx. $0.2 \times f_{\text{slip}}$. Taking into account the slip values of standard motors in the power range from 75 kW to 1200 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 S150 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.

Services and documentation

5



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Training

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Training cases

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AOP30 cabinet operator panel
training case

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SINAMICS High Power training case

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Service & Support

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Documentation

SINAMICS S150

Services and documentation

Training

Overview



Training is decisive for your success

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

Training by the market leader in automation, plant installation and plant support enables you to make your decisions with certainty and full command. Especially where the optimum and efficient use of products and plants are concerned. You can eliminate deficiencies in existing plants, and exclude expensive faulty planning right from the beginning.

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■ 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.

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

■ Close to customer

We are only a short distance away. You can find us approx. 60 times in Germany, and worldwide in 62 countries. You wish to have individual training instead of one of our 300 courses? Our solution: we will provide a program tailored exactly to your personal requirements. Training can be carried out in our Training Centers or at your company.

The right mixture: blended learning

Blended learning is understood to be the combination of various training media and sequences. For example, a local attendance course in a Training Center can be optimally supplemented by a teach-yourself program as preparation or follow-up. Furthermore, SITRAIN utilizes supported online training for live instruction on the Internet at agreed times.

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

The international training portal

For further information please visit us at:

<http://www.siemens.com/sitrain>

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	Language	Order No.
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SITRAINonCD Interactive course information system on CD-ROM	German/English	E86060-D6850-A100-C1-7400
Overview of training worldwide	German/English	E86060-K6899-A101-B4-7400

Structure

Training package for SINAMICS G150/G130/S150 drive system

This provides an overview of the training available for the SINAMICS G150/G130/S150 drive system.

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.

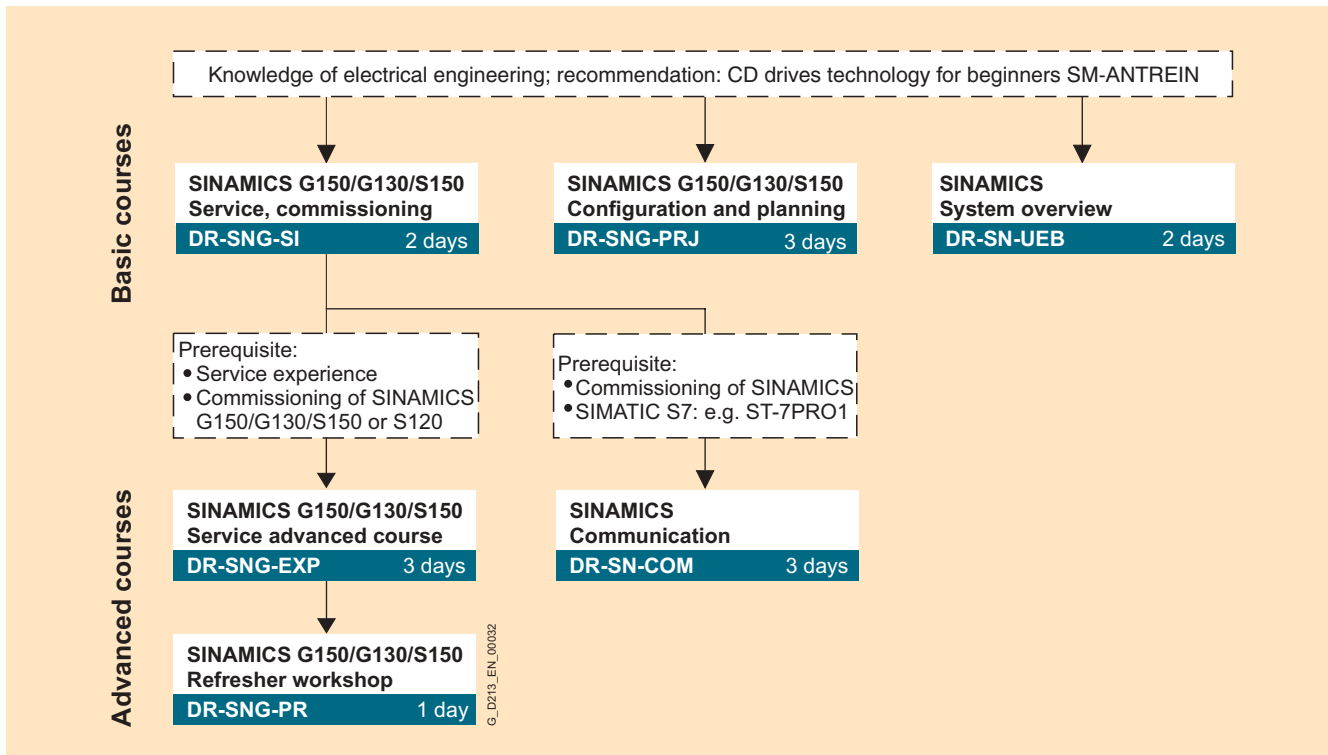
The planning course provides all the information you need to set up the drive system.

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

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

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

SINAMICS G150/G130/S150 training



SINAMICS S150

Services and documentation

Training

Function

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

Description/learning target

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

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

The SIZER engineering tool and the STARTER startup 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 engineering tool
- STARTER start-up tool
- Simple startup of a drive
- Practical exercises using the training case

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

Description/learning target

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

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

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

Control functions are explained, and their associated conditions described.

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

Target group

Planning engineers, design engineers

Content

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

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

Description/learning target

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

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

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

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

Target group

Commissioning engineers, servicing personnel

Content

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

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

Description/learning target

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

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

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

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

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

Target group

Servicing employees of Siemens AG and OEMs

Content

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

Function (continued)

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

Description/learning target

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

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

The trainer will provide instructions and temporary consultation.

Target group

Servicing employees of Siemens AG and OEMs

Content

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

SINAMICS communication (3 days) DR-SN-COM

Description/learning target

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

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

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

Target group

Programmers, commissioning engineers and servicing personnel

Content

- Overview of the PROFIBUS DP, RS232-PPI, CAN interfaces and I/O terminals: function, topology, parameterization
- Fundamentals of PROFIBUS with the PROFIDrive V3 profile
- Basic functions on the PROFIBUS: routing, teleservice and direct access
- PROFIBUS for motion control with: equidistant bus cycle and isochrone mode with servo control
- Cyclic and acyclic data exchange with Drive ES 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

Services and documentation

AOP30 cabinet operator panel training case

Application



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

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

Design

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

Technical data

AOP30 cabinet operator panel training case

Input voltages	1 AC 230 V
Degree of protection to DIN VDE 0470	IP00

Selection and ordering data

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

SINAMICS High Power training case

Application

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

Function

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

Technical data

SINAMICS High Power training case

Input voltage	1 AC 230 V
Degree of protection to DIN VDE 0470	IP00

Available on request from:

Siemens AG
A&D SE S3 SIDEMO
Würzburger Str. 121
90766 Fürth/Bavaria
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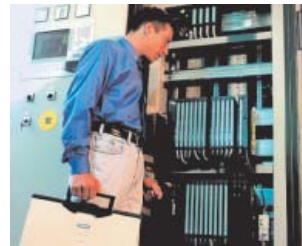
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Support in the planning and designing of your project from detailed actual-state analysis, target definition and consulting on product and system questions right to the creation of the automation solution. ¹⁾

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>

SINAMICS S150

Services and documentation

Documentation

Overview

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

- Description
- Mounting instructions
- Commissioning guide
- Function description
- Maintenance instructions
- Spare parts list

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

The documentation is delivered as standard in English/German together with the converter.

The scope of delivery also includes a CD-ROM with the STARTER startup tool.

If one of the languages listed below is required, the corresponding order code should be added when ordering the converter:

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

Appendix



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Siemens contacts worldwide

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A&D online services

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A&D in the WWW

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Product selection using the interactive catalog

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Easy shopping with the A&D Mall

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Terms and Conditions of Sale and Delivery

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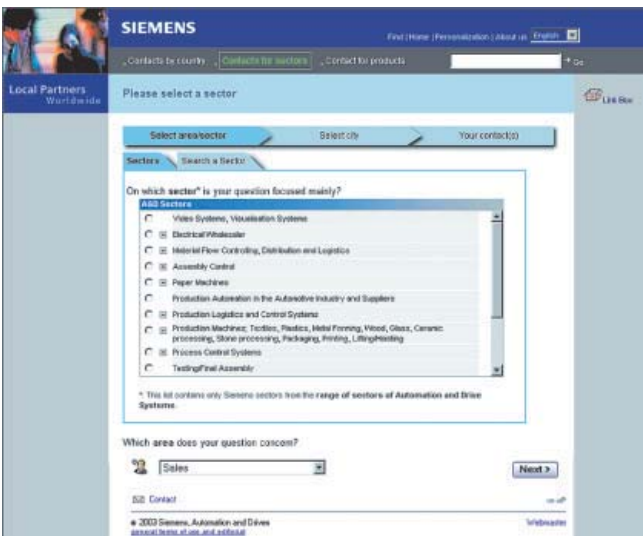
Export regulations



SINAMICS S150

Drive converter cabinet units

Siemens contacts worldwide



At

www.siemens.com/automation/partner

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

You can obtain in most cases a contact partner for

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

You start by selecting a

- Country,
- Product or
- Sector.

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

SINAMICS S150 Drive converter cabinet units

A&D online services

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.

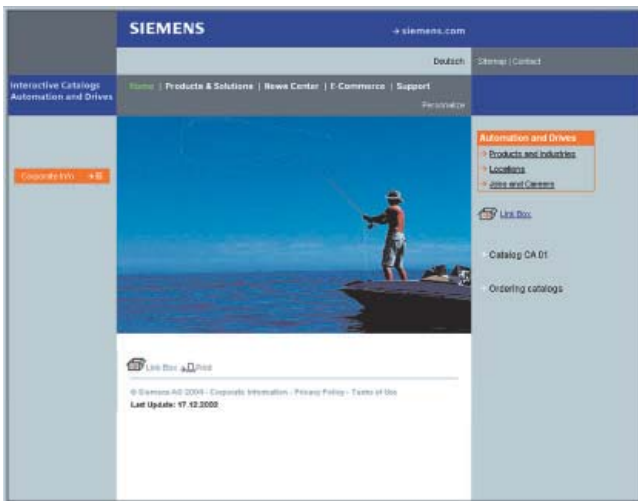
The Siemens Automation and Drives Group (A&D) has therefore built up a comprehensive range of information in the World Wide Web, which offers quick and easy access to all data required.

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.

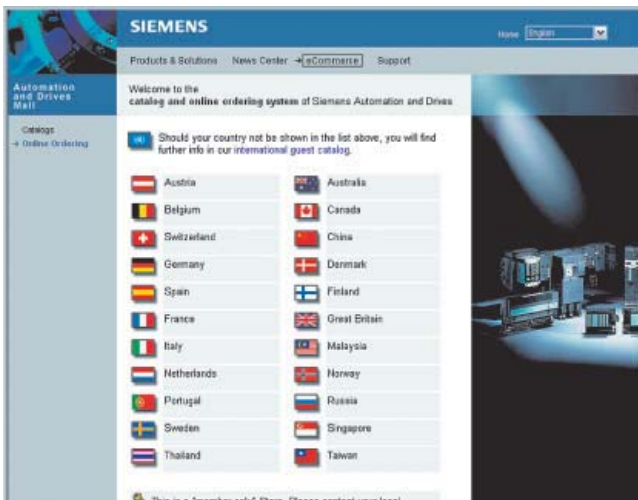
Information on the interactive catalog can be found in the Internet under

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

or on CD-ROM:

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

Easy Shopping with the A&D Mall



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

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

Numerous functions are available to support you.

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

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

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

SINAMICS S150

Drive converter cabinet units

Appendix

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.

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

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

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

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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 according to the applicable legal regulations.

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

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

The dimensions are in mm. Illustrations are not binding.

Insofar as there are no remarks on the corresponding pages, - especially with regard to data, - dimensions and weights given - these are subject to change without prior notice.

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

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

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

Export regulations

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

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

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

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

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Responsible for
Technical content:
Siemens AG, A&D LD M PM
General editing:
Siemens AG, A&D PT 5, Erlangen,
Federal Republic of Germany

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

Order No.: **E86060-K5521-A131-A1-7600**
Printed in the Federal Republic of Germany
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Please send any request to your Siemens representative
Addresses can be found at <http://www.siemens.com/automation/partner>

Automation and Drives	<i>Catalog</i>	
Interactive catalog on CD-ROM		
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Automation Systems for Machine Tools		
SINUMERIK & SIMODRIVE	NC 60	
Drive Systems		
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SINAMICS G150 Drive Converter Cabinet Units		
SINAMICS G110 Inverter Chassis Units	D 11.1	
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