SINAMICS DCM Cabinet

Catalog D 23.2 · 2012

SINAMICS Drives

Answers for industry.

SIEMENS

Related Catalogs

SINAMICS DCM D 23.1
Converter Units

E86060-K5523-A111-A1-7600

Motion Control Drives D 31
SINAMICS and Motors
for Single-Axis Drives

E86060-K5531-A101-A1-7600

SINAMICS Drives D 11
SINAMICS G130 Drive Converter Chassis Units
SINAMICS G150 Drive Converter Cabinet Units

E86060-K5511-A101-A5-7600

SINAMICS GM150/SINAMICS SM150 D 12
Medium-Voltage Converters

E86060-K5512-A101-A2-7600

SINAMICS S120 D 21.3
Chassis Format Units and
Cabinet Modules
SINAMICS S150
Converter Cabinet Units
E86060-K5521-A131-A3-7600

dc motors DA 12
Sizes 160 to 630
31,5 kW to 1610 kW

E86060-K5312-A101-A2-7600

dc motors DA 12 T
Engineering information
for Catalog DA 12

E86060-T5312-A101-A2-7600

Motion Control PM 21
SIMOTION, SINAMICS S120 and
Motors for Production Machines

E86060-K4921-A101-A2-7600

SINAMICS S110 PM 22
The Basic Positioning Drive

E86060-K4922-A101-A1-7600

SITRAIN ITC
Training for Automation and
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E86060-K6850-A101-C2 [1)]

Products for Automation and Drives CA 01
Interactive Catalog, DVD

E86060-D4001-A510-D1-7600

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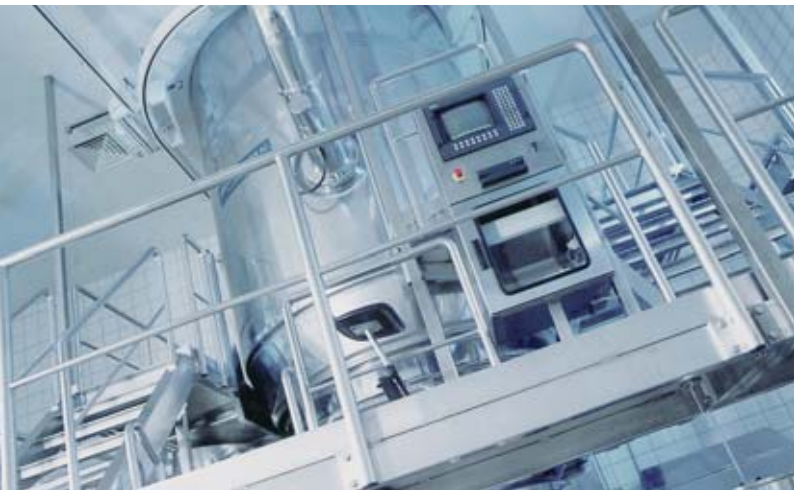
[1)] Language: German

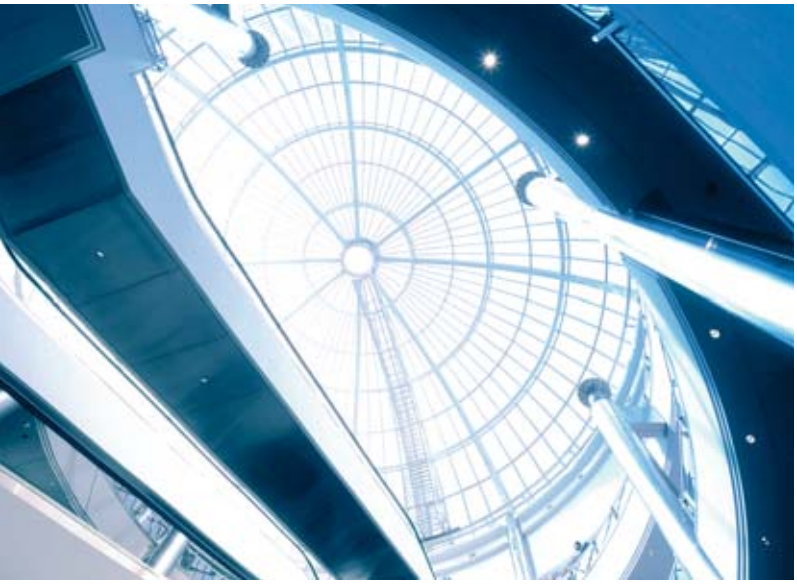
SINAMICS Drives
SINAMICS DCM Cabinet

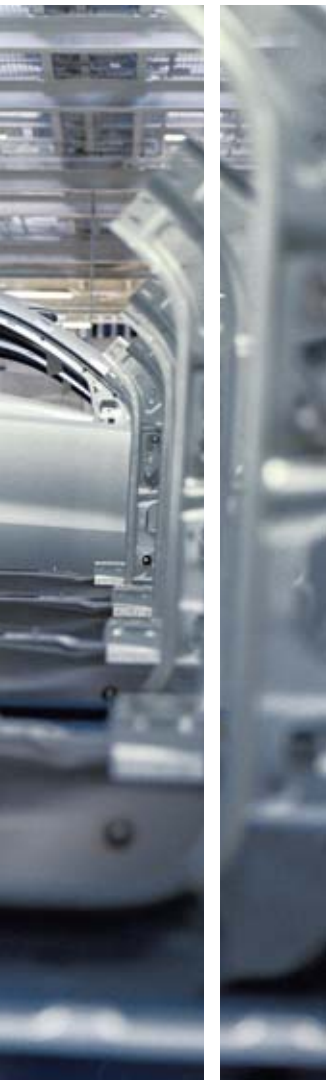
Catalog D 23.2 · 2012

The products and systems described in this catalog are manufactured/distributed under application of a certified quality management system in accordance with ISO 9001/ ISO 14001 (Certified Registration No. AT-00257/1 and AT-00355/1). The certificate is recognized by all IQNet countries.

Supersedes:
Catalog DA 22 · 2002







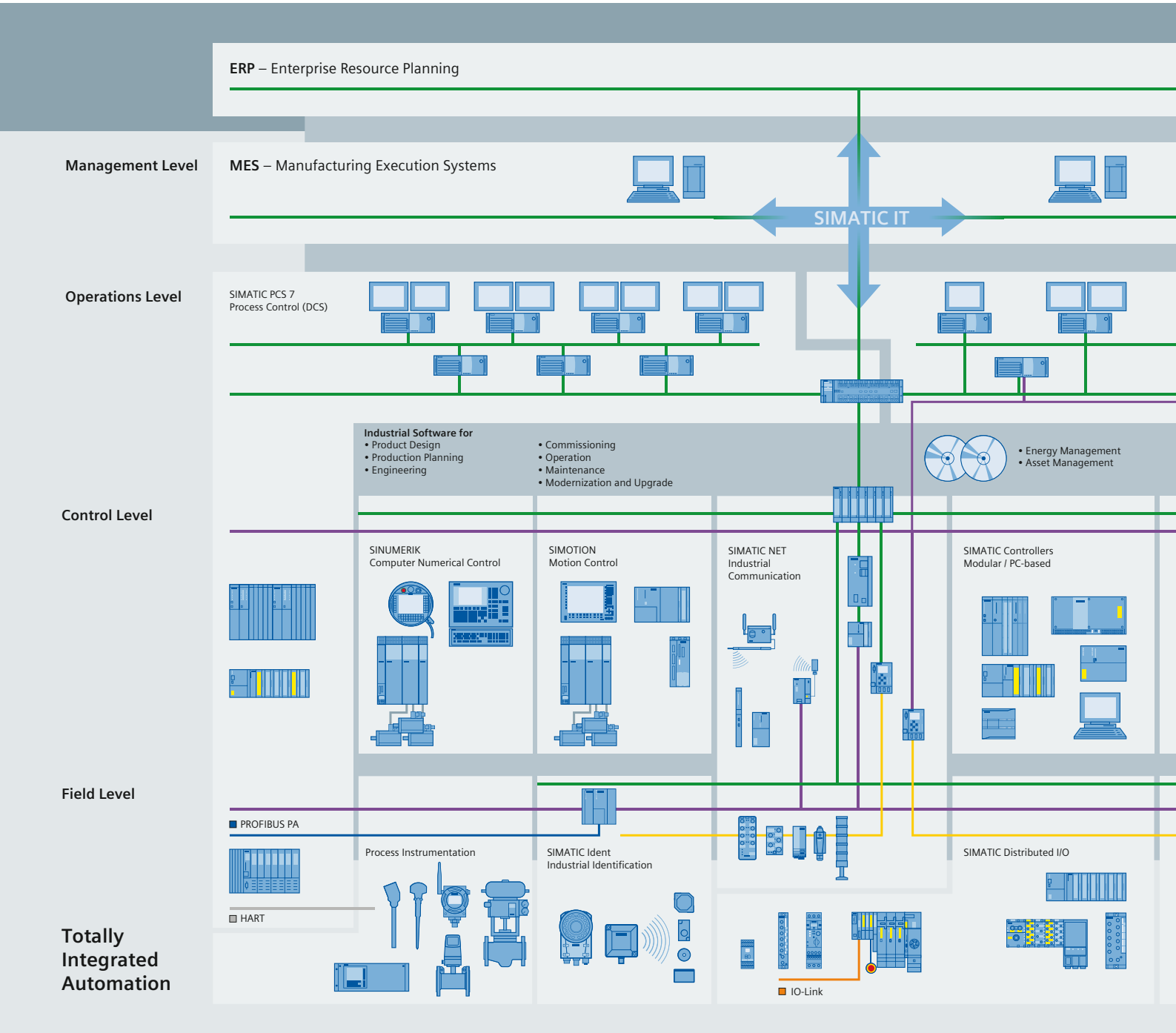
Answers for industry.

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

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

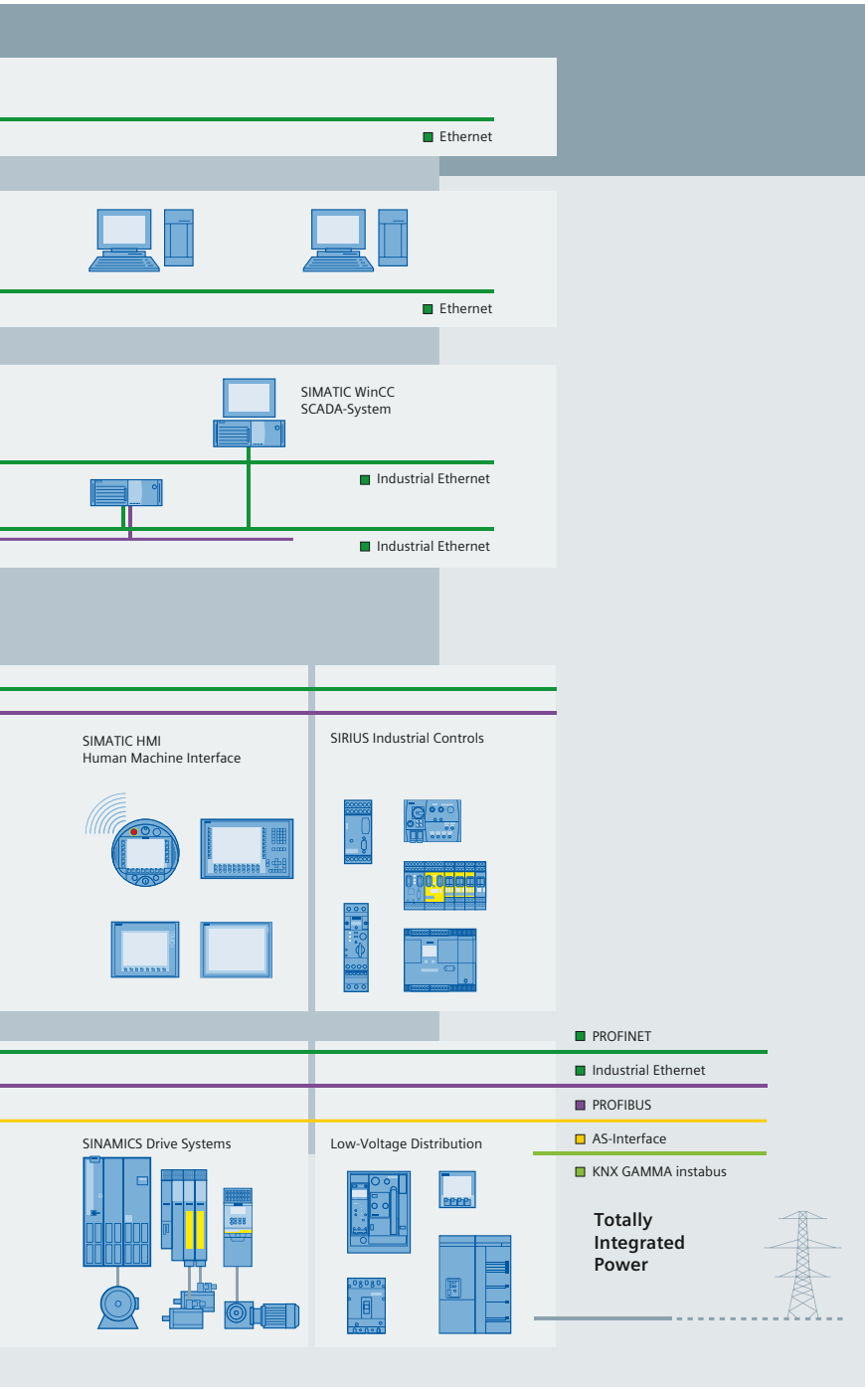
The high quality of our products sets industry-wide benchmarks. High environmental aims are part of our eco-management, and we implement these aims consistently. Right from product design, possible effects on the environment are examined. Hence many of our products and systems are RoHS compliant (Restriction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

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



Setting standards in productivity and competitiveness.

Totally Integrated Automation.



TIA is characterized by its unique continuity.

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

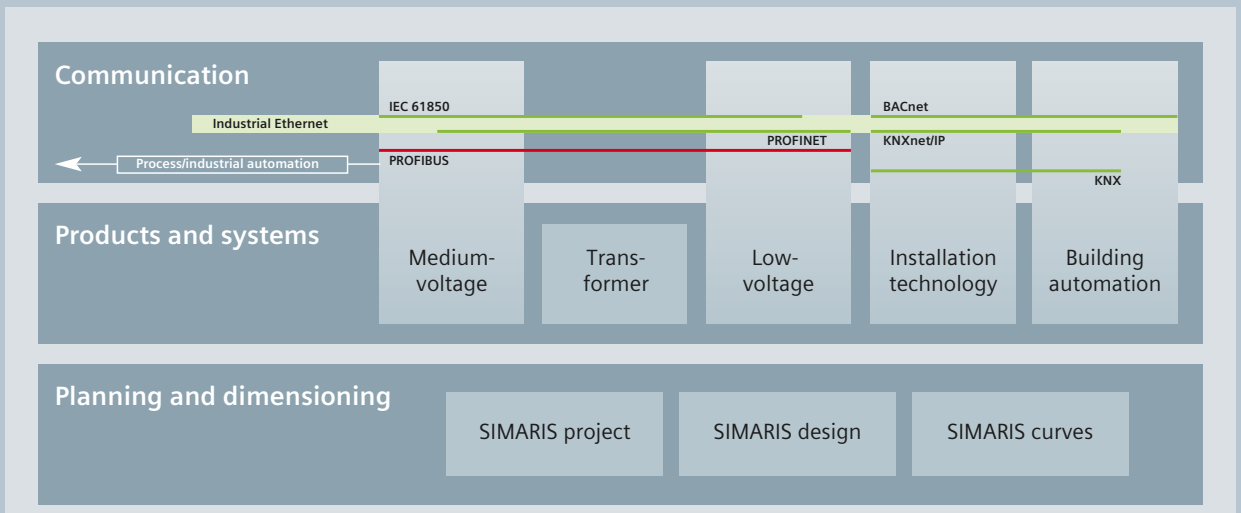
The unique continuity is already a defined characteristic at the development stage of our products and systems.

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

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

Integrated power distribution from one source.

Totally Integrated Power.



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

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

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

Much more than a catalog. The Industry Mall.

You have a catalog in your hands that will serve you well for selecting and ordering your products. But have you heard of the electronic online catalog (the Industry Mall) and all its benefits? Take a look around it sometime:

www.siemens.com/industrymall

Selecting

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

Ordering

You can load the products that you have selected in this way into the shopping basket at a click of the mouse. You can create your own templates and you will be informed about the availability of the products in your shopping cart. You can load the completed parts lists directly into Excel or Word.

Delivery status

When you have sent the order, you will receive a short e-mail confirmation which you can print out or save. With a click on "Carrier", you will be directly connected to the website of the carrier where you can easily track the delivery status.

Added value due to additional information

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

Convinced? We look forward to your visit!

Introduction

1

The SINAMICS drive family


Mixers/mills


Plastics


Converting


Machine tools


Pumps/fans/
compressors


Textiles


Packaging


Conveyor systems


Printing machines


Woodworking


Renewable energies

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Application areas of the SINAMICS drive family

Application

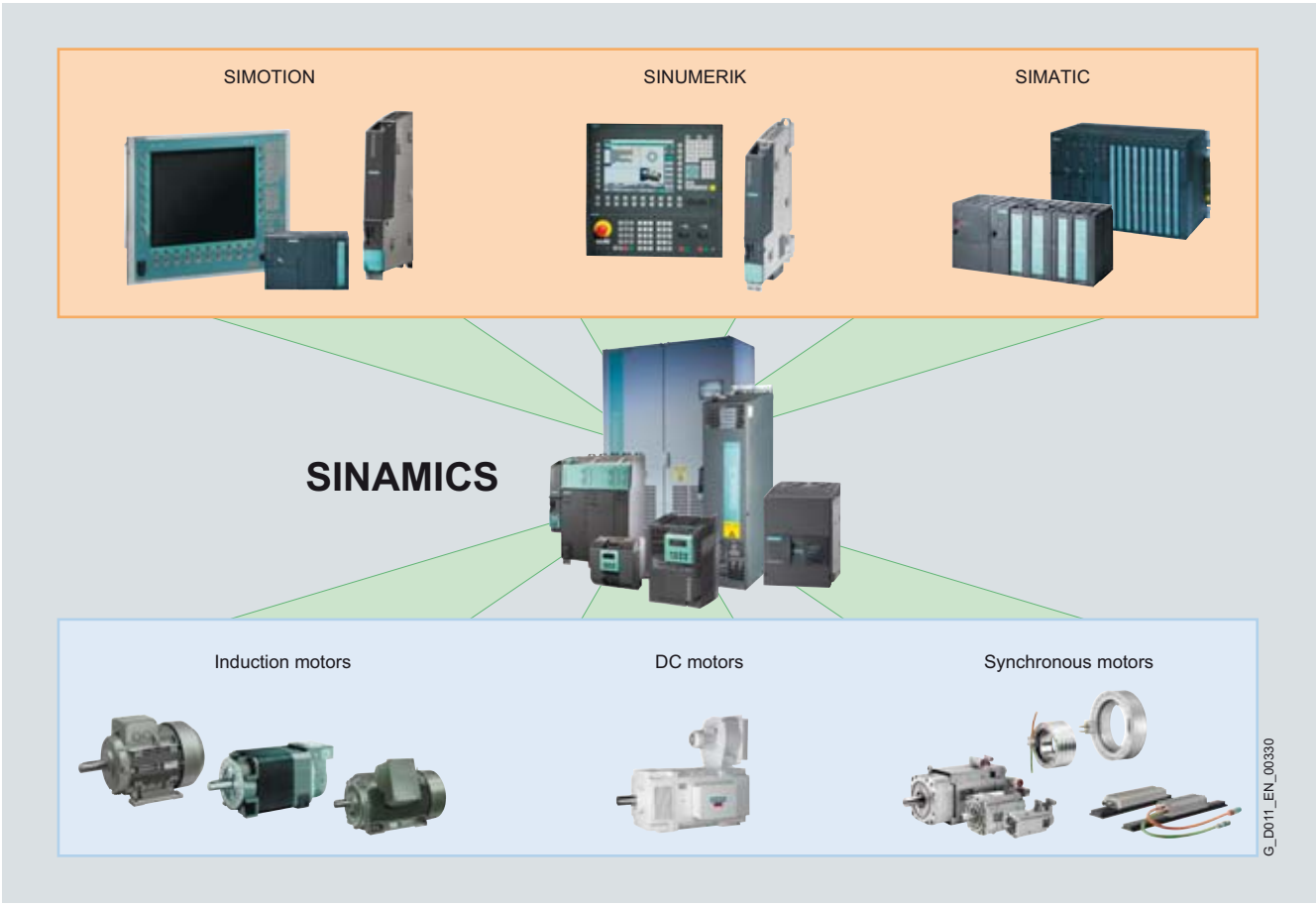
SINAMICS is the family of drives from Siemens designed for industrial machine and plant construction. SINAMICS offers solutions for all drive tasks:

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

Product variants

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

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



SINAMICS as part of the Siemens modular automation system

Platform concept and Totally Integrated Automation

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

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

Quality management according to DIN EN ISO 9001

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

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

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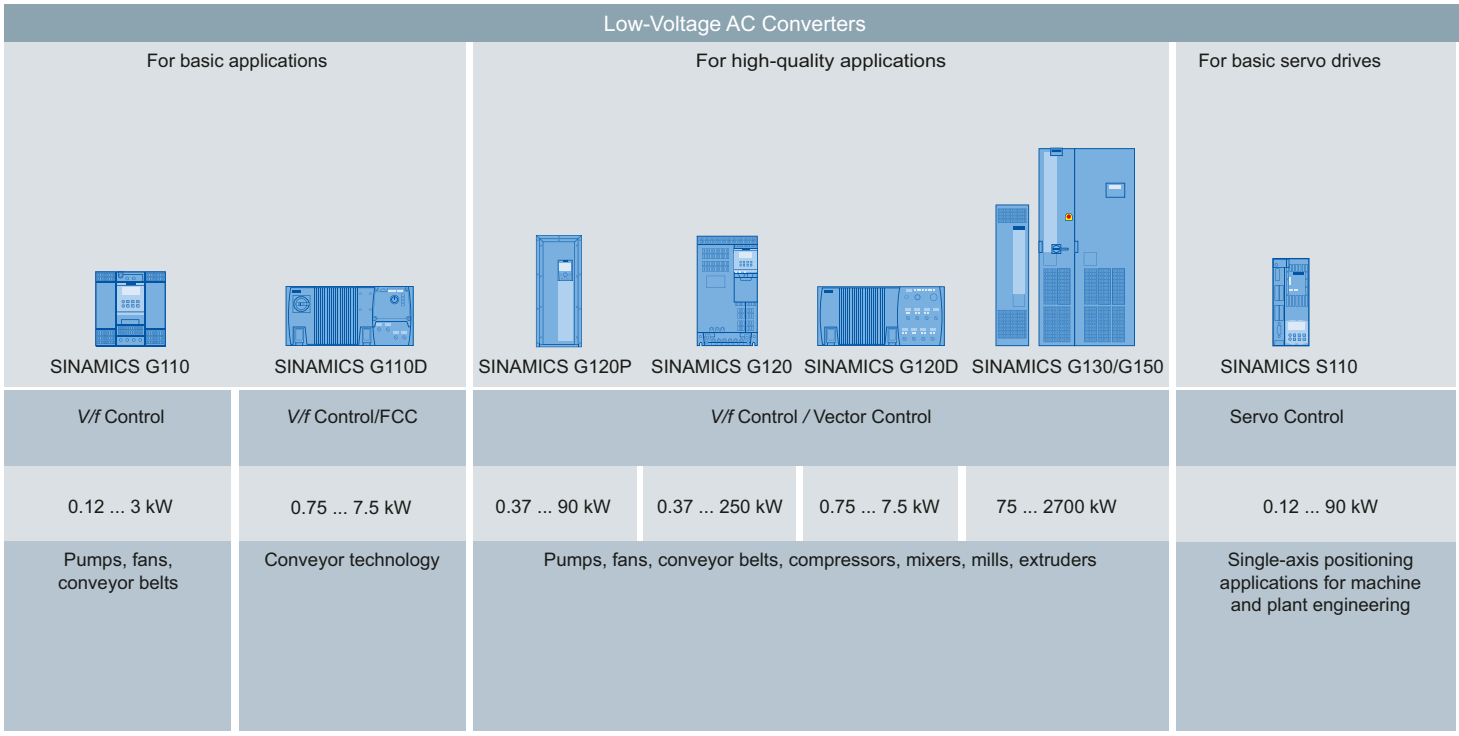
The SINAMICS drive family



System properties

The SINAMICS range is characterized by the following system properties:

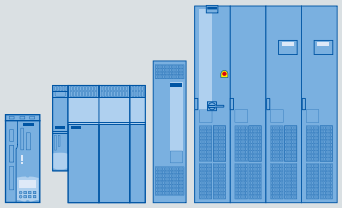
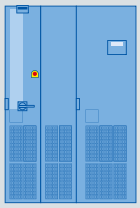
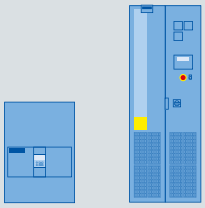
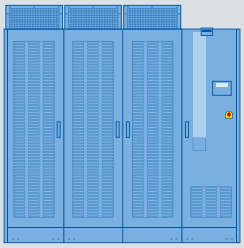
- Standard functionality based on a single platform concept
- Standardized engineering
- High degree of flexibility and combination capability
- Broad power range
- Designed for global use
- SINAMICS Safety Integrated
- Higher efficiency and effectiveness
- High energy efficiency
- Versatile interfacing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

Application areas

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

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

- **SINAMICS G110**
  - The versatile drive for low power ratings
- **SINAMICS G120P**
  - The specialist for pumps, fans, and compressors
- **SINAMICS G120**
  - The modular single-motor drive for low up to medium power ratings
- **SINAMICS G110D**
  - The distributed, compact single-motor drive in a high degree of protection for basic applications
- **SINAMICS G120D**
  - The distributed, modular single-motor drive in a high degree of protection for sophisticated applications
- **SINAMICS G130** and **SINAMICS G150**
  - The universal drive solution for single-motor drives with a high power rating
- **SINAMICS S110**
  - The basic positioning drive for single-axis applications
- **SINAMICS S120**
  - The flexible, modular drive system for demanding drive tasks
- **SINAMICS S150**
  - The drive solution for demanding single-motor drives with a high power rating

Low-Voltage AC Converters		DC Converters	Medium-Voltage AC Converters
For demanding applications		For basic and demanding applications	For high-power applications
			
SINAMICS S120	SINAMICS S150	SINAMICS DCM	SINAMICS GM150/SM150/GL150/SL150
V/f Control / Vector Control / Servo Control		Closed-loop speed control / torque control	*V/f* Control / Vector Control
0.12 ... 4500 kW	75 ... 1200 kW	6 kW ... 30 MW	0.8 ... 120 MW
Motion Control applications in production machines (packaging, textile, printing, paper, plastic), machine tools, plants and process lines, metal forming technology, renewable energies	Test stands, cross cutters, centrifuges	Rolling mills, cross cutters and shears, wire-drawing machines, extruders and kneaders, presses, elevator and crane installations, cableways and lifts, mining hoists, test stand drives	Pumps, fans, compressors, mixers, extruders, mills, rolling mills, mining hoist drives, excavators, test stands

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Common Engineering Tools

SIZER for Siemens Drives – for simple planning and configuration **STARTER – for fast commissioning, optimization and diagnostics**

Application areas *(continued)*

DC converter (line supply voltage < 1000 V)

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

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

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

1

The members of the SINAMICS drive family

SINAMICS DC converters

SINAMICS DCM	SINAMICS DCM Cabinet
	
The scalable drive system for basic and demanding applications	*The ready-to-connect converter cabinet unit for basic and demanding applications*
Main applications	**Main applications**
• Machines and plants in the industrial environment (steel/aluminum, plastics, printing, paper, cranes, mining, oil and gas, excitation equipment) in the new plant and retrofit businesses	• Machines and plants in the industrial environment (steel/aluminum, plastics, printing, paper, cranes, mining, oil and gas) in the new plant and retrofit businesses
Application examples	**Application examples**
• Rolling mills • Cross cutters and shears • Wire-drawing machines • Extruders and mixers • Presses • Elevators and cranes • Cableways and lifts • Mine hoists • Test bay drives	• Rolling mills • Cross cutters and shears • Wire-drawing machines • Drilling facility • Extruders and mixers • Presses • Elevators and cranes • Cableways and lifts • Mine hoists • Test bay drives
Highlights	**Highlights**
• PROFIBUS as standard, PROFINET optional • Variance of the Control Units • Field power supply in-line with requirements • Electronics power supply for connection to 24 V DC • Power unit isolated with respect to ground • Free function blocks and Drive Control Chart • Expandable functionality using SINAMICS components • Single-phase connection possible • Varnished PCBs and nickel-plated copper busbars • Wide temperature range	• Ready-to-connect, ready-to-switch on converter cabinet • Integrated voltage supply of the motor fan • Flexible auxiliary power supply • EMC zone concept regarding cabinet installation and voltage levels • Monitoring the internal temperature fo the drive cabinet • Individual components are easily accessible despite of compact design • Type testing, system testing, and routine test • Individual circuit manual with terminal diagram and current diagram • Special project-specific solutions • Commissioning interface (PROFIBUS) (optionally) in the cabinet door
Catalog D 23.1	**Catalog D 23.2**

SINAMICS low-voltage converters		
SINAMICS G110	**SINAMICS G120P**	**SINAMICS G120**
		
The versatile single-motor drive for low power ratings	*The specialist for pumps, fans, and compressors*	*The modular single-motor drive for low up to medium power ratings*
Main applications		
• Machines and plants for industrial and commercial applications	• Machines and plants in the industrial and commercial areas (heating, climate, ventilation, water/wastewater, process industry, food and beverage industry)	• Machines and plants for industrial and commercial applications (mechanical engineering, automotive, textiles, chemicals, printing, steel)
Application examples		
• Pumps and fans • Auxiliary drives • Conveyor systems • Advertisement panels • Door/gate operating mechanisms • Centrifuges	• Pumps • Fans • Compressors	• Mixers • Mills • Centrifuges • Agitators • Extruders • Conveyor systems • Traction drives • Indoor cranes
Highlights		
• Compact • Flexible adaptation to different applications • Simple and fast commissioning • Clear terminal layout • Optimum interaction with SIMATIC and LOGO!	• Modular design for an increased degree of user-friendliness and flexibility • Energy efficiency thanks to innovative hardware and software functions • High degree of usability when commissioning and diagnostics using an innovative operator panel • Lower harmonics through an innovative topology	• Modular design for a high degree of flexibility and service friendliness • Energy recovery available instead of a braking resistor • Safety Integrated • High degree of usability when commissioning and for diagnostics • Flexibility through the widest range of communication systems • Application-specific versions
Catalog D 11.1	**Catalog D 11.1 N**	**Catalog D 11.1**

1

The members of the SINAMICS drive family

SINAMICS low-voltage converters

SINAMICS G110D	SINAMICS G120D	SINAMICS G130, SINAMICS G150
		
The distributed, compact single-motor drive for basic applications	*The distributed, single-motor drive for sophisticated applications*	*The universal drive solution for singlemotor drives with a high power rating*
Main applications		
• Horizontal conveyor applications in the industrial environmental, with the main focus on distribution and logistics in airports; generally suitable for basic conveyor-related tasks with local control or connected to a bus via AS-Interface	• Conveyor drive applications in industrial environments, with the main focus on the automotive industry; also suitable for high performance applications, e.g. at airports and in the food, beverage and tobacco industry (without tenside)	• Machines and plants in the process and production industry, water/waste, power stations, oil and gas, petrochemicals, chemical raw materials, paper, cement, stone, steel
Application examples		
• Conveyor systems • Airports • Distribution logistics	• Conveyor systems • Electric overhead-conveyor systems in distribution logistics	• Pumps and fans • Compressors • Extruders and mixers • Mills
Highlights		
• Low profile design with uniform drilling dimensions (constant footprint) in IP65 degree of protection • Simple and fast commissioning • Variants with and without repair switch • Optional keyswitch • AS-Interface bus parameterization • Quick stop function • Integrated brake control, 180 V DC • Optimum interaction with SIMATIC and LOGO!	• Low profile design with uniform drilling dimensions (constant footprint) in IP65 degree of protection • Modular • Flexible expansion capability • Simple and fast commissioning • Regenerative feedback • Optimum interaction with SIMOTION and SIMATIC • SINAMICS Safety Integrated	• Space-saving • Low noise • Simple and fast commissioning • SINAMICS G130: Modular components • SINAMICS G150: Ready-to-connect cabinet unit • Optimum interaction with SIMATIC
Catalog D 11.1	**Catalog D 11.1**	**Catalog D 11**

SINAMICS low-voltage converters		
SINAMICS S110	**SINAMICS S120**	**SINAMICS S150**
		
The basic positioning drive for single-axis applications	*The flexible, modular drive system for demanding drive tasks*	*The drive solution for demanding single-motor drives with a high power rating*
Main applications		
• Machine and plants in the industrial environment, where machine axes should be quickly and precisely positioned in the simplest possible way.	• Machines and plants for industrial applications (packaging, plastics, textiles, printing, wood, glass, ceramics, presses, paper, lifting equipment, semiconductors, automated assembly and testing equipment, handling, machine tools)	• Machines and plants in the process and production industry, food, beverages and tobacco, automotive and steel industry, mining/open-cast mining, shipbuilding, lifting equipment, conveyors
Application examples		
• Handling equipment • Feed and withdrawal devices • Stacking units • Automatic assembly machines • Laboratory automation • Metalworking • Woodworking, glass and ceramic industries • Printing machines • Plastics processing machines	• Motion control applications (positioning, synchronous operation) • Numerical control, interpolating motion control • Converting • Technological applications	• Test bay drives • Centrifuges • Elevators and cranes • Cross cutters and shears • Conveyor belts • Presses • Cable winches
Highlights		
• For universal use • Flexible, modular • Scalable in terms of power, functionality, number of axes, performance • Simple and fast commissioning, auto-configuration • Innovative, futureproof system architecture • Graded infeed/regenerative feedback concepts • Wide range of motors • Optimum interaction with SIMOTION, SIMATIC and SINUMERIK • SINAMICS Safety Integrated	• For universal use • Flexible, modular • Scalable in terms of power, functionality, number of axes, performance • Simple and fast commissioning, auto-configuration • Innovative, futureproof system architecture • Graded infeed/regenerative feedback concepts • Wide range of motors • Optimum interaction with SIMOTION, SIMATIC and SINUMERIK • SINAMICS Safety Integrated	• Four-quadrant operation as standard • High control accuracy and dynamic performance • Minimum harmonic effects on the supply system, considerably lower than the limits specified in IEEE 519 THD • Tolerant to fluctuations in line voltage • Option of reactive power compensation • Simple and fast commissioning • Ready-to-connect cabinet unit • Optimum interaction with SIMATIC
Catalog PM 22	**Catalogs PM 21, D 11.1 and D 21.3**	**Catalog D 21.3**

The members of the SINAMICS drive family

SINAMICS medium-voltage converters

SINAMICS GM150	SINAMICS SM150	SINAMICS GL150	SINAMICS SL150
			
The universal drive solution for single-motor drives	*The drive solution for demanding single-motor and multi-motor drives*	*The drive solution for synchronous motors up to 120 MW*	*The drive solution for slow speed motors with highest torques and overloads*
Main applications			
• Machines and plants in the process industry	• Plants and machines in the steel sector (rolling mills) and mining	• Plants and machines in the process industry, especially in the oil, gas and petrochemicals sectors	• Plants and machines in the basic materials industry, especially in the steel and mining sectors
Application examples			
• Pumps and fans • Compressors • Extruders and mixers • Mills • Marine drives	• Hot and cold rolling mill stands • Mine hoists • Test bay drives • Ore conveyor belts	• Compressors • Pumps and fans • Extruders and mixers • Marine drives • Blast furnace blowers	• Hot rolling mill roughing stands • Mine hoists • Ore and cement mills • Excavators
Highlights			
• Space-saving • Simple and fast commissioning • Ready-to-connect cabinet unit • Optimum interaction with SIMATIC	• Four-quadrant operation as standard • High efficiency and minimum load on the motor • High control accuracy and dynamic performance • Almost free of line-current harmonics • Option of reactive power compensation • Simple and fast commissioning • Ready-to-connect cabinet unit • Optimum interaction with SIMATIC	• Compact design and high power density • Easy operation and monitoring • Extremely rugged, reliable and almost maintenance-free • Two directions of rotation by reversing the rotating field • Capable of seamless integration into higher-level automation systems	• Low output frequency/ motor speed • High short-time overload capability • Four-quadrant operation as standard • Extremely rugged, reliable and almost maintenance-free • High efficiency • Capable of seamless integration into higher-level automation systems
Catalog D 12	**Catalog D 12**	**–**	**–**

Overview

SINAMICS DC MASTER is the new generation of DC converters from Siemens. The name SINAMICS DC MASTER – briefly: SINAMICS DCM – embodies the strengths of this new generation. It combines the advantages of its predecessor SIMOREG DC-MASTER with the advantages of the SINAMICS family.

SINAMICS DC MASTER is the consequential ongoing development of the previous series, and additionally to proven quality and reliability, also offers new functions that go beyond the range of its predecessor.

SINAMICS DC MASTER is the new member of the SINAMICS family that now makes many of the SINAMICS tools and components known from AC technology available to DC technology.

With SINAMICS DC MASTER Cabinet, users now have access to ready-to-connect drive cabinets. The SINAMICS DC MASTER DC Converter is the core of the cabinet, with its scalability in many areas, such as computational performance, field current supply, armature current supply and interfaces.

Already in the basic version, SINAMICS DC MASTER Cabinet has all of the components required to feed power to a DC motor from the three-phase line supply, is ready to connect up and can be immediately commissioned from the AOP30. In addition to the options of the DC Converter, SINAMICS DC MASTER Cabinet has a wide range of cabinet options, which allows it to be adapted to the widest range of requirements and situations.

For instance, the units can be optionally adapted to address various ambient conditions or the available auxiliary power supply. Further, it is possible to use the basic version of the cabinet as a basis for order-specific adaptations. In this case, there are hardly any limits regarding the requirements that can be fulfilled – from simply rounding off a standard option, up to a higher power rating or a special application.

The system components of a DC drive

1

Overview

Motor (see Catalog DA 12)

SINAMICS DC MASTER Cabinet

Motor-side components


Fuses,
SICROWBAR DC,
smoothing reactor

SINAMICS DC MASTER DC Converter

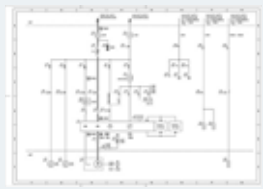
AOP 30

Other options



e.g.:
SIMOREG CCP
Terminal Modules,
PROFINET,
insulation monitoring

Documentation



Circuit manual with
terminal diagramm
and current diagram

Line-side components

e.g.:
Commutating reactor,
mains fuse,
circuit breaker or contactor,
radio interference
suppression filter,
SICROWBAR AC

3 AC line supply

G_D023_EN_00089

Highlights

Overview

With the SINAMICS DC MASTER Cabinet, flexibility and standardized quality has been fused to create a converter cabinet system. As a result of numerous options, the cabinet can be optimally adapted to individual requirements and the standardized production techniques and components ensure short delivery times.

Ready to connect up and switch on

SINAMICS DC MASTER Cabinet is, in the basic version, ready to connect and switch on. As result, engineering and commissioning times as well as plant downtimes can be shortened and the functionality guaranteed as result of the components which are optimally harmonized with one another.

Supply for motor fan

The power supply for the external DC motor fan is already included in the basic version, including motor protection circuit breaker. The setting values of the motor protection circuit breaker can be harmonized to the motor by selecting the appropriate option.

Flexibility for the auxiliary power supply

SINAMICS DC MASTER Cabinet can be universally and flexibly used for a wide voltage range. The ability to adapt to the existing control voltage is especially interesting when it comes to modernizing existing plants and systems. When specifying the line supply voltage, the auxiliary voltage for the converter cabinet is appropriately adapted. If a separate auxiliary power supply is not available, then this is taken from the cabinet.

EMC zone concept

As a result of the EMC zone concept, SINAMICS DC MASTER Cabinet is admirably suited for the industrial environment – both regarding the ruggedness with respect to interference and also to the low noise emission.

The zone concept refers to the spatial arrangement of the components installed inside the cabinet. These are electrical/electronic devices, especially also cables for power and signals; these can act as noise sources as well as also noise sinks. Features of this concept include separate cable routing and high-frequency low-ohmic connections. In order that this concept can also be maintained on the plant or system side, the customer interfaces that are easy to access, not only provide suitable terminals and shield connecting bars, but also sufficient space to connect cable screens in-line with the appropriate specifications.

The drive cabinet designed and built according to this concept ensures disturbance-free operation when it comes to electromagnetic compatibility.

Also refer to the Section "Notes for EMC-compliant drive installation".

Overview (continued)

Monitoring the temperature inside the drive cabinet

In the field, the availability of a drive is often influenced by changes to the ambient conditions:

- Additional, external heat sources in the surroundings can cause the air intake temperature to increase.
- Unusually high pollution in the air clogs the air intake filter.
- Subsequently adding equipment and devices with a high power loss to the drive cabinet additionally loads the cabinet cooling.

These influences can be detected at an early stage by monitoring the temperature inside the drive cabinet using a PTC sensor so that the appropriate measures can be taken in plenty of time.

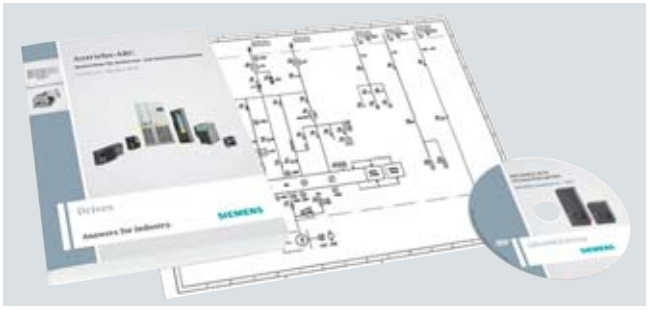
Individual components and customer interfaces that are easy to access

In spite of the compact design, the individual components in the SINAMICS DC MASTER Cabinet are clearly arranged and easy to access. Especially the terminals are arranged so that there is sufficient space for installation and strain relief of the cables. The signal cables are combined and routed to terminals in the lower cabinet section.

Type tested

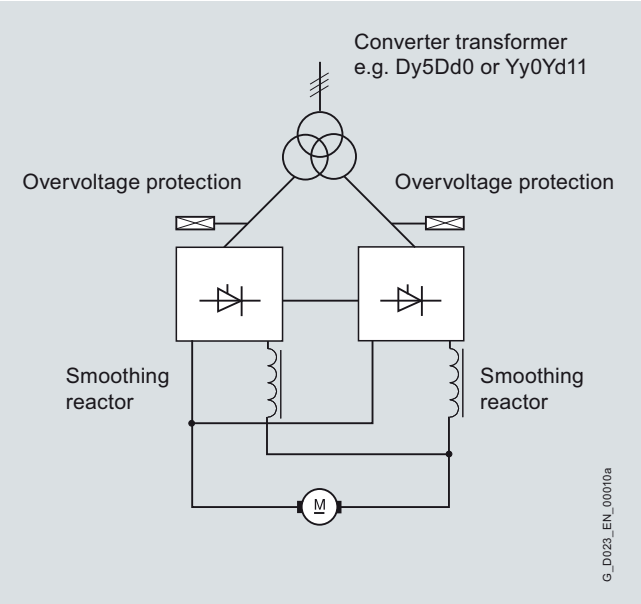
It goes without saying that the SINAMICS DC MASTER Cabinets are type-test cabinets. The comprehensive range of tests, for example to ensure mechanical and electrical strength as well as cooling, clearly confirm our high quality demands.

Documentation



In addition to the manuals for SINAMICS DC MASTER, it goes without saying that a circuit diagram and terminal diagram are also supplied. The diagrams are individually produced and precisely represent the state of the converter cabinets when they are shipped. The diagrams can also be provided digitally so that customers can integrate them into CAE systems.

Special project-specific solutions



In addition to 12-pulse series and 12-pulse parallel connections, solutions are also available to extend the power range – or for use in the medium-voltage range. Depending on the particular requirement, the converter cabinet is built based on the SINAMICS DC MASTER DC Converter or with the Control Module and a separate power section.

SINAMICS DCM Cabinet

General information

Overview

The standard series of SINAMICS DC MASTER chassis units encompasses an extensive range of currents and voltages.

A converter drive cabinet is available for each of the chassis units. The options of the chassis units, the existing cabinets and the SINAMICS cabinet systems have been merged.

This means that SINAMICS DC MASTER Cabinet can be optimally adapted to the requirements of the plant or system. The compact design, the EMC zone concept and the good accessibility of the individual components allows new systems to be quickly and simply built and existing plants or systems to be retrofitted with the shortest downtimes.

The drive cabinets can be directly connected to three-phase line supplies with rated voltages up to 950 V 3 AC – and in the basic version, cover a power range extending from 6 up to 2 500 kW. Increased power ratings using parallel connections as well as solutions for medium-voltage applications are available on request.

SINAMICS DC MASTER Cabinet drive cabinets are available in the following sizes (referred to the basic version).

Rated DC current A				
≤ 280	≤ 600	≤ 1 200	≤ 3 000	
Dimensions (W x H x D), referred to the basic version mm				
600 × 2 326 [1] × 600	800 × 2 200 × 600	1 200 × 2 200 × 600	1 400 × 2 200 × 600	1 600 × 2 200 × 600
Size				
BC	CC	DC	EC [2]	FC [2]

Detailed dimension drawings in the PDF format and DXF formats are available in the Internet at
http://www.siemens.com/sinamics-dcm

[1] Height including fan.

[2] Assignment to the rated DC current, see the technical data.

Benefits

- Plant and system availability are increased by being able to quickly and simply replace components:
  These components have been designed so that they can be quickly and simply replaced. The spare parts that are available can be viewed online at any time and assigned to the serial number of the cabinet.
- Easy commissioning and parameterization:
  Menu-prompted at the AOP30 Advanced Operator Panel with graphics-capable LCD display and plain text display, or PC-supported using the "STARTER" commissioning tool of the SINAMICS family – see "Tools and engineering".
- Can be simply integrated into automation solutions:
  For instance using standard PROFIBUS communication interface and various analog and digital interfaces as well as PROFINET.
- Immediately ready to connect up:
  All of the terminals are easy to access and the documentation supplied with the equipment contains detailed circuit diagrams and terminal diagrams, which facilitate fast and simple installation and commissioning.
- High degree of adaptability and optimum support for application-specific versions:
  For instance, 12-pulse applications, redundant operation or increased power ratings.

Application

DC drive technology: Dynamic, rugged and cost effective

Depending on the particular application, DC drives are often the most favorably-priced drive solution with many advantages when it comes to reliability, operator friendliness and operating behavior. Just as before, there are some compelling technical and economic reasons for still using DC drives in many industrial areas:

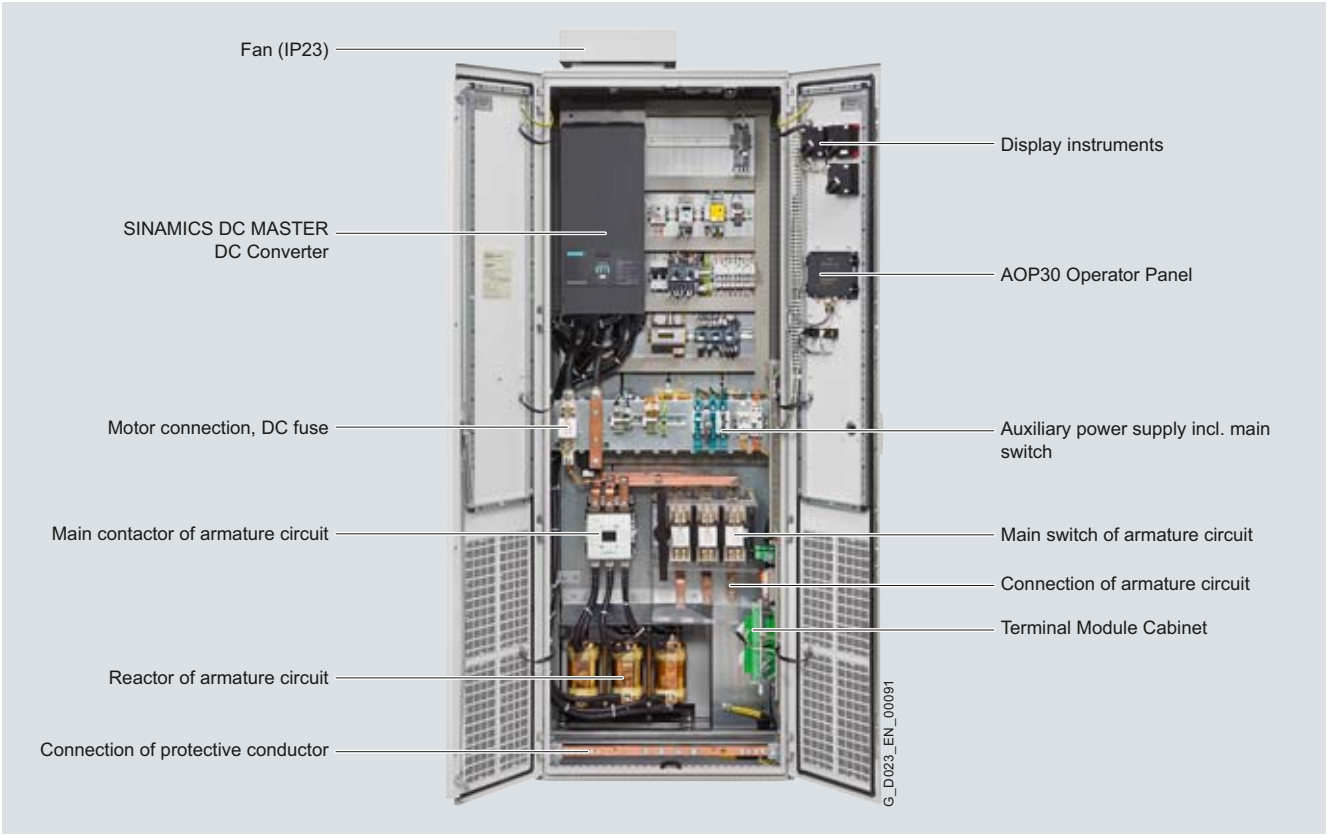
- Favorably-priced four-quadrant operation
- Continuous operation at low speeds
- Full torque even at low speeds
- Low torque ripple even at low speeds
- High starting torque
- Wide speed control range with constant power
- Low space requirement and low weight
- Reliability
- Low amount of heat dissipated in the switchgear room and therefore a very high efficiency

Main applications for DC drives include:

- Rolling mill drives
- Wire-drawing machines
- Extruders and kneaders
- Presses
- Elevators and cranes
- Cableways and lifts
- Mine hoists
- Test stand drives

General information

Design



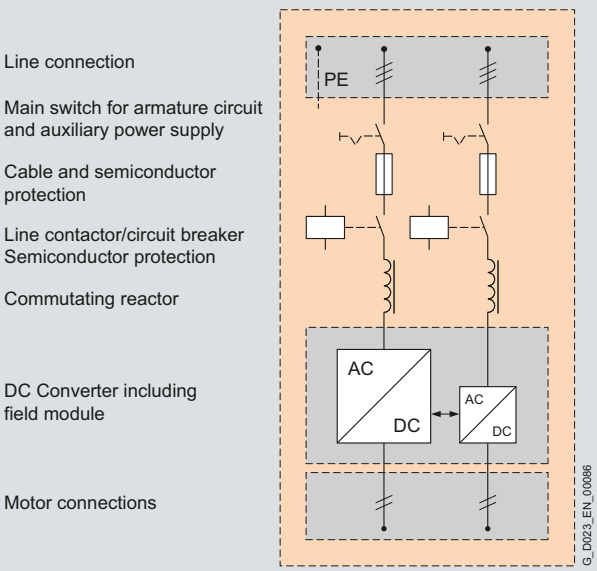
SINAMICS DC MASTER Cabinet, size CC (shown with options)

The basic version of the standard cabinet system is ready to connect up and, based on the TS8 cabinet system from Rittal, offers standard components such as:

- Line connection with input terminals
- Main switch
- Commutating reactor
- Fuses
- Line contactor or circuit breaker
- Control voltage transformer
- Cable and motor protection circuit breaker for auxiliary equipment
- AOP30 Advanced Operator Panel
- PROFIBUS connection

All of the auxiliary and supplementary components are supplied from the auxiliary supply (400 V 3 AC) as well as the field circuit and feeders for the DC motor fan.

For straightforward operation and diagnostics, the AOP30 is mounted in the cabinet door, and the detailed documentation, including circuit manual with circuit diagram and terminal diagram, provide a well-founded technical overview of the drive cabinet. In addition to the basic version, a wide range of options allow the drive cabinet to be optimally adapted to the plant or system requirements.



Note:

All of the connections are established at the lower part of the cabinet.

Design (continued)

Line connection

Line connections for the armature supply (3 AC) and auxiliary power supply (400 V 3 AC) including the field supply. Optionally, also other line voltages or integrated auxiliary power supply.

Main switch for the armature circuit and auxiliary power supply

For drive cabinets from 15 up to 850 A rated DC current, the armature circuit is switched in using a manually actuated fuse load disconnector and a main contactor; from 950 A the drive cabinets are equipped with an electrically operated circuit breaker.

Cable and semiconductor protection

SITOR semiconductor fuses, type 3NE are used.

Line contactor for armature and field

For drive cabinets with a rated current from 950 A and higher, implemented as circuit breaker.

The commutating reactor in the armature and field circuit is designed for the rated current of the unit. If the rated motor current is significantly lower then the rated current of the unit, then on request, a cost-optimized solution can be offered with adapted current carrying capability of the power components.

DC converter including field module

A detailed description of the DC converter can be found in the operating instructions and Catalog D 23.1.

Motor connections

In addition to the motor connections for the field and armature, the basic version also includes the power supply for the motor fan. The setting range of the motor protection circuit breaker must be specified when placing the order.

For drive cabinets for four-quadrant operation up to 850 A, the armature circuit has a DC fuse.

A detailed diagram showing the electrically relevant individual components is provided in the Section, Block diagrams.

Degrees of protection of drive cabinets

Standard EN 60529 addresses the protection of electrical equipment using housings, covers or equivalent, and includes:

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

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

Degrees of protection of the converter drive cabinet	First digit (touch protection and protection against ingress of foreign solid matter)	Second digit (protection of the equipment against the ingress of water)	Options
IP20	Protected against solid foreign matter, diameter ≥ 12.5 mm	No water protection	asic version
IP21	Protected against solid foreign matter, diameter ≥ 12.5 mm	Protected against drip water Vertically falling drip water shall not have a harmful effect.	Option M21
IP23	Protected against solid foreign matter, diameter ≥ 12.5 mm	Protected against water spray Water sprayed at an angle of max. 60° to the vertical planes shall not have a harmful effect.	Option M23
IP43	Protected against solid foreign matter, diameter ≥ 1 mm	Protected against water spray Water sprayed at an angle of max. 60° to the vertical planes shall not have a harmful effect.	Option M43
IP54	Protected against dust Ingress of dust is not totally prevented, but dust must not be allowed to enter in such quantities that the functioning or safety of the equipment is impaired.	Protected against water spray Water splashing onto the enclosure from any direction shall not have a harmful effect.	Option M54 with filter elements and Option M58 with climate control equipment

General information

More information

Siemens DC motors

Siemens DC motors have proven themselves for decades in day to day use. In conjunction with the SINAMICS DC MASTER converters, they always form the ideal team – wherever favorably-priced drive technology and the highest degree of availability are demanded.

These motors can also be used where space is restricted thanks to their compact and modular design.

Further, an extensive range of equipment and devices for mounting on the motor is available. A wide range of monitoring and diagnostic options facilitate reliable and disturbance-free operation.

Detailed specifications regarding quality assurance and improvement are integrated in all of the various operations and processes – from motor development through to production and service. Quality management coordinates the interaction between all of the company processes to ensure error-free and smooth processes.

It goes without saying that our stringent quality requirements also apply to our suppliers. All of the suppliers must seamlessly integrate themselves into our quality management system.

The result: Only fault-free and high quality materials are released for use in our motor production.

Customer benefits:

- High power density with small motor dimensions
- High degree of operational reliability and availability through a wide range of diagnostic features, in conjunction with the SINAMICS DC MASTER converter
- High thermal reserves for continuous and overload conditions as a result of the DURIGNIT 2000® insulation system
- Low losses through a very good efficiency
- Long brush lifetimes through an optimized current commutation system

Technical specifications	
Power range	31.5 … 1 610 kW
Rated armature voltage	420 … 810 V DC
Field	Separately excited
Shaft heights	160 … 630 mm
Number of poles	4- and 6-pole
Speed	p to 4 500 rpm
Degree of protection	IP23 and IP54
Type of construction	IM B3, IM B35, IM V1 and others
Cooling type	IC06/IC17/IC37/IC A06 A66/IC W37 A86
Stator version	Fully laminated
Standards	IEC, EN, DIN, VDE
Operation	Converter operation, 2Q and 4Q, S1 – S9

Typical applications:

- Lift and cableway drives
- Rolling mill drives and winders
- Hoisting and travel gear drives for cranes
- Extruders in the plastics industry
- Drives for printing machines
- Drives for paper machines

Additional information on Siemens DC motors is available on the Internet at:
http://www.siemens.de/dc-motor

Selection and ordering data

SINAMICS DC MASTER Cabinet for two-quadrant operation

Armature circuit				Field circuit	
Rated supply voltage [1]	Rated DC voltage	Rated DC current	Rated power	Rated DC current	Order No.
V	V	A	kW	A	
3 AC 400	485	60	29	10	**6RM8025-6DS22-0AA0**
		90	44	10	**6RM8028-6DS22-0AA0**
		125	61	10	**6RM8031-6DS22-0AA0**
		210	102	15	**6RM8075-6DS22-0AA0**
		280	136	15	**6RM8078-6DS22-0AA0**
		400	194	25	**6RM8081-6DS22-0AA0**
		600	291	25	**6RM8085-6DS22-0AA0**
		850	412	30	**6RM8087-6DS22-0AA0**
		1 200	582	30	**6RM8091-6DS22-0AA0**
		1 600	776	40	**6RM8093-4DS22-0AA0**
		2 000	970	40	**6RM8095-4DS22-0AA0**
		3 000	1 455	40	**6RM8098-4DS22-0AA0**
3 AC 480	575	60	35	10	**6RM8025-6FS22-0AA0**
		90	52	10	**6RM8028-6FS22-0AA0**
		125	72	10	**6RM8031-6FS22-0AA0**
		210	121	15	**6RM8075-6FS22-0AA0**
		280	161	15	**6RM8078-6FS22-0AA0**
		450	259	25	**6RM8082-6FS22-0AA0**
		600	345	25	**6RM8085-6FS22-0AA0**
		850	489	30	**6RM8087-6FS22-0AA0**
		1 200	690	30	**6RM8091-6FS22-0AA0**
3 AC 575	690	60	41	10	**6RM8025-6GS22-0AA0**
		125	86	10	**6RM8031-6GS22-0AA0**
		210	145	15	**6RM8075-6GS22-0AA0**
		400	276	25	**6RM8081-6GS22-0AA0**
		600	414	25	**6RM8085-6GS22-0AA0**
		800	552	30	**6RM8087-6GS22-0AA0**
		1 100	759	40	**6RM8090-6GS22-0AA0**
		1 600	1 104	40	**6RM8093-4GS22-0AA0**
		2 000	1 380	40	**6RM8095-4GS22-0AA0**
		2 200	1 518	40	**6RM8096-4GS22-0AA0**
		2 800	1 932	40	**6RM8097-4GS22-0AA0**
3 AC 690	830	720	598	30	**6RM8086-6KS22-0AA0**
		1 000	830	40	**6RM8090-6KS22-0AA0**
		1 500	1 245	40	**6RM8093-4KS22-0AA0**
		2 000	1 660	40	**6RM8095-4KS22-0AA0**
		2 600	2 158	40	**6RM8097-4KS22-0AA0**
3 AC 830	1 000	950	950	40	**6RM8088-6LS22-0AA0**
		1 500	1 500	40	**6RM8093-4LS22-0AA0**
		1 900	1 900	40	**6RM8095-4LS22-0AA0**
3 AC 950	1 140	2 200	2 508	40	**6RM8096-4MS22-0AA0**

[1] 50/60 Hz

Selection and ordering data (continued)

SINAMICS DC MASTER Cabinet for four-quadrant operation

Armature circuit				Field circuit	
Rated supply voltage [1]	Rated DC voltage	Rated DC current	Rated power	Rated DC current	Order No.
V	V	A	kW	A	
3 AC 400	420	15	6.3	3	**6RM8013-6DV62-0AA0**
		30	12.6	5	**6RM8018-6DV62-0AA0**
		60	25	10	**6RM8025-6DV62-0AA0**
		90	38	10	**6RM8028-6DV62-0AA0**
		125	53	10	**6RM8031-6DV62-0AA0**
		210	88	15	**6RM8075-6DV62-0AA0**
		280	118	15	**6RM8078-6DV62-0AA0**
		400	168	25	**6RM8081-6DV62-0AA0**
		600	252	25	**6RM8085-6DV62-0AA0**
		850	357	30	**6RM8087-6DV62-0AA0**
		1 200	504	30	**6RM8091-6DV62-0AA0**
		1 600	672	40	**6RM8093-4DV62-0AA0**
		2 000	840	40	**6RM8095-4DV62-0AA0**
		3 000	1 260	40	**6RM8098-4DV62-0AA0**
3 AC 480	500	15	6	3	**6RM8013-6FV62-0AA0**
		30	15	5	**6RM8018-6FV62-0AA0**
		60	30	10	**6RM8025-6FV62-0AA0**
		90	45	10	**6RM8028-6FV62-0AA0**
		125	63	10	**6RM8031-6FV62-0AA0**
		210	105	15	**6RM8075-6FV62-0AA0**
		280	140	15	**6RM8078-6FV62-0AA0**
		450	225	25	**6RM8082-6FV62-0AA0**
		600	300	25	**6RM8085-6FV62-0AA0**
		850	425	30	**6RM8087-6FV62-0AA0**
		1 200	600	30	**6RM8091-6FV62-0AA0**
3 AC 575	600	60	36	10	**6RM8025-6GV62-0AA0**
		125	75	10	**6RM8031-6GV62-0AA0**
		210	126	15	**6RM8075-6GV62-0AA0**
		400	240	25	**6RM8081-6GV62-0AA0**
		600	360	25	**6RM8085-6GV62-0AA0**
		850	510	30	**6RM8087-6GV62-0AA0**
		1 100	660	40	**6RM8090-6GV62-0AA0**
		1 600	960	40	**6RM8093-4GV62-0AA0**
		2 000	1 200	40	**6RM8095-4GV62-0AA0**
		2 200	1 320	40	**6RM8096-4GV62-0AA0**
		2 800	1 680	40	**6RM8097-4GV62-0AA0**
3 AC 690	725	760	551	30	**6RM8086-6KV62-0AA0**
		1 000	725	40	**6RM8090-6KV62-0AA0**
		1 500	1 088	40	**6RM8093-4KV62-0AA0**
		2 000	1 450	40	**6RM8095-4KV62-0AA0**
		2 600	1 885	40	**6RM8097-4KV62-0AA0**
3 AC 830	875	950	831	40	**6RM8088-6LV62-0AA0**
		1 500	1 313	40	**6RM8093-4LV62-0AA0**
		1 900	1 663	40	**6RM8095-4LV62-0AA0**
3 AC 950	1 000	2 200	2 200	40	**6RM8096-4MV62-0AA0**

[1] 50/60 Hz

Function

Operator control and visualization with AOP30

An AOP30 Advanced Operator Panel is located in the cabinet door of the converter cabinets for operation, monitoring and commissioning tasks.

The AOP30's two-stage safety concept prevents unintentional or unauthorized changes to settings. Operation of the drive from the operator panel can be disabled using the keyboard lock so that only parameter values and process variables can be displayed on the operating panel. The default setting of the OFF key is "activated", however this can be changed by the customer to "deactivated". A password can be used to prevent the unauthorized modification of the DC converter parameters.

The user is guided by interactive menus through the drive-commissioning screens. Only 5 parameters (which can be found on the motor rating plate and the line supply data) have to be entered on the AOP30 when commissioning the system for the first time. The closed-loop control is then optimized automatically to adapt the converter to the motor.

The operator panel languages German, English and Chinese can be used without any additional memory card. French, Italian, Spanish and Russian are available on the Control Unit memory card (option). The actual unit firmware including languages can be downloaded free of charge from the Internet under the following link:
http://support.automation.siemens.com/WW/view/en/38157755/133100

Communication

The units are equipped as standard with PROFIBUS – the industry standard. As a consequence, the converters can be simply and quickly integrated into the TIA environment. PROFINET is available as option. It goes without saying that communications can be established on the drive to higher-level control systems via the fieldbus. This means that using the STARTER commissioning tool, the drives can be monitored and diagnosed from a central location.

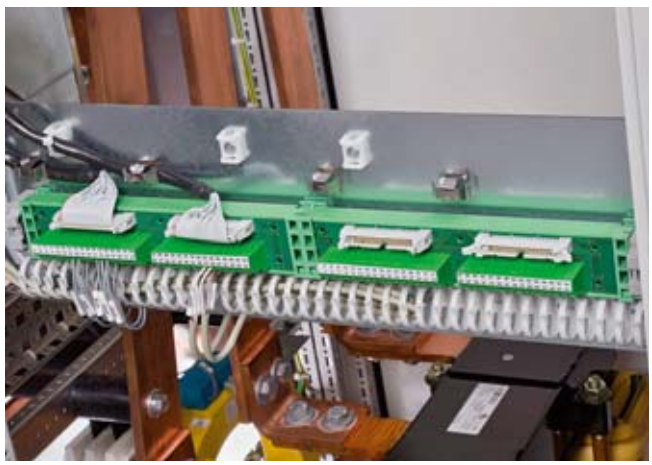
In addition to the communication interfaces, naturally there are many digital and analog inputs/outputs available; these can be used to control the converter or to output parameter values for diagnostics. The inputs and outputs are quickly and easily connected via the control terminal strip.

Control terminal strip TMC

The Terminal Module Cabinet (TMC) is located in the lower section of the cabinet, so that all of the digital and analog inputs/outputs can be quickly and simply connected. The installation space has been selected so that it is guaranteed that they are spatially separated from the power cables. Not only this, when retrofitting, the length of the existing signal cables are generally sufficient so that the signal terminals can be used. The digital input/outputs are connected via interface relays in order to guarantee operational safety and reliability. In addition to the inputs/outputs and the incremental encoder interface, optionally the tachometer connection can be routed to the control terminal strip.

Note:

A detailed terminal assignment is provided in the Section, Assignment of terminals and connectors.



Control terminal strip

Function (continued)

Terminals for the motor fan

The basic version already includes the power supply for the motor fan. The connections are protected using a motor protection circuit breaker. The setting range of the motor protection circuit breaker must be assigned as option (W20 to W41). As option, the feeder for the motor fan can be omitted or extended by a second motor fan feeder. The feeders are switched using a contactor, which is automatically controlled from the internal sequence control of the SINAMICS DC MASTER.

Terminals for the auxiliary supply

The basic version of the drive cabinet assumes that there is an auxiliary power supply of 400 V 3 AC, 50 Hz from a grounded line supply (TN or TT supply system). The power supply is also used to supply the field and the motor fan. Optionally, other supply voltages and a line frequency of 60 Hz can be selected. It also goes without saying that an option can be selected for an internal auxiliary power supply.

Dependent on the selected options, other terminals are available, for example for the cabinet anti-condensation heating. Data regarding the terminal assignment and the connection options are provided in the description of the relevant option.

For the power connections, the maximum connection cross-sections and the number of cables that can be connected are specified in the technical data.

Closed-loop control functions

Function	Description
Functions of the closed-loop control in the armature circuit	
Speed setpoint	The source of the speed setpoint and additional setpoints can be freely selected by making the appropriate parameter settings: • Entered using analog values 0 to ± 10 V, 0 to ± 20 mA, 4 to 20 mA • Entered via the fieldbus interface PROFIBUS, Ethernet interface for PROFINET (optional) • Via the integrated motorized potentiometer • Via binectors with the functions: Fixed setpoint, jogging, crawl • Entered via serial interfaces of the SINAMICS DC MASTER • Entered via supplementary modules • The scaling is realized so that 100 % setpoint (formed from the main setpoint and supplementary setpoints) corresponds to the max. motor speed. • The setpoint can be limited to a min. and max. value via a parameter or connector. Further, additional points are provided in the firmware e.g. in order to be able to enter supplementary setpoints before or after the ramp-function generator. The "setpoint enable function" can be selected using a binector. After a parameterizable filter function (PT1 element), the summed setpoint is transferred to the setpoint input of the speed controller. In this case, the ramp-function generator is also active.
Actual speed	One of four sources can be selected as signal for the speed actual value. • *Analog tachometer* The voltage of the tachogenerator at the maximum speed can be between 8 and 270 V. Adaptation to the voltage is realized using parameters. • *Pulse encoder* The pulse encoder type, the number of pulses per revolution and the maximum speed are set using parameters. From the evaluation electronics, the encoder signals (symmetrical: with additional, inverted track, non-symmetrical: referred to ground) can be processed up to a maximum differential voltage of 27 V. The rated voltage range (5 or 15 V) for the encoder can be selected using parameters. For a rated voltage of 15 V, the power supply for the pulse encoder can be taken from the DC converter. 5 V encoders require an external power supply. The pulse encoder is evaluated across the three tracks: Track 1, track 2 and zero mark. However, pulse encoders without zero mark can can also be used. A position actual value can be sensed using the zero mark. The max. frequency of the encoder pulses can be 300 kHz. Pulse encoders with a minimum of 1 024 pulses per revolution are recommended (due to the smooth running property at low speeds). • *Operation without tachometer with closed-loop EMF control* A speed actual value encoder is not required for the closed-loop EMF control. In this case, the output voltage of the device is measured in the DC converter. The measured armature voltage is compensated by the internal voltage drop across the motor (IR compensation). The level of compensation is automatically determined during the current controller optimization run. The accuracy of this control method, which is defined by the temperature-dependent change in the motor armature circuit resistance, is approximately 5 %. We recommend that the current controller optimization run is repeated when the motor is in the warm operating condition to achieve a higher degree of precision. The closed loop EMF control can be used if the requirements on the precision are not so high, if it is not possible to mount an encoder and the motor is operated in the armature voltage control range. Notice: In this mode, EMF-dependent field weakening is not possible. • *Freely selectable speed actual value signal* For this mode, any connector number can be selected as speed actual value signal. This setting is especially selected if the speed actual value sensing is implemented on a supplementary technology module. Before the speed actual value is transferred to the speed controller, it can be smoothed using a parameterizable smoothing element (PT1 element) and two adjustable bandstop filters. Bandstop filters are used primarily for the purpose of filtering out resonant frequencies caused by mechanical resonance. The resonant frequency and the filter quality factor can be set.

Function (continued)

Function	Description
Functions of the closed-loop control in the armature circuit (continued)	
Ramp-function generator	When there is a step change in the setpoint applied at its input, the ramp-function generator converts the setpoint into a signal with a steady rate of rise. Ramp-up time and ramp-down time can be selected independently of one another. In addition, the ramp-function generator has initial and final rounding-off (jerk limiting) that are effective at the beginning and end of the ramp-up time. All of the times for the ramp-function generator can be set independently of one another. Three parameter sets are available for the ramp-function generator times; these can be selected via binary select inputs or a serial interface (via binectors). The ramp-up function generator parameters can be switched over in operation. In addition, a multiplication factor can be applied to the value of parameter set 1 via a connector (to change the ramp-function generator data via a connector). When entering ramp-function generator times with the value zero, the speed setpoint is directly input into the speed controller.
Speed controller	The speed controller compares the setpoint and actual value of the speed and if there is a deviation, enters an appropriate current setpoint into the current controller (principle: Speed control with lower-level current controller). The speed controller is implemented as PI controller with additional D component that can be selected. Further, a switchable droop function can be parameterized. All of the controller parameters can be adjusted independently of one another. The value for K_p (gain) can be adapted depending on a connector signal (external or internal). In this case, the P gain of the speed controller can be adapted depending on the speed actual value, current actual value, setpoint-actual value distance or the wound roll diameter. This can be precontrolled in order to achieve a high dynamic performance in the speed control loop. For this purpose, e.g. depending on the friction and the moment of inertia of the drive, a torque setpoint signal can be added after the speed controller. The friction and moment of inertia compensation are determined using an automatic optimization run. The output quantity of the speed controller can be directly adjusted via parameter after the controller has been enabled. Depending on the parameterization, the speed controller can be bypassed and the converter controlled either with closed-loop torque or current control. In addition, it is also possible to switch between speed control/torque control in operation using the "leading/following switchover" selection function. The function can be selected as binector using a binary user-assignable terminal or a serial interface. The torque setpoint is input via a selectable connector and can therefore come from an analog user-assignable terminal or via a serial interface. A limiting controller is active when in the following drive state (torque or current controlled operation). In this case, depending on a speed limit that can be selected using parameters, the limiting controller can intervene in order to prevent the drive accelerating in an uncontrolled fashion. In this case, the drive is limited to an adjustable speed deviation.
Torque limitation	The speed controller output represents the torque setpoint or current setpoint depending on what has been parameterized. In torque-controlled operation, the speed controller output is weighted with the machine flux and transferred to a current limiting stage as a current setpoint. Torque control is primarily used in field weakening operation in order to limit the maximum motor torque independent of the speed. The following functions are available: • Independent setting of positive and negative torque limits using parameters. • Switchover of the torque limit using a binector as a function of a parameterizable switchover speed. • Free input of a torque limit by means of a connector signal, e.g. via an analog input or via serial interface. • The lowest specified quantity should always be effective as the actual torque limit. Additional torque setpoints can be added after the torque limit.
Current limiting	The current limit that can be adjusted after the torque limit is used to protect the converter and the motor. The lowest specified quantity is always effective as the actual current limit. The following current limit values can be set: • Independent setting of positive and negative current limits using parameters (max. motor current setting). • Free input of a current limit using a connector, e.g. from an analog input or via a serial interface. • Separate setting of current limit using parameters for stopping and quick stop. • Speed-dependent current limiting: An automatically initiated, speed-dependent reduction of the current limit at high speeds can be parameterized (commutation limit curve of the motor). • I^2t monitoring of the power section: The thermal state of the thyristors is calculated for all current values. When the thyristor limit temperature is reached, the unit responds as a function of parameter settings, i.e. the converter current is reduced to the rated DC current or the unit is shut down with a fault message. This function is used to protect the thyristors.
Current controller	The current controller is implemented as PI controller with P gain and integral time that can be set independently from one another. The P and I components can also be deactivated (pure P controller or pure I controller). The current actual value is sensed using a current transformer on the three-phase side and is fed to the current controller via a load resistor and rectification after analog-digital conversion. The resolution is 10 bits for the rated current current. The current limit output is used as current setpoint. The current controller output transfers the firing angle to the gating unit - the precontrol function is effective in parallel.
Precontrol	The precontrol in the current control loop improves the dynamic performance of the closed-loop control. This allows rise times of between 6 and 9 ms in the current control loop. The precontrol is effective dependent on the current setpoint and EMF of the motor and ensures - for intermittent and continuous current or when the torque direction is reversed - that the required firing angle is quickly transferred as setpoint to the gating unit.
Auto-reversing module	In conjunction with the current control loop, the auto-reversing module (only for units with four-quadrant drives) ensures the logical sequence of all of the operations and processes required to change the torque direction. The torque direction can also be disabled when required via parameter.

Function (continued)

Function	Description
Functions of the closed-loop control in the armature circuit (continued)	
Gating unit	The gating unit generates the firing pulses for the power section thyristors in synchronism with the line supply voltage. The synchronization is independent of the speed and the electronics supply and is sensed at the power section. The timing of the firing pulses is defined by the output values of the current controller and the precontrol. The firing angle limit can be set using parameters. In a frequency range from 45 to 65 Hz, the gating unit automatically adapts itself to the actual line frequency.
Functions of the closed-loop control in the field circuit	
EMF controller	The EMF controller compares the setpoint and actual value of the EMF (induced motor voltage) and enters the setpoint for the field current controller. This therefore permits field weakening control that is dependent on the EMF. The EMF controller operates as PI controller; P and I components can be adjusted independently of one another and/or the controller can be operated as pure P controller or pure I controller. A precontrol function operates in parallel to the EMF controller. Depending on the speed, it precontrols the field current setpoint using an automatically recorded field characteristic (refer to the optimization runs). There is an adding point after the EMF controller, where the supplementary field current setpoints can be entered either via a connector, via an analog input or a serial interface. The limit is then effective for the field current setpoint. In this case, the field current setpoint can be limited to a minimum and a maximum value that can be set independently from one another. The limit is realized using a parameter or a connector. The minimum for the upper limit or the maximum for the lower limit is effective.
Field current controller	The field current controller is a PI controller - where K_p and T_n can be independently set. It can also be operated as pure P and I controller. A precontrol function operates in parallel to the field current controller. This calculates and sets the firing angle for the field circuit as a function of current setpoint and line supply voltage. The precontrol supports the current controller and ensures that the field circuit has the appropriate dynamic performance.
Gating unit	The gating unit generates the firing pulses for the power section thyristors in synchronism with the line supply voltage in the field circuit. The synchronization is detected in the power section and is therefore independent of the electronics power supply. The timing of the firing pulses is defined by the output values of the current controller and the precontrol. The firing angle limit can be set using parameters. In a frequency range from 45 to 65 Hz, the gating unit automatically adapts itself to the actual line supply voltage.
Communication between drive components	
DRIVE-CLiQ	Communication between SINAMICS components is realized using the standard internal SINAMICS interface DRIVE-CLiQ (this is an abbreviation for Drive Component Link with IQ). This couples the Control Unit with the connected drive components (e.g. DC converter, Terminal Modules). DRIVE-CLiQ provides standard digital interfaces for all SINAMICS drives. This permits modularization of the drive functions and thus increased flexibility for customized solutions (allows power and intelligence to be separated). The DRIVE-CLiQ hardware is based on the Industrial Ethernet standard and uses twisted-pair cables. The DRIVE-CLiQ line provides the transmit and receive signals and also the 24 V power supply. Setpoints and actual values, control commands, status feedback signals and electronic rating plate data of the drive components are transferred via DRIVE-CLiQ. Only original Siemens cables must be used for DRIVE-CLiQ cables. As a result of the special transfer and damping properties, only these cables can guarantee that the system functions perfectly.
SINAMICS Link	SINAMICS Link allows data to be directly exchanged between several (2 to 64) Control Units. A higher-level master is not required. The following Control Units support SINAMICS Link: • CU320-2 • Advanced CUD In order to use SINAMICS Link, all of the Control Units must be equipped with the CBE20 Communication Board (option G20). For the Advanced CUD, a memory card is also required (options S01, S02). Communication can either be synchronous (only CU320-2) or non-synchronous or a combination of both. Each participant can send and receive up to 16 process data words. For instance, SINAMICS Link can be used for the following applications: • Torque distribution for n drives • Setpoint cascade for n drives • Load distribution of drives coupled through a material web • Master-slave function for infeed units • Couplings between SINAMICS units

Technical specifications

General technical data

Coolant temperature and installation altitude

Current derating

The permissible coolant temperatures and installation altitudes for SINAMICS DC MASTER Cabinet as well as the associated maximum permissible load in continuous operation can be taken from the following table (the load is specified as a % of the rated DC current).

Note: The rated DC current of the drive cabinets corresponds to the rated DC current of the DC converters installed in them. The degree of protection and cooling type of the drive cabinets as well as the coolant temperature and installation altitude influence the max. permissible load in continuous operation. In practice, the rated current of the DC motor lies significantly below the rated DC current of the next largest converter in order to be able to fully utilize the high overload capability of the motor. The derating factors below should be taken into account for the particular application.

Example:
Rated current of the DC motor 450 A, coolant temperature 40 °C, installation altitude of the drive cabinet 2 000 m, selected rated DC current of the converter 600 A, derating factor 81 %.

Result:
The maximum permissible load of the drive cabinet in continuous operation is 486 A, and is therefore sufficient for the motor.

Maximum permissible load of the drive cabinets in continuous operation
(load specified as % of the rated DC current)

Installation altitude above sea level
(The derating factors for intermediate values can be obtained through interpolation.)

Ambient or coolant temperature	Units	1 000 m					2 000 m					3 000 m					4 000 m					5 000 m				
	from 1 500 A																									
	from 950 A																									
	from 720 A																									
	from 210 A																									
	up to125 A																									
Degree of protection IP 20 up to IP21																										
25 °C	%							96	93	97	93	96	86	83	87	83	86	76	73	77	73	78	68	65	69	65
30 °C	%		100					91	88	92	88	90	81	78	82	78	80	71	68	72	68					
35 °C	%			95	99	95	94	86	83	87	83	84	76	73	77	73										
40 °C	%		95	90	94	90	88	81	78	82	78															
45 °C	%	94	90	85	89	85	82	76	73	77	73															
50 °C	%	88																								
Degree of protection IP23, IP43, IP54																										
25 °C	%							98	96	98	98	96	88	86	88	88	86	78	76	78	78	78	70	68	70	70
30 °C	%		100					93	91	93	93	90	83	81	83	83	80	73	71	73	73					
35 °C	%			98			94	88	86	88	88	84	78	76	78	78										
40 °C	%		95	93	95	95	88	83	81	83	83															
45 °C	%	94	90	88	90	90	82	78	76	78	78															
50 °C	%	88																								

Voltage derating

The cabinets can be operated up to an installation altitude of 4 000 m above sea level with the specified rated supply voltages. The line supply voltages may have overvoltage category III with respect to ground. For installation altitudes above 4 000 m, in some cases, it will be necessary to reduce the supply voltage or ensure that overvoltage category II is maintained. Detailed information is provided in the Operating Instructions.

Installation location

In their basic version (IP20), SINAMICS DC MASTER Cabinet drive cabinets are intended for use in closed electrical rooms (according to EN 61800-5-1).

These rooms must be dry and dust free, in order to prevent deposits of dirt accumulating, which in conjunction with moisture, could result in a conductive connection between live parts.

In plants, frequently electrical operating rooms have central power and fresh air supplies, which fulfill these requirements. If this is not the case, then the drive cabinet must be ordered with a higher degree of protection by specifying the appropriate options (M21, M23, M43, M54 and M58).

Technical specifications (continued)

General technical data	
Relevant standards	
EN 50274	Low-voltage switchgear and controlgear assemblies: Protection against electric shock - protection against accidental, direct contact with dangerous live parts, option M60 provides additional touch protection in accordance with BGV A3
EN 60529	Degrees of protection provided by the enclosures (IP code)
EN 61800-3	Adjustable speed electrical power drive systems, Part 3 - EMC product standard including specific test methods
EN 61800-5-1	Adjustable speed electrical power drive systems - Part 5_1: Requirements regarding safety - electrical, thermal, and energy requirements
EN 62477-1 (product standard, combines safety-relevant standards such as IEC 61800_5_1, IEC 60204_1)	Safety requirements for power semiconductor converter systems - Part 1: General information
EN 60204-1 (VDE 0113-1) where applicable	Safety of machinery - Electrical equipment of machines - Part 1: General requirements
The following standards are applicable for the SINAMICS DC MASTER DC Converter chassis units	EN 60146_1_1; EN 61800_5_1; IEC 62103 (identical with EN 50178). Additional information is provided in Catalog D 23.1.
Electrical data	
Overvoltage category	Category II according to EN 61800_5_1 within line supply circuits Category III according to EN 61800_5_1 for line supply circuits with respect to the surroundings (other line supply circuits, enclosure, electronics)
Overvoltage strength	Class 1 acc. to EN 50178
Radio interference suppression	SINAMICS DC MASTER Cabinet are operated in industrial environments and fulfill the requirements of EN 61800_3, Categories C3 and C4. Radio interference suppression filters are required for use in Category C2 (option L00)
Auxiliary power supply	400 V 3 AC at 50 Hz, optional: 60 Hz and/or other voltages
Overload capability	x × I_n 1.8
Mechanical data	
Degree of protection	IP20 according to EN 60529; optional: IP21, IP23, IP43 and IP54
Protection class	Class 1 acc. to EN 61140
Cooling type	Increased air cooling with integrated fan 0 up to 55 °C; the derating depends on the ambient temperature and installation altitude; see the table on the current derating
Closed-loop control constancy	
• for pulse encoder operation and digital setpoint	Δ_n = 0.006 % of the rated motor speed
• for analog tachometer and analog setpoint [1)]	Δ_n = 0.1 % of the rated motor speed
Environmental compatibility	Materials free of hazardous substances have been used for all of the essential parts. Only very few materials containing halogens are used for cable insulation and cable ducts (alternative designs available on request). All of the materials correspond to the RoHS criteria, with the exception of the backup battery in the AOP30. Environmental compatibility is also a key criterion in selecting supplier parts.
Environmental conditions	
Permissible ambient temperature during storage and transport	–25 ... +70 °C
Permissible humidity	relative air humidity ≤ 95 % (75 % at 17 °C as annual average, 95 % at 24 °C max., condensation is not permissible)
Climate class	3K3 according to EN 60721-3-3
Insulation	Pollution degree 2 according to EN 61800_5_1, Condensation not permissible
Installation altitude	≤ 1 000 m above sea level (100 % load capability) > 1 000 ... 5 000 m above sea level (see under "Coolant temperature and installation altitude")

Mechanical stability	**Storage**	**Transport**	**Operation**
Vibratory load	1M2 according to EN 60721-3-1 (toppling not permissible)	1.5 mm at 2 ... 9 Hz, 5 m/s^2 at 9 ... 200 Hz acc. to EN 60721-3-2 (toppling not permissible)	3M2 according to EN 60721-3-3
Shock load	1M2 according to EN 60721-3-1 (toppling not permissible)	40 m/s^2 at 11 ms acc. to EN 60721-3-2 (toppling not permissible)	3M2 according to EN 60721-3-3

Approvals	
Version according to UL	A converter cabinet design according to UL can be ordered by specifying option U09. Certification must be separately carried out.
Marine version	With option M66, the cabinet is provided in a marine design for onboard applications. Certification by the appropriate authorities must be carried out separately.

For footnote, see Page 3/15.

Technical specifications (continued)

Notes on dimensioning the fault current and insulation monitoring:

The basic version does not include any fault current monitoring devices. However, these can be ordered as option (L82 for grounded line supplies). Insulation monitoring according to the applicable regulations must be provided for operation in non-grounded IT line supplies. Options L87 or L88 are available to realize this.

Notes on touch protection:

In the standard version of the SINAMICS DC MASTER Cabinet, in compliance with the current standards, finger and back of hand protection is ensured when the cabinet doors are open. With option M60 "Additional touch protection", the drive cabinets are equipped with additional touch protection corresponding to BGV A3.

Notes on the armature circuit busbars:

Aluminum armature busbars are used for cabinets with rated DC currents of 1 500, 1 600, 1 900, 2 000 and 2 200 A. When selecting option M11, nickel-plated copper busbars are supplied.

[1] Conditions

The closed-loop control (PI control) constancy is referred to the rated motor speed and applies when the SINAMICS DC MASTER is in the warm operating condition. This is based on the following preconditions:

- Temperature changes of ± 10 °C
- Line supply voltage changes of +10 %/–5 % of the rated input voltage
- Temperature coefficient of tachometer generator with temperature compensation: 0.15 every 10 °C (for analog tachometer generator only)
- Constant setpoint

Technical specifications (continued)

SINAMICS DC MASTER Cabinet for 400 V 3 AC, 60 to 210 A, two-quadrant operation

		Type			
		6RM8025-6DS22-0AA0	6RM8028-6DS22-0AA0	6RM8031-6DS22-0AA0	6RM8075-6DS22-0AA0
Rated armature supply voltage	V	3 AC 400 (+15 %/–20 %)			
Rated armature input current	A	49.8	74.7	103.75	174.3
Cooling air requirement	m^3/h	800	800	800	800
Sound pressure level	dB (A)	72	72	72	72
Rated frequency	Hz	45 ... 65	45 ... 65	45 ... 65	45 ... 65
Rated DC voltage	V	485	485	485	485
Rated DC current	A	**60**	**90**	**125**	**210**
Overload capability	$x \times I_n$	1.8	1.8	1.8	1.8
Rated power	kW	29.1	43.65	60.625	101.85
Power loss at rated DC current	W	463	592	691	1 152
Rated DC field voltage	V	max. 325	max. 325	max. 325	max. 325
Rated DC field current	A	**10**	**10**	**10**	**15**
Max. connection cross-sections [1]					
• Line connection (3 phases and PE)	Number × mm^2	1 × 16	1 × 25	1 × 50	1 × 95
• Armature circuit connection	Number × mm^2	1 × 16	1 × 25	1 × 50	1 × 95
• Field circuit connection	Number × mm^2	1 × 1.5	1 × 1.5	1 × 1.5	1 × 2.5
• Auxiliary power supply	mm^2	2.5	2.5	2.5	4
Max. permissible fusing on the customer's side (NH fuse gL/gG)					
• Power connections	A	63	80	125	200
- Max. permissible short-circuit current	kA	50	50	50	50
• Auxiliary power supply	A	16	16	16	25
- Max. permissible short-circuit current	kA	30	30	30	30
Normal ambient temperature in operation	°C	See the table on installation altitude and ambient temperature on Page 3/13			
Dimensions					
• Width	mm	600	600	600	600
• Height	mm	2 326	2 326	2 326	2 326
• Depth	mm	600	600	600	600
Size		**BC**	**BC**	**BC**	**BC**
Weight, approx.	kg	233	233	240	263

[1] With cable lugs according to DIN 46234 or DIN 46235; for units from 2 600 to 3 000 A, motor cables are only directly connected at the DC converter using cable lugs according to DIN 46234.

Technical specifications (continued)

SINAMICS DC MASTER Cabinet for 400 V 3 AC, 280 to 850 A, two-quadrant operation

		Type			
		6RM8078-6DS22-0AA0	6RM8081-6DS22-0AA0	6RM8085-6DS22-0AA0	6RM8087-6DS22-0AA0
Rated armature supply voltage	V	3 AC 400 (+15 %/–20 %)			
Rated armature input current	A	232.4	332	498	705.5
Cooling air requirement	m^3/h	800	600	600	600
Sound pressure level	dB (A)	72	74	74	74
Rated frequency	Hz	45 ... 65	45 ... 65	45 ... 65	45 ... 65
Rated DC voltage	V	485	485	485	485
Rated DC current	A	**280**	**400**	**600**	**850**
Overload capability	$x \times I_n$	1.8	1.8	1.8	1.8
Rated power	kW	135.8	194	291	412.25
Power loss at rated DC current	W	1 482	2 131	2 884	3 759
Rated DC field voltage	V	max. 325	max. 325	max. 325	max. 325
Rated DC field current	A	**15**	**25**	**25**	**30**
Max. connection cross-sections [1]					
• Line connection (3 phases and PE)	Number × mm^2	1 × 120	1 × 185	2 × 150	2 × 240
• Armature circuit connection	Number × mm^2	2 × 50	1 × 185	2 × 150	4 × 95
• Field circuit connection	Number × mm^2	1 × 2.5	1 × 4	1 × 4	1 × 4
• Auxiliary power supply	mm^2	4	10	10	16
Max. permissible fusing on the customer's side (NH fuse gL/gG)					
• Power connections	A	250	355	500	710
- Max. permissible short-circuit current	kA	50	50	50	50
• Auxiliary power supply	A	25	50	50	63
- Max. permissible short-circuit current	kA	30	30	30	30
Normal ambient temperature in operation	°C	See the table on installation altitude and ambient temperature on Page 3/13			
Dimensions					
• Width	mm	600	800	800	1 200
• Height	mm	2 326	2 200	2 200	2 200
• Depth	mm	600	600	600	600
Size		**BC**	**CC**	**CC**	**DC**
Weight, approx.	kg	273	320	340	490

[1] With cable lugs according to DIN 46234 or DIN 46235; for units from 2 600 to 3 000 A, motor cables are only directly connected at the DC converter using cable lugs according to DIN 46234.

Technical specifications (continued)

SINAMICS DC MASTER Cabinet for 400 V 3 AC, 1 200 to 3 000 A, two-quadrant operation

		Type			
		6RM8091-6DS22-0AA0	6RM8093-4DS22-0AA0	6RM8095-4DS22-0AA0	6RM8098-4DS22-0AA0
Rated armature supply voltage	V	3 AC 400 (+15 %/–20 %)			
Rated armature input current	A	996	1 328	1 660	2 490
Cooling air requirement	m^3/h	1 000	3 000	3 000	3 000
Sound pressure level	dB (A)	76	78	78	78
Rated frequency	Hz	45 ... 65	45 ... 65	45 ... 65	45 ... 65
Rated DC voltage	V	485	485	485	485
Rated DC current	A	**1 200**	**1 600**	**2 000**	**3 000**
Overload capability	$x \times I_n$	1.8	1.8	1.8	1.8
Rated power	kW	582	776	970	1 455
Power loss at rated DC current	W	4 697	6 430	7 618	11 747
Rated DC field voltage	V	max. 390	max. 390	max. 390	max. 390
Rated DC field current	A	**30**	**40**	**40**	**40**
Max. connection cross-sections [1]					
• Line connection (3 phases and PE)	Number × mm^2	4 × 150	6 × 150	6 × 185	8 × 240
• Armature circuit connection	Number × mm^2	4 × 185	8 × 95	8 × 150	8 × 240
• Field circuit connection	Number × mm^2	1 × 4	1 × 6	1 × 6	1 × 6
• Auxiliary power supply	mm^2	16	35	35	35
Max. permissible fusing on the customer's side (NH fuse gL/gG)					
• Power connections	A	_ [2]	_ [2]	_ [2]	_ [2]
- Max. permissible short-circuit current	kA	65	75	75	75
• Auxiliary power supply	A	63	100	100	100
- Max. permissible short-circuit current	kA	30	50	50	50
Normal ambient temperature in operation	°C	See the table on installation altitude and ambient temperature on Page 3/13			
Dimensions					
• Width	mm	1 200	1 400	1 400	1 400
• Height	mm	2 200	2 200	2 200	2 200
• Depth	mm	600	600	600	600
Size		**DC**	**EC**	**EC**	**EC**
Weight, approx.	kg	570	760	800	930

[1] With cable lugs according to DIN 46234 or DIN 46235; for units from 2 600 to 3 000 A, motor cables are only directly connected at the DC converter using cable lugs according to DIN 46234.

[2] It must be ensured that the maximum permissible short-circuit current at the supply switch of the drive cabinet is not exceeded.

Technical specifications (continued)

SINAMICS DC MASTER Cabinet for 480 V 3 AC, 60 to 280 A, two-quadrant operation

		Type				
		6RM8025-6FS22-0AA0	6RM8028-6FS22-0AA0	6RM8031-6FS22-0AA0	6RM8075-6FS22-0AA0	6RM8078-6FS22-0AA0
Rated armature supply voltage	V	3 AC 480 (+10 %/–20 %)				
Rated armature input current	A	49.8	74.7	103.75	174.3	232.4
Cooling air requirement	m^3/h	800	800	800	800	800
Sound pressure level	dB (A)	72	72	72	72	72
Rated frequency	Hz	45 ... 65	45 ... 65	45 ... 65	45 ... 65	45 ... 65
Rated DC voltage	V	575	575	575	575	575
Rated DC current	A	**60**	**90**	**125**	**210**	**280**
Overload capability	$x \times I_n$	1.8	1.8	1.8	1.8	1.8
Rated power	kW	34.5	51.75	71.875	120.75	161
Power loss at rated DC current	W	512	614	713	1 225	1 481
Rated DC field voltage	V	max. 390	max. 390	max. 390	max. 390	max. 390
Rated DC field current	A	**10**	**10**	**10**	**15**	**15**
Max. connection cross-sections [1]						
• Line connection (3 phases and PE)	Number × mm^2	1 × 16	1 × 25	1 × 50	1 × 95	1 × 120
• Armature circuit connection	Number × mm^2	1 × 16	1 × 25	1 × 50	1 × 95	2 × 50
• Field circuit connection	Number × mm^2	1 × 1.5	1 × 1.5	1 × 1.5	1 × 2.5	1 × 2.5
• Auxiliary power supply	mm^2	2.5	2.5	2.5	4	4
Max. permissible fusing on the customer's side (NH fuse gL/gG)						
• Power connections	A	63	80	125	200	250
- Max. permissible short-circuit current	kA	50	50	50	50	50
• Auxiliary power supply	A	16	16	16	25	25
- Max. permissible short-circuit current	kA	30	30	30	30	30
Normal ambient temperature in operation	°C	See the table on installation altitude and ambient temperature on Page 3/13				
Dimensions						
• Width	mm	600	600	600	600	600
• Height	mm	2 326	2 326	2 326	2 326	2 326
• Depth	mm	600	600	600	600	600
Size		**BC**	**BC**	**BC**	**BC**	**BC**
Weight, approx.	kg	233	238	240	273	273

[1] With cable lugs according to DIN 46234 or DIN 46235; for units from 2 600 to 3 000 A, motor cables are only directly connected at the DC converter using cable lugs according to DIN 46234.

Technical specifications (continued)

SINAMICS DC MASTER Cabinet for 480 V 3 AC, 450 to 1 200 A, two-quadrant operation

		Type			
		6RM8082-6FS22-0AA0	6RM8085-6FS22-0AA0	6RM8087-6FS22-0AA0	6RM8091-6FS22-0AA0
Rated armature supply voltage	V	3 AC 480 (+10 %/–20 %)			
Rated armature input current	A	373.5	498	705.5	996
Cooling air requirement	m^3/h	600	600	600	1 000
Sound pressure level	dB (A)	74	74	74	76
Rated frequency	Hz	45 ... 65	45 ... 65	45 ... 65	45 ... 65
Rated DC voltage	V	575	575	575	575
Rated DC current	A	**450**	**600**	**850**	**1 200**
Overload capability	$x \times I_n$	1.8	1.8	1.8	1.8
Rated power	kW	258.75	345	488.75	690
Power loss at rated DC current	W	2 377	3 097	3 983	4 857
Rated DC field voltage	V	max. 390	max. 390	max. 390	max. 390
Rated DC field current	A	**25**	**25**	**30**	**30**
Max. connection cross-sections [1]					
• Line connection (3 phases and PE)	Number × mm^2	2 × 120	2 × 150	2 × 240	4 × 150
• Armature circuit connection	Number × mm^2	2 × 95	2 × 150	4 × 95	4 × 185
• Field circuit connection	Number × mm^2	1 × 4	1 × 4	1 × 4	1 × 4
• Auxiliary power supply	mm^2	10	10	16	16
Max. permissible fusing on the customer's side (NH fuse gL/gG)					
• Power connections	A	400	500	710	– [2]
- Max. permissible short-circuit current	kA	50	50	50	65
• Auxiliary power supply	A	50	50	63	63
- Max. permissible short-circuit current	kA	30	30	30	30
Normal ambient temperature in operation	°C	See the table on installation altitude and ambient temperature on Page 3/13			
Dimensions					
• Width	mm	800	800	1 200	1 200
• Height	mm	2 200	2 200	2 200	2 200
• Depth	mm	600	600	600	600
Size		**CC**	**CC**	**DC**	**DC**
Weight, approx.	kg	340	355	500	570

[1] With cable lugs according to DIN 46234 or DIN 46235; for units from 2 600 to 3 000 A, motor cables are only directly connected at the DC converter using cable lugs according to DIN 46234.

[2] It must be ensured that the maximum permissible short-circuit current at the supply switch of the drive cabinet is not exceeded.

Technical specifications (continued)

SINAMICS DC MASTER Cabinet for 575 V 3 AC, 60 to 400 A, two-quadrant operation

		Type			
		6RM8025-6GS22-0AA0	6RM8031-6GS22-0AA0	6RM8075-6GS22-0AA0	6RM8081-6GS22-0AA0
Rated armature supply voltage	V	3 AC 575 (+10 %/–20 %)			
Rated armature input current	A	49.8	103.75	174.3	332
Cooling air requirement	m^3/h	800	800	800	600
Sound pressure level	dB (A)	72	72	72	74
Rated frequency	Hz	45 ... 65	45 ... 65	45 ... 65	45 ... 65
Rated DC voltage	V	690	690	690	690
Rated DC current	A	**60**	**125**	**210**	**400**
Overload capability	$x \times I_n$	1.8	1.8	1.8	1.8
Rated power	kW	41.4	86.25	144.9	276
Power loss at rated DC current	W	487	762	1 284	2 439
Rated DC field voltage	V	max. 390	max. 390	max. 390	max. 390
Rated DC field current	A	**10**	**10**	**15**	**25**
Max. connection cross-sections [1]					
• Line connection (3 phases and PE)	Number × mm^2	1 × 16	1 × 50	1 × 95	1 × 185
• Armature circuit connection	Number × mm^2	1 × 16	1 × 50	1 × 95	1 × 185
• Field circuit connection	Number × mm^2	1 × 1.5	1 × 1.5	1 × 2.5	1 × 4
• Auxiliary power supply	mm^2	2.5	2.5	4	10
Max. permissible fusing on the customer's side (NH fuse gL/gG)					
• Power connections	A	63	125	200	355
- Max. permissible short-circuit current	kA	50	50	50	50
• Auxiliary power supply	A	16	16	25	50
- Max. permissible short-circuit current	kA	30	30	30	30
Normal ambient temperature in operation	°C	See the table on installation altitude and ambient temperature on Page 3/13			
Dimensions					
• Width	mm	600	600	600	800
• Height	mm	2 326	2 326	2 326	2 200
• Depth	mm	600	600	600	600
Size		**BC**	**BC**	**BC**	**CC**
Weight, approx.	kg	233	240	273	335

[1] With cable lugs according to DIN 46234 or DIN 46235; for units from 2 600 to 3 000 A, motor cables are only directly connected at the DC converter using cable lugs according to DIN 46234.

Technical specifications (continued)

SINAMICS DC MASTER Cabinet for 575 V 3 AC, 600 to 1 600 A, two-quadrant operation

		Type			
		6RM8085-6GS22-0AA0	6RM8087-6GS22-0AA0	6RM8090-6GS22-0AA0	6RM8093-4GS22-0AA0
Rated armature supply voltage	V	3 AC 575 (+10 %/–20 %)			
Rated armature input current	A	498	664	913	1 328
Cooling air requirement	m^3/h	600	600	1 000	3 000
Sound pressure level	dB (A)	74	74	76	78
Rated frequency	Hz	45 ... 65	45 ... 65	45 ... 65	45 ... 65
Rated DC voltage	V	690	690	690	690
Rated DC current	A	**600**	**800**	**1 100**	**1 600**
Overload capability	$x \times I_n$	1.8	1.8	1.8	1.8
Rated power	kW	414	552	759	1 104
Power loss at rated DC current	W	3 190	3 932	4 583	6 988
Rated DC field voltage	V	max. 390	max. 390	max. 390	max. 390
Rated DC field current	A	**25**	**30**	**30**	**40**
Max. connection cross-sections [1]					
• Line connection (3 phases and PE)	Number × mm^2	2 × 150	2 × 240	4 × 150	6 × 150
• Armature circuit connection	Number × mm^2	2 × 150	4 × 95	4 × 120	8 × 95
• Field circuit connection	Number × mm^2	1 × 4	1 × 4	1 × 4	1 × 6
• Auxiliary power supply	mm^2	10	16	16	35
Max. permissible fusing on the customer's side (NH fuse gL/gG)					
• Power connections	A	500	710	_ [2]	_ [2]
- Max. permissible short-circuit current	kA	50	50	65	75
• Auxiliary power supply	A	50	63	63	100
- Max. permissible short-circuit current	kA	30	30	30	50
Normal ambient temperature in operation	°C	See the table on installation altitude and ambient temperature on Page 3/13			
Dimensions					
• Width	mm	800	1 200	1 200	1 400
• Height	mm	2 200	2 200	2 200	2 200
• Depth	mm	600	600	600	600
Size		**CC**	**DC**	**DC**	**EC**
Weight, approx.	kg	355	515	600	775

[1] With cable lugs according to DIN 46234 or DIN 46235; for units from 2 600 to 3 000 A, motor cables are only directly connected at the DC converter using cable lugs according to DIN 46234.

[2] It must be ensured that the maximum permissible short-circuit current at the supply switch of the drive cabinet is not exceeded.

Technical specifications (continued)

SINAMICS DC MASTER Cabinet for 575 V 3 AC, 2 000 to 2 800 A, two-quadrant operation

		Type		
		6RM8095-4GS22-0AA0	6RM8096-4GS22-0AA0	6RM8097-4GS22-0AA0
Rated armature supply voltage	V	3 AC 575 (+10 %/–20 %)		
Rated armature input current	A	1 660	1 826	2 324
Cooling air requirement	m^3/h	3 000	3 000	3 000
Sound pressure level	dB (A)	78	78	78
Rated frequency	Hz	45 ... 65	45 ... 65	45 ... 65
Rated DC voltage	V	690	690	690
Rated DC current	A	**2 000**	**2 200**	**2 800**
Overload capability	$x \times I_n$	1.8	1.8	1.8
Rated power	kW	1 380	1 518	1 932
Power loss at rated DC current	W	8 090	8 408	11 937
Rated DC field voltage	V	max. 390	max. 390	max. 390
Rated DC field current	A	**40**	**40**	**40**
Max. connection cross-sections [1]				
• Line connection (3 phases and PE)	Number × mm^2	6 × 185	8 × 150	8 × 240
• Armature circuit connection	Number × mm^2	8 × 150	8 × 185	8 × 240
• Field circuit connection	Number × mm^2	1 × 6	1 × 6	1 × 6
• Auxiliary power supply	mm^2	35	35	35
Max. permissible fusing on the customer's side (NH fuse gL/gG)				
• Power connections	A	– [2]	– [2]	– [2]
- Max. permissible short-circuit current	kA	75	75	75
• Auxiliary power supply	A	100	100	100
- Max. permissible short-circuit current	kA	50	50	50
Normal ambient temperature in operation	°C	See the table on installation altitude and ambient temperature on Page 3/13		
Dimensions				
• Width	mm	1 400	1 400	1 400
• Height	mm	2 200	2 200	2 200
• Depth	mm	600	600	600
Size		**EC**	**EC**	**EC**
Weight, approx.	kg	830	930	1 010

[1] With cable lugs according to DIN 46234 or DIN 46235; for units from 2 600 to 3 000 A, motor cables are only directly connected at the DC converter using cable lugs according to DIN 46234.

[2] It must be ensured that the maximum permissible short-circuit current at the supply switch of the drive cabinet is not exceeded.

Technical specifications (continued)

SINAMICS DC MASTER Cabinet for 690 V 3 AC, 720 to 2 600 A, two-quadrant operation

		Type				
		6RM8086-6KS22-0AA0	6RM8090-6KS22-0AA0	6RM8093-4KS22-0AA0	6RM8095-4KS22-0AA0	6RM8097-4KS22-0AA0
Rated armature supply voltage	V	3 AC 690 (+10 %/–20 %)				
Rated armature input current	A	597.6	830	1 245	1 660	2 158
Cooling air requirement	m^3/h	600	1 000	3 000	3 000	3 000
Sound pressure level	dB (A)	74	76	78	78	78
Rated frequency	Hz	45 ... 65	45 ... 65	45 ... 65	45 ... 65	45 ... 65
Rated DC voltage	V	830	830	830	830	830
Rated DC current	A	**720**	**1 000**	**1 500**	**2 000**	**2 600**
Overload capability	$x \times I_n$	1.8	1.8	1.8	1.8	1.8
Rated power	kW	597.6	830	1 245	1 660	2 158
Power loss at rated DC current	W	4 012	4 642	7 627	9 175	12 007
Rated DC field voltage	V	max. 390	max. 390	max. 390	max. 390	max. 390
Rated DC field current	A	**30**	**30**	**40**	**40**	**40**
Max. connection cross-sections [1]						
• Line connection (3 phases and PE)	Number × mm^2	2 × 240	4 × 120	6 × 120	6 × 185	8 × 240
• Armature circuit connection	Number × mm^2	4 × 95	4 × 120	8 × 95	8 × 150	8 × 240
• Field circuit connection	Number × mm^2	1 × 4	1 × 4	1 × 6	1 × 6	1 × 6
• Auxiliary power supply	mm^2	16	16	35	35	35
Max. permissible fusing on the customer's side (NH fuse gL/gG)						
• Power connections	A	630	_ [2]	_ [2]	_ [2]	_ [2]
- Max. permissible short-circuit current	kA	50	65	75	75	75
• Auxiliary power supply	A	63	63	100	100	100
- Max. permissible short-circuit current	kA	30	30	50	50	50
Normal ambient temperature in operation	°C	See the table on installation altitude and ambient temperature on Page 3/13				
Dimensions						
• Width	mm	1 200	1 200	1 400	1 400	1 600
• Height	mm	2 200	2 200	2 200	2 200	2 200
• Depth	mm	600	600	600	600	600
Size		**DC**	**DC**	**EC**	**EC**	**FC**
Weight, approx.	kg	515	600	795	830	1 050

[1] With cable lugs according to DIN 46234 or DIN 46235; for units from 2 600 to 3 000 A, motor cables are only directly connected at the DC converter using cable lugs according to DIN 46234.

[2] It must be ensured that the maximum permissible short-circuit current at the supply switch of the drive cabinet is not exceeded.

Technical specifications (continued)

SINAMICS DC MASTER Cabinet for 830 V 3 AC, 950 to 1 900 A and 950 V 3 AC, 2 200 A, two-quadrant operation

		Type			
		6RM8088-6LS22-0AA0	6RM8093-4LS22-0AA0	6RM8095-4LS22-0AA0	6RM8096-4MS22-0AA0
Rated armature supply voltage	V	3 AC 830 (+10 %/–20 %)			3 AC 950 (+15 %/–20 %)
Rated armature input current	A	788.5	1 245	1 577	1 826
Cooling air requirement	m^3/h	1 000	3 000	3 000	3 000
Sound pressure level	dB (A)	76	78	78	78
Rated frequency	Hz	45 ... 65	45 ... 65	45 ... 65	45 ... 65
Rated DC voltage	V	1 000	1 000	1 000	1 140
Rated DC current	A	**950**	**1 500**	**1 900**	**2 200**
Overload capability	$x \times I_n$	1.8	1.8	1.8	1.8
Rated power	kW	950	1 500	1 900	2 508
Power loss at rated DC current	W	4 911	8 039	9 986	12 957
Rated DC field voltage	V	max. 390	max. 390	max. 390	max. 390
Rated DC field current	A	**30**	**40**	**40**	**40**
Max. connection cross-sections [1]					
• Line connection (3 phases and PE)	Number × mm^2	4 × 120	6 × 120	6 × 185	8 × 150
• Armature circuit connection	Number × mm^2	4 × 120	8 × 95	8 × 150	8 × 185
• Field circuit connection	Number × mm^2	1 × 4	1 × 6	1 × 6	1 × 6
• Auxiliary power supply	mm^2	16	35	35	35
Max. permissible fusing on the customer's side (NH fuse gL/gG)					
• Power connections	A	_ [2]	_ [2]	_ [2]	_ [2]
- Max. permissible short-circuit current	kA	50	50	50	50
• Auxiliary power supply	A	63	100	100	100
- Max. permissible short-circuit current	kA	30	50	50	50
Normal ambient temperature in operation	°C	See the table on installation altitude and ambient temperature on Page 3/13			
Dimensions					
• Width	mm	1 200	1 400	1 400	1 600
• Height	mm	2 200	2 200	2 200	2 200
• Depth	mm	600	600	600	600
Size		**DC**	**EC**	**EC**	**FC**
Weight, approx.	kg	600	825	905	1 050

[1] With cable lugs according to DIN 46234 or DIN 46235; for units from 2 600 to 3 000 A, motor cables are only directly connected at the DC converter using cable lugs according to DIN 46234.

[2] It must be ensured that the maximum permissible short-circuit current at the supply switch of the drive cabinet is not exceeded.

Technical specifications (continued)

SINAMICS DC MASTER Cabinet for 400 V 3 AC, 15 to 90 A, four-quadrant operation

		Type			
		6RM8013-6DV62-0AA0	6RM8018-6DV62-0AA0	6RM8025-6DV62-0AA0	6RM8028-6DV62-0AA0
Rated armature supply voltage	V	3 AC 400 (+15 %/–20 %)			
Rated armature input current	A	12	25	50	75
Cooling air requirement	m^3/h	800	800	800	800
Sound pressure level	dB (A)	72	72	72	72
Rated frequency	Hz	45 ... 65	45 ... 65	45 ... 65	45 ... 65
Rated DC voltage	V	420	420	420	420
Rated DC current	A	**15**	**30**	**60**	**90**
Overload capability	$x \times I_n$	1.8	1.8	1.8	1.8
Rated power	kW	6.3	12.6	25.2	37.8
Power loss at rated DC current	W	292	372	485	587
Rated DC field voltage	V	max. 325	max. 325	max. 325	max. 325
Rated DC current Feld	A	**3**	**5**	**10**	**10**
Max. connection cross-sections [1]					
• Line connection (3 phases and PE)	Number × mm^2	1 × 2.5	1 × 6	1 × 16	1 × 25
• Armature circuit connection	Number × mm^2	1 × 2.5	1 × 6	1 × 16	1 × 25
• Field circuit connection	Number × mm^2	1 × 1.5	1 × 1.5	1 × 1.5	1 × 1.5
• Auxiliary power supply	mm^2	2.5	2.5	2.5	2.5
Max. permissible fusing on the customer's side (NH fuse gL/gG)					
• Power connections	A	20	32	63	80
- Max. permissible short-circuit current	kA	50	50	50	50
• Auxiliary power supply	A	16	16	16	16
- Max. permissible short-circuit current	kA	30	30	30	30
Normal ambient temperature in operation	°C	See the table on installation altitude and ambient temperature on Page 3/13			
Dimensions					
• Width	mm	600	600	600	600
• Height	mm	2 326	2 326	2 326	2 326
• Depth	mm	600	600	600	600
Size		**BC**	**BC**	**BC**	**BC**
Weight, approx.	kg	233	213	233	233

[1] With cable lugs according to DIN 46234 or DIN 46235; for units from 2 600 to 3 000 A, motor cables are only directly connected at the DC converter using cable lugs according to DIN 46234.

Technical specifications (continued)

SINAMICS DC MASTER Cabinet for 400 V 3 AC, 125 to 400 A, four-quadrant operation

		Type			
		6RM8031-6DV62-0AA0	6RM8075-6DV62-0AA0	6RM8078-6DV62-0AA0	6RM8081-6DV62-0AA0
Rated armature supply voltage	V	3 AC 400 (+15 %/–20 %)			
Rated armature input current	A	104	174	232	332
Cooling air requirement	m^3/h	800	800	800	600
Sound pressure level	dB (A)	72	72	72	74
Rated frequency	Hz	45 ... 65	45 ... 65	45 ... 65	45 ... 65
Rated DC voltage	V	420	420	420	420
Rated DC current	A	**125**	**210**	**280**	**400**
Overload capability	$x \times I_n$	1.8	1.8	1.8	1.8
Rated power	kW	52.5	88.2	117.6	168
Power loss at rated DC current	W	726	1 202	1 557	2 226
Rated DC field voltage	V	max. 325	max. 325	max. 325	max. 325
Rated DC current Feld	A	**10**	**15**	**15**	**25**
Max. connection cross-sections [1]					
• Line connection (3 phases and PE)	Number × mm^2	1 × 50	1 × 95	1 × 120	1 × 185
• Armature circuit connection	Number × mm^2	1 × 50	1 × 95	2 × 50	1 × 185
• Field circuit connection	Number × mm^2	1 × 1.5	1 × 2.5	1 × 2.5	1 × 4
• Auxiliary power supply	mm^2	2.5	4	4	10
Max. permissible fusing on the customer's side (NH fuse gL/gG)					
• Power connections	A	125	200	250	355
- Max. permissible short-circuit current	kA	50	50	50	50
• Auxiliary power supply	A	16	25	25	50
- Max. permissible short-circuit current	kA	30	30	30	30
Normal ambient temperature in operation	°C	See the table on installation altitude and ambient temperature on Page 3/13			
Dimensions					
• Width	mm	600	600	600	800
• Height	mm	2 326	2 326	2 326	2 200
• Depth	mm	600	600	600	600
Size		**BC**	**BC**	**BC**	**CC**
Weight, approx.	kg	240	263	273	320

[1] With cable lugs according to DIN 46234 or DIN 46235; for units from 2 600 to 3 000 A, motor cables are only directly connected at the DC converter using cable lugs according to DIN 46234.

Technical specifications (continued)

SINAMICS DC MASTER Cabinet for 400 V 3 AC, 600 to 1 600 A, four-quadrant operation

		Type			
		6RM8085-6DV62-0AA0	6RM8087-6DV62-0AA0	6RM8091-6DV62-0AA0	6RM8093-4DV62-0AA0
Rated armature supply voltage	V	3 AC 400 (+15 %/–20 %)			
Rated armature input current	A	498	706	996	1 328
Cooling air requirement	m^3/h	600	600	1 000	3 000
Sound pressure level	dB (A)	74	74	76	78
Rated frequency	Hz	45 ... 65	45 ... 65	45 ... 65	45 ... 65
Rated DC voltage	V	420	420	420	420
Rated DC current	A	**600**	**850**	**1 200**	**1 600**
Overload capability	$x \times I_n$	1.8	1.8	1.8	1.8
Rated power	kW	252	357	504	672
Power loss at rated DC current	W	2 984	3 939	4 697	6 430
Rated DC field voltage	V	max. 325	max. 325	max. 390	max. 390
Rated DC field current	A	**25**	**30**	**30**	**40**
Max. connection cross-sections [1]					
• Line connection (3 phases and PE)	Number × mm^2	2 × 150	2 × 240	4 × 150	6 × 150
• Armature circuit connection	Number × mm^2	2 × 150	4 × 95	4 × 185	8 × 95
• Field circuit connection	Number × mm^2	1 × 4	1 × 4	1 × 4	1 × 6
• Auxiliary power supply	mm^2	10	16	16	35
Max. permissible fusing on the customer's side (NH fuse gL/gG)					
• Power connections	A	500	710	– [2]	– [2]
- Max. permissible short-circuit current	kA	50	50	65	75
• Auxiliary power supply	A	50	63	63	100
- Max. permissible short-circuit current	kA	30	30	30	50
Normal ambient temperature in operation	°C	See the table on installation altitude and ambient temperature on Page 3/13			
Dimensions					
• Width	mm	800	1 200	1 200	1 400
• Height	mm	2 200	2 200	2 200	2 200
• Depth	mm	600	600	600	600
Size		**CC**	**DC**	**DC**	**EC**
Weight, approx.	kg	340	490	570	780

[1] With cable lugs according to DIN 46234 or DIN 46235; for units from 2 600 to 3 000 A, motor cables are only directly connected at the DC converter using cable lugs according to DIN 46234.

[2] It must be ensured that the maximum permissible short-circuit current at the supply switch of the drive cabinet is not exceeded.

Technical specifications (continued)

SINAMICS DC MASTER Cabinet for 400 V 3 AC, 2 000 to 3 000 A, four-quadrant operation

		Type	
		6RM8095-4DV62-0AA0	6RM8098-4DV62-0AA0
Rated armature supply voltage	V	3 AC 400 (+15 %/–20 %)	
Rated armature input current	A	1 660	2 490
Cooling air requirement	m^3/h	3 000	3 000
Sound pressure level	dB (A)	78	78
Rated frequency	Hz	45 ... 65	45 ... 65
Rated DC voltage	V	420	420
Rated DC current	A	**2 000**	**3 000**
Overload capability	$x \times I_n$	1.8	1.8
Rated power	kW	840	1 260
Power loss at rated DC current	W	7 618	11 747
Rated DC field voltage	V	max. 390	max. 390
Rated DC field current	A	**40**	**40**
Max. connection cross-sections [1]			
• Line connection (3 phases and PE)	Number × mm^2	6 × 185	8 × 240
• Armature circuit connection	Number × mm^2	8 × 150	8 × 240
• Field circuit connection	Number × mm^2	1 × 6	1 × 6
• Auxiliary power supply	mm^2	35	35
Max. permissible fusing on the customer's side (NH fuse gL/gG)			
• Power connections	A	– [2]	– [2]
- Max. permissible short-circuit current	kA	75	75
• Auxiliary power supply	A	100	100
- Max. permissible short-circuit current	kA	50	50
Normal ambient temperature in operation	°C	See the table on installation altitude and ambient temperature on Page 3/13	
Dimensions			
• Width	mm	1 400	1 400
• Height	mm	2 200	2 200
• Depth	mm	600	600
Size		**EC**	**EC**
Weight, approx.	kg	820	950

[1] With cable lugs according to DIN 46234 or DIN 46235; for units from 2 600 to 3 000 A, motor cables are only directly connected at the DC converter using cable lugs according to DIN 46234.

[2] It must be ensured that the maximum permissible short-circuit current at the supply switch of the drive cabinet is not exceeded.

Technical specifications (continued)

SINAMICS DC MASTER Cabinet for 480 V 3 AC, 15 to 90 A, four-quadrant operation

		Type			
		6RM8013-6FV62-0AA0	6RM8018-6FV62-0AA0	6RM8025-6FV62-0AA0	6RM8028-6FV62-0AA0
Rated armature supply voltage	V	3 AC 480 (+10 %/–20 %)			
Rated armature input current	A	12	25	50	75
Cooling air requirement	m^3/h	800	800	800	800
Sound pressure level	dB (A)	72	72	72	72
Rated frequency	Hz	45 ... 65	45 ... 65	45 ... 65	45 ... 65
Rated DC voltage	V	500	500	500	500
Rated DC current	A	**15**	**30**	**60**	**90**
Overload capability	$x \times I_n$	1.8	1.8	1.8	1.8
Rated power	kW	6.3	15	30	45
Power loss at rated DC current	W	292	377	534	609
Rated DC field voltage	V	max. 390	max. 390	max. 390	max. 390
Rated DC field current	A	**3**	**5**	**10**	**10**
Max. connection cross-sections [1]					
• Line connection (3 phases and PE)	Number × mm^2	1 × 2.5	1 × 6	1 × 16	1 × 25
• Armature circuit connection	Number × mm^2	1 × 2.5	1 × 6	1 × 16	1 × 25
• Field circuit connection	Number × mm^2	1 × 1.5	1 × 1.5	1 × 1.5	1 × 1.5
• Auxiliary power supply	mm^2	2.5	2.5	2.5	2.5
Max. permissible fusing on the customer's side (NH fuse gL/gG)					
• Power connections	A	20	32	63	80
- Max. permissible short-circuit current	kA	50	50	50	50
• Auxiliary power supply	A	16	16	16	16
- Max. permissible short-circuit current	kA	30	30	30	30
Normal ambient temperature in operation	°C	See the table on installation altitude and ambient temperature on Page 3/13			
Dimensions					
• Width	mm	600	600	600	600
• Height	mm	2 326	2 326	2 326	2 326
• Depth	mm	600	600	600	600
Size		**BC**	**BC**	**BC**	**BC**
Weight, approx.	kg	210	215	233	238

[1] With cable lugs according to DIN 46234 or DIN 46235; for units from 2 600 to 3 000 A, motor cables are only directly connected at the DC converter using cable lugs according to DIN 46234.

Technical specifications (continued)

SINAMICS DC MASTER Cabinet for 480 V 3 AC, 125 to 450 A, four-quadrant operation

		Type			
		6RM8031-6FV62-0AA0	6RM8075-6FV62-0AA0	6RM8078-6FV62-0AA0	6RM8082-6FV62-0AA0
Rated armature supply voltage	V	3 AC 480 (+10 %/–20 %)			
Rated armature input current	A	104	174	232	374
Cooling air requirement	m^3/h	800	800	800	600
Sound pressure level	dB (A)	72	72	72	74
Rated frequency	Hz	45 ... 65	45 ... 65	45 ... 65	45 ... 65
Rated DC voltage	V	500	500	500	500
Rated DC current	A	**125**	**210**	**280**	**450**
Overload capability	$x \times I_n$	1.8	1.8	1.8	1.8
Rated power	kW	62.5	105	140	225
Power loss at rated DC current	W	748	1 275	1 556	2 467
Rated DC field voltage	V	max. 390	max. 390	max. 390	max. 390
Rated DC field current	A	**10**	**15**	**15**	**25**
Max. connection cross-sections [1]					
• Line connection (3 phases and PE)	Number × mm^2	1 × 50	1 × 95	1 × 120	2 × 120
• Armature circuit connection	Number × mm^2	1 × 50	1 × 95	2 × 50	2 × 95
• Field circuit connection	Number × mm^2	1 × 1.5	1 × 2.5	1 × 2.5	1 × 4
• Auxiliary power supply	mm^2	2.5	4	4	10
Max. permissible fusing on the customer's side (NH fuse gL/gG)					
• Power connections	A	125	200	250	400
- Max. permissible short-circuit current	kA	50	50	50	50
• Auxiliary power supply	A	16	25	25	50
- Max. permissible short-circuit current	kA	30	30	30	30
Normal ambient temperature in operation	°C	See the table on installation altitude and ambient temperature on Page 3/13			
Dimensions					
• Width	mm	600	600	600	800
• Height	mm	2 326	2 326	2 326	2 200
• Depth	mm	600	600	600	600
Size		**BC**	**BC**	**BC**	**CC**
Weight, approx.	kg	240	273	273	340

[1] With cable lugs according to DIN 46234 or DIN 46235; for units from 2 600 to 3 000 A, motor cables are only directly connected at the DC converter using cable lugs according to DIN 46234.

Technical specifications (continued)

SINAMICS DC MASTER Cabinet for 480 V 3 AC, 600 to 1 200 A, four-quadrant operation

		Type		
		6RM8085-6FV62-0AA0	6RM8087-6FV62-0AA0	6RM8091-6FV62-0AA0
Rated armature supply voltage	V	3 AC 480 (+10 %/–20 %)		
Rated armature input current	A	498	706	996
Cooling air requirement	m^3/h	600	600	1 000
Sound pressure level	dB (A)	74	74	76
Rated frequency	Hz	45 ... 65	45 ... 65	45 ... 65
Rated DC voltage	V	500	500	500
Rated DC current	A	**600**	**850**	**1 200**
Overload capability	$x \times I_n$	1.8	1.8	1.8
Rated power	kW	300	425	600
Power loss at rated DC current	W	3 197	4 303	4 857
Rated DC field voltage	V	max. 390	max. 390	max. 390
Rated DC field current	A	**25**	**30**	**30**
Max. connection cross-sections [1]				
• Line connection (3 phases and PE)	Number × mm^2	2 × 150	2 × 240	4 × 150
• Armature circuit connection	Number × mm^2	2 × 150	4 × 95	4 × 185
• Field circuit connection	Number × mm^2	1 × 4	1 × 4	1 × 4
• Auxiliary power supply	mm^2	10	16	16
Max. permissible fusing on the customer's side (NH fuse gL/gG)				
• Power connections	A	500	710	– [2]
- Max. permissible short-circuit current	kA	50	50	65
• Auxiliary power supply	A	50	63	63
- Max. permissible short-circuit current	kA	30	30	30
Normal ambient temperature in operation	°C	See the table on installation altitude and ambient temperature on Page 3/13		
Dimensions				
• Width	mm	800	1 200	1 200
• Height	mm	2 200	2 200	2 200
• Depth	mm	600	600	600
Size		**CC**	**DC**	**DC**
Weight, approx.	kg	355	500	570

[1] With cable lugs according to DIN 46234 or DIN 46235; for units from 2 600 to 3 000 A, motor cables are only directly connected at the DC converter using cable lugs according to DIN 46234.

[2] It must be ensured that the maximum permissible short-circuit current at the supply switch of the drive cabinet is not exceeded.

Technical specifications (continued)

SINAMICS DC MASTER Cabinet for 575 V 3 AC, 60 to 400 A, four-quadrant operation

		Type			
		6RM8025-6GV62-0AA0	6RM8031-6GV62-0AA0	6RM8075-6GV62-0AA0	6RM8081-6GV62-0AA0
Rated armature supply voltage	V	3 AC 575 (+10 %/–20 %)			
Rated armature input current	A	50	104	174	332
Cooling air requirement	m^3/h	800	800	800	600
Sound pressure level	dB (A)	72	72	72	74
Rated frequency	Hz	45 ... 65	45 ... 65	45 ... 65	45 ... 65
Rated DC voltage	V	600	600	600	600
Rated DC current	A	**60**	**125**	**210**	**400**
Overload capability	$x \times I_n$	1.8	1.8	1.8	1.8
Rated power	kW	36	75	126	240
Power loss at rated DC current	W	509	797	1 320	2 534
Rated DC field voltage	V	max. 390	max. 390	max. 390	max. 390
Rated DC field current	A	**10**	**10**	**15**	**25**
Max. connection cross-sections [1]					
• Line connection (3 phases and PE)	Number × mm^2	1 × 16	1 × 50	1 × 95	1 × 185
• Armature circuit connection	Number × mm^2	1 × 16	1 × 50	1 × 95	1 × 185
• Field circuit connection	Number × mm^2	1 × 1.5	1 × 2.5	1 × 2.5	1 × 4
• Auxiliary power supply	mm^2	2.5	2.5	4	10
Max. permissible fusing on the customer's side (NH fuse gL/gG)					
• Power connections	A	63	125	200	355
- Max. permissible short-circuit current	kA	50	50	50	50
• Auxiliary power supply	A	16	16	25	50
- Max. permissible short-circuit current	kA	30	30	30	30
Normal ambient temperature in operation	°C	See the table on installation altitude and ambient temperature on Page 3/13			
Dimensions					
• Width	mm	600	600	600	800
• Height	mm	2 326	2 326	2 326	2 200
• Depth	mm	600	600	600	600
Size		**BC**	**BC**	**BC**	**CC**
Weight, approx.	kg	233	240	273	335

[1] With cable lugs according to DIN 46234 or DIN 46235; for units from 2 600 to 3 000 A, motor cables are only directly connected at the DC converter using cable lugs according to DIN 46234.

Technical specifications (continued)

SINAMICS DC MASTER Cabinet for 575 V 3 AC, 600 to 1 600 A, four-quadrant operation

		Type			
		6RM8085-6GV62-0AA0	6RM8087-6GV62-0AA0	6RM8090-6GV62-0AA0	6RM8093-4GV62-0AA0
Rated armature supply voltage	V	3 AC 575 (+10 %/–20 %)			
Rated armature input current	A	498	706	913	1 328
Cooling air requirement	m^3/h	600	600	1 000	3 000
Sound pressure level	dB (A)	74	74	76	78
Rated frequency	Hz	45 ... 65	45 ... 65	45 ... 65	45 ... 65
Rated DC voltage	V	600	600	600	600
Rated DC current	A	**600**	**850**	**1 100**	**1 600**
Overload capability	$x \times I_n$	1.8	1.8	1.8	1.8
Rated power	kW	360	510	660	960
Power loss at rated DC current	W	3 290	4 112	4 583	6 988
Rated DC field voltage	V	max. 390	max. 390	max. 390	max. 390
Rated DC field current	A	**25**	**30**	**30**	**40**
Max. connection cross-sections [1]					
• Line connection (3 phases and PE)	Number × mm^2	2 × 150	2 × 240	4 × 150	6 × 150
• Armature circuit connection	Number × mm^2	2 × 150	4 × 95	4 × 120	8 × 95
• Field circuit connection	Number × mm^2	1 × 4	1 × 4	1 × 4	1 × 6
• Auxiliary power supply	mm^2	10	16	16	35
Max. permissible fusing on the customer's side (NH fuse gL/gG)					
• Power connections	A	500	710	_ [2]	_ [2]
- Max. permissible short-circuit current	kA	50	50	65	75
• Auxiliary power supply	A	50	63	63	100
- Max. permissible short-circuit current	kA	30	30	30	50
Normal ambient temperature in operation	°C	See the table on installation altitude and ambient temperature on Page 3/13			
Dimensions					
• Width	mm	800	1 200	1 200	1 400
• Height	mm	2 200	2 200	2 200	2 200
• Depth	mm	600	600	600	600
Size		**CC**	**DC**	**DC**	**EC**
Weight, approx.	kg	355	515	600	795

[1] With cable lugs according to DIN 46234 or DIN 46235; for units from 2 600 to 3 000 A, motor cables are only directly connected at the DC converter using cable lugs according to DIN 46234.

[2] It must be ensured that the maximum permissible short-circuit current at the supply switch of the drive cabinet is not exceeded.

Technical specifications (continued)

SINAMICS DC MASTER Cabinet for 575 V 3 AC, 2 000 to 2 800 A, four-quadrant operation

		Type		
		6RM8095-4GV62-0AA0	6RM8096-4GV62-0AA0	6RM8097-4GV62-0AA0
Rated armature supply voltage	V	3 AC 575 (+10 %/–20 %)		
Rated armature input current	A	1 660	1 826	2 324
Cooling air requirement	m^3/h	3 000	3 000	3 000
Sound pressure level	dB (A)	78	78	78
Rated frequency	Hz	45 ... 65	45 ... 65	45 ... 65
Rated DC voltage	V	600	600	600
Rated DC current	A	**2 000**	**2 200**	**2 800**
Overload capability	$x \times I_n$	1.8	1.8	1.8
Rated power	kW	1 200	1 320	1 680
Power loss at rated DC current	W	8 090	8 408	11 937
Rated DC field voltage	V	max. 390	max. 390	max. 390
Rated DC field current	A	**40**	**40**	**40**
Max. connection cross-sections [1]				
• Line connection (3 phases and PE)	Number × mm^2	6 × 185	8 × 150	8 × 240
• Armature circuit connection	Number × mm^2	8 × 150	8 × 185	8 × 240
• Field circuit connection	Number × mm^2	1 × 6	1 × 6	1 × 6
• Auxiliary power supply	mm^2	35	35	35
Max. permissible fusing on the customer's side (NH fuse gL/gG)				
• Power connections	A	– [2]	– [2]	– [2]
- Max. permissible short-circuit current	kA	75	75	75
• Auxiliary power supply	A	100	100	100
- Max. permissible short-circuit current	kA	50	50	50
Normal ambient temperature in operation	°C	See the table on installation altitude and ambient temperature on Page 3/13		
Dimensions				
• Width	mm	1 400	1 400	1 400
• Height	mm	2 200	2 200	2 200
• Depth	mm	600	600	600
Size		**EC**	**EC**	**EC**
Weight, approx.	kg	850	950	1 030

[1] With cable lugs according to DIN 46234 or DIN 46235; for units from 2 600 to 3 000 A, motor cables are only directly connected at the DC converter using cable lugs according to DIN 46234.

[2] It must be ensured that the maximum permissible short-circuit current at the supply switch of the drive cabinet is not exceeded.

Technical specifications (continued)

SINAMICS DC MASTER Cabinet for 690 V 3 AC, 760 to 2 600 A, four-quadrant operation

		Type				
		6RM8086-6KV62-0AA0	6RM8090-6KV62-0AA0	6RM8093-4KV62-0AA0	6RM8095-4KV62-0AA0	6RM8097-4KV62-0AA0
Rated armature supply voltage	V	3 AC 690 (+10 %/–20 %)				
Rated armature input current	A	631	830	1 245	1 660	2 158
Cooling air requirement	m^3/h	600	1 000	3 000	3 000	3 000
Sound pressure level	dB (A)	74	76	78	78	78
Rated frequency	Hz	45 ... 65	45 ... 65	45 ... 65	45 ... 65	45 ... 65
Rated DC voltage	V	725	725	725	725	725
Rated DC current	A	**760**	**1 000**	**1 500**	**2 000**	**2 600**
Overload capability	$x \times I_n$	1.8	1.8	1.8	1.8	1.8
Rated power	kW	551	725	1 087.5	1 450	1 885
Power loss at rated DC current	W	4 352	4 642	7 627	9 175	12 007
Rated DC field voltage	V	max. 390	max. 390	max. 390	max. 390	max. 390
Rated DC field current	A	**30**	**30**	**40**	**40**	**40**
Max. connection cross-sections [1]						
• Line connection (3 phases and PE)	Number × mm^2	2 × 240	4 × 120	6 × 120	6 × 185	8 × 240
• Armature circuit connection	Number × mm^2	4 × 95	4 × 120	8 × 95	8 × 150	8 × 240
• Field circuit connection	Number × mm^2	1 × 4	1 × 4	1 × 6	1 × 6	1 × 6
• Auxiliary power supply	mm^2	16	16	35	35	35
Max. permissible fusing on the customer's side (NH fuse gL/gG)						
• Power connections	A	630	_ [2]	_ [2]	_ [2]	_ [2]
- Max. permissible short-circuit current	kA	50	65	75	75	75
• Auxiliary power supply	A	63	63	100	100	100
- Max. permissible short-circuit current	kA	30	30	50	50	50
Normal ambient temperature in operation	°C	See the table on installation altitude and ambient temperature on Page 3/13				
Dimensions						
• Width	mm	1 200	1 200	1 400	1 400	1 600
• Height	mm	2 200	2 200	2 200	2 200	2 200
• Depth	mm	600	600	600	600	600
Size		**DC**	**DC**	**EC**	**EC**	**FC**
Weight, approx.	kg	515	600	815	850	1 070

[1] With cable lugs according to DIN 46234 or DIN 46235; for units from 2 600 to 3 000 A, motor cables are only directly connected at the DC converter using cable lugs according to DIN 46234.

[2] It must be ensured that the maximum permissible short-circuit current at the supply switch of the drive cabinet is not exceeded.

Technical specifications (continued)

SINAMICS DC MASTER Cabinet for 830 V 3 AC, 950 to 1 900 A and 950 V 3 AC, 2 200 V, four-quadrant operation

		Type			
		6RM8088-6LV62-0AA0	6RM8093-4LV62-0AA0	6RM8095-4LV62-0AA0	6RM8096-4MV62-0AA0
Rated armature supply voltage	V	3 AC 830 (+10 %/–20 %)			3 AC 950 (+15 %/–20 %)
Rated armature input current	A	789	1 245	1 577	1 826
Cooling air requirement	m^3/h	1 000	3 000	3 000	3 000
Sound pressure level	dB (A)	76	78	78	78
Rated frequency	Hz	45 ... 65	45 ... 65	45 ... 65	45 ... 65
Rated DC voltage	V	875	875	875	1 000
Rated DC current	A	**950**	**1 500**	**1 900**	**2 200**
Overload capability	$x \times I_n$	1.8	1.8	1.8	1.8
Rated power	kW	831.25	1 312.5	1 662.5	2 200
Power loss at rated DC current	W	4 911	8 039	9 986	12 957
Rated DC field voltage	V	max. 390	max. 390	max. 390	max. 390
Rated DC field current	A	**30**	**40**	**40**	**40**
Max. connection cross-sections [1]					
• Line connection (3 phases and PE)	Number × mm^2	4 × 120	6 × 120	6 × 185	8 × 150
• Armature circuit connection	Number × mm^2	4 × 150	8 × 95	8 × 150	8 × 185
• Field circuit connection	Number × mm^2	1 × 4	1 × 6	1 × 6	1 × 6
• Auxiliary power supply	mm^2	16	35	35	35
Max. permissible fusing on the customer's side (NH fuse gL/gG)					
• Power connections	A	_ [2]	_ [2]	_ [2]	_ [2]
- Max. permissible short-circuit current	kA	50	50	50	50
• Auxiliary power supply	A	63	100	100	100
- Max. permissible short-circuit current	kA	30	50	50	50
Normal ambient temperature in operation	°C	See the table on installation altitude and ambient temperature on Page 3/13			
Dimensions					
• Width	mm	1 200	1 400	1 400	1 600
• Height	mm	2 200	2 200	2 200	2 200
• Depth	mm	600	600	600	600
Size		**DC**	**EC**	**EC**	**FC**
Weight, approx.	kg	600	845	925	1 070

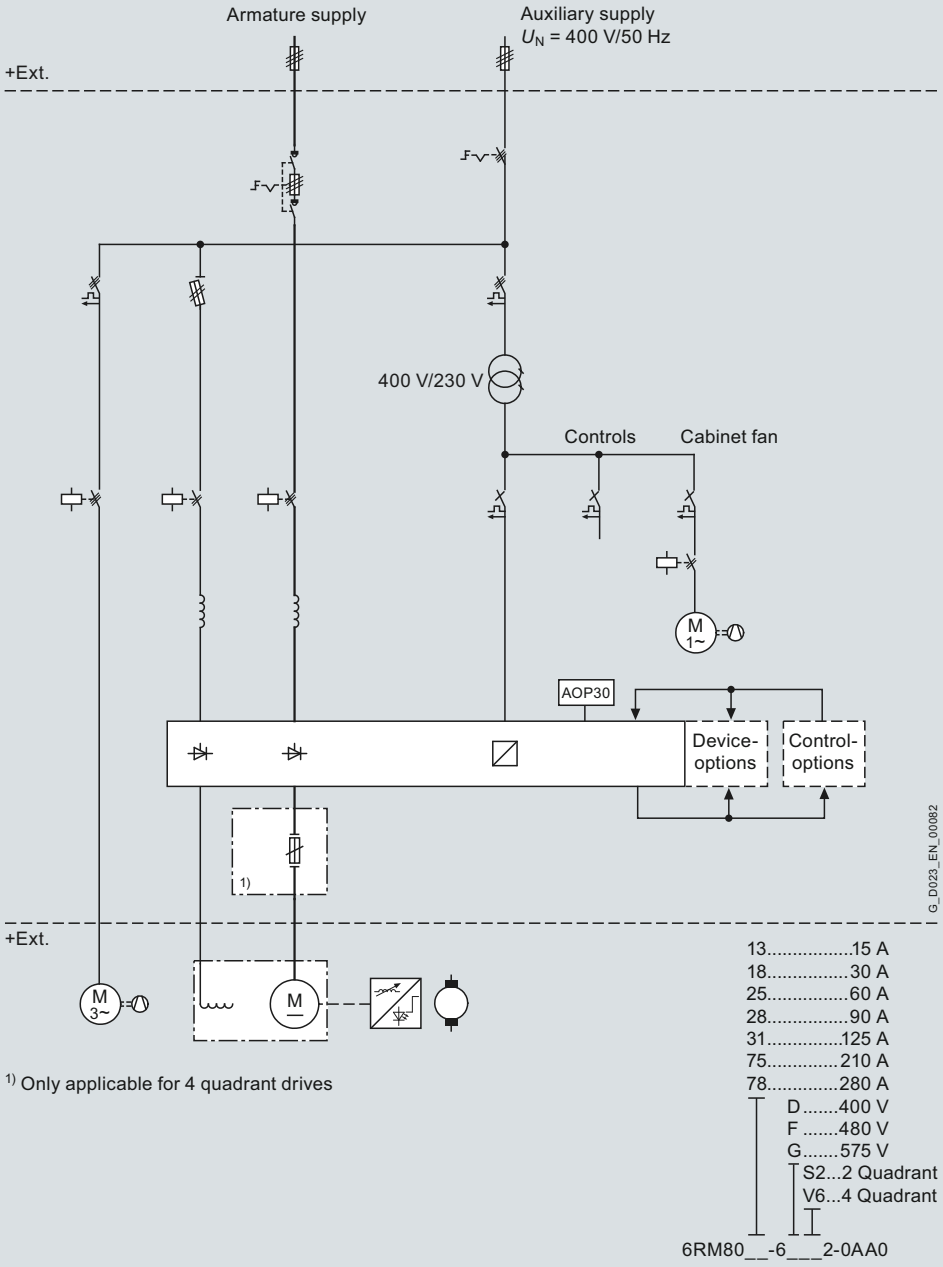
[1] With cable lugs according to DIN 46234 or DIN 46235; for units from 2 600 to 3 000 A, motor cables are only directly connected at the DC converter using cable lugs according to DIN 46234.

[2] It must be ensured that the maximum permissible short-circuit current at the supply switch of the drive cabinet is not exceeded.

Schematics

Block diagrams

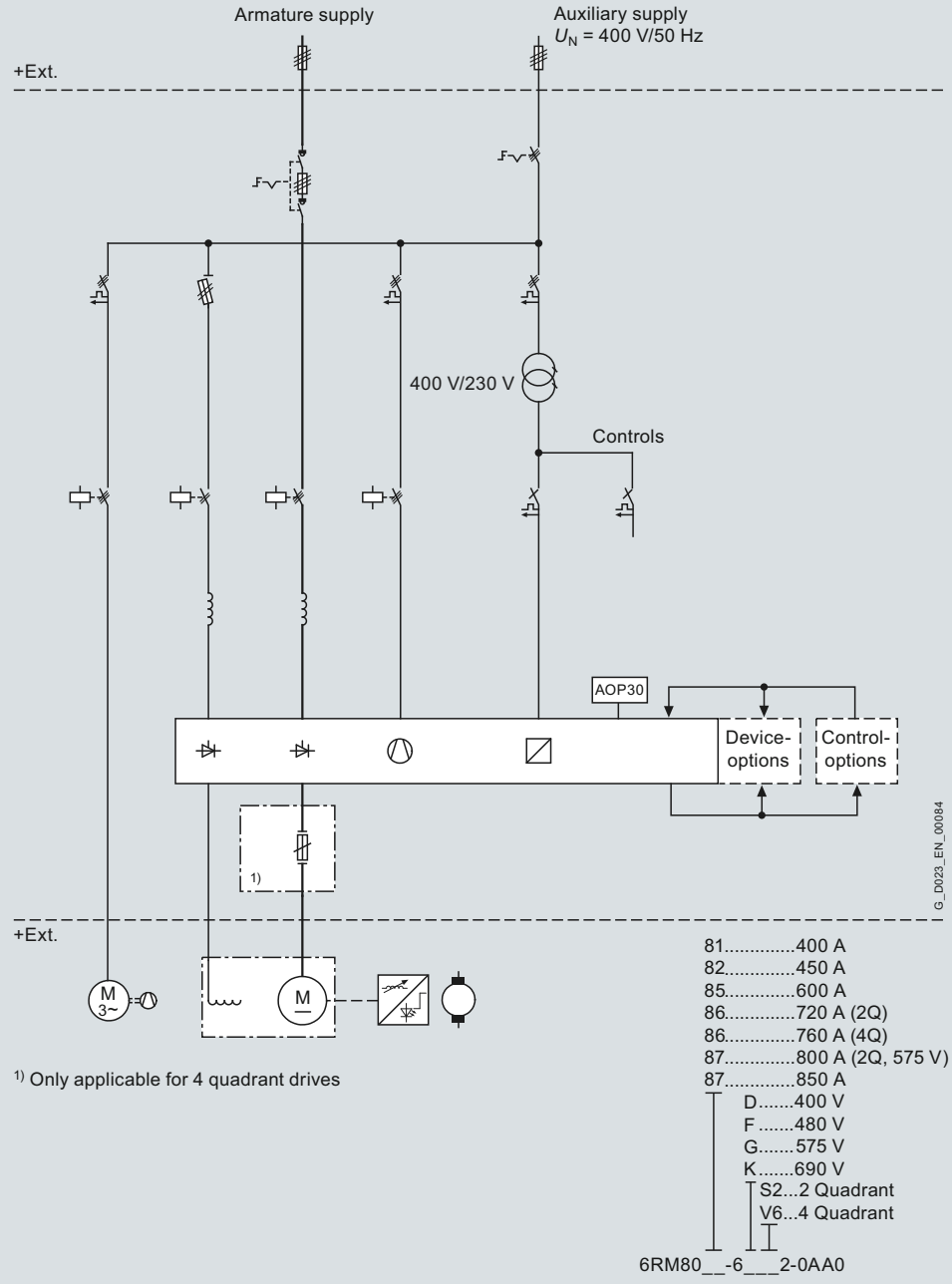
Representative for the converter cabinets, three single-line circuit diagrams will be subsequently shown with the principal electrical design of the basic version. Another diagram shows a cabinet version with the options that are relevant from an electrical perspective.



1) Only applicable for 4 quadrant drives

Single-line circuit diagram, rated DC current ≤ 280 A

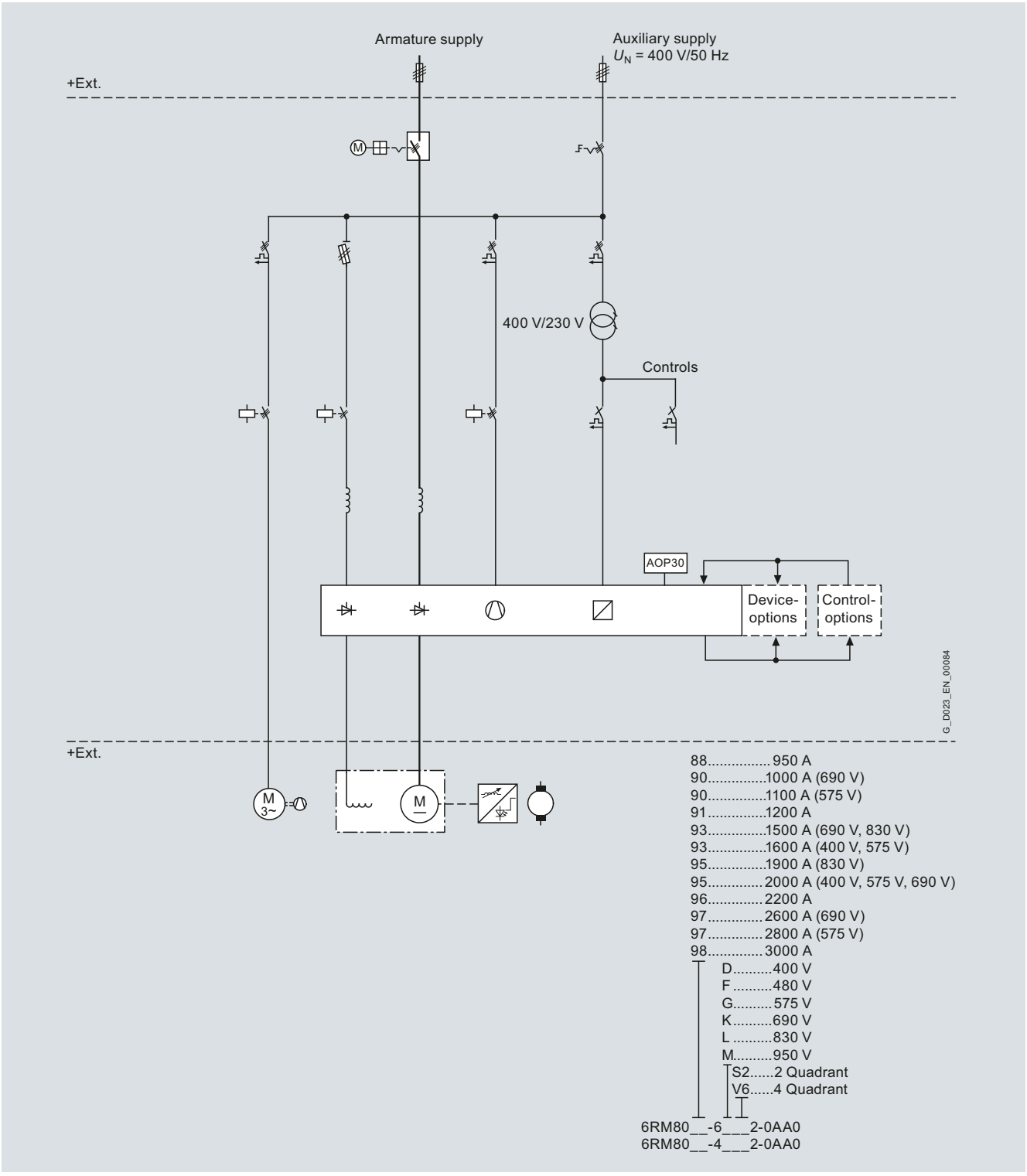
Schematics (continued)



1) Only applicable for 4 quadrant drives

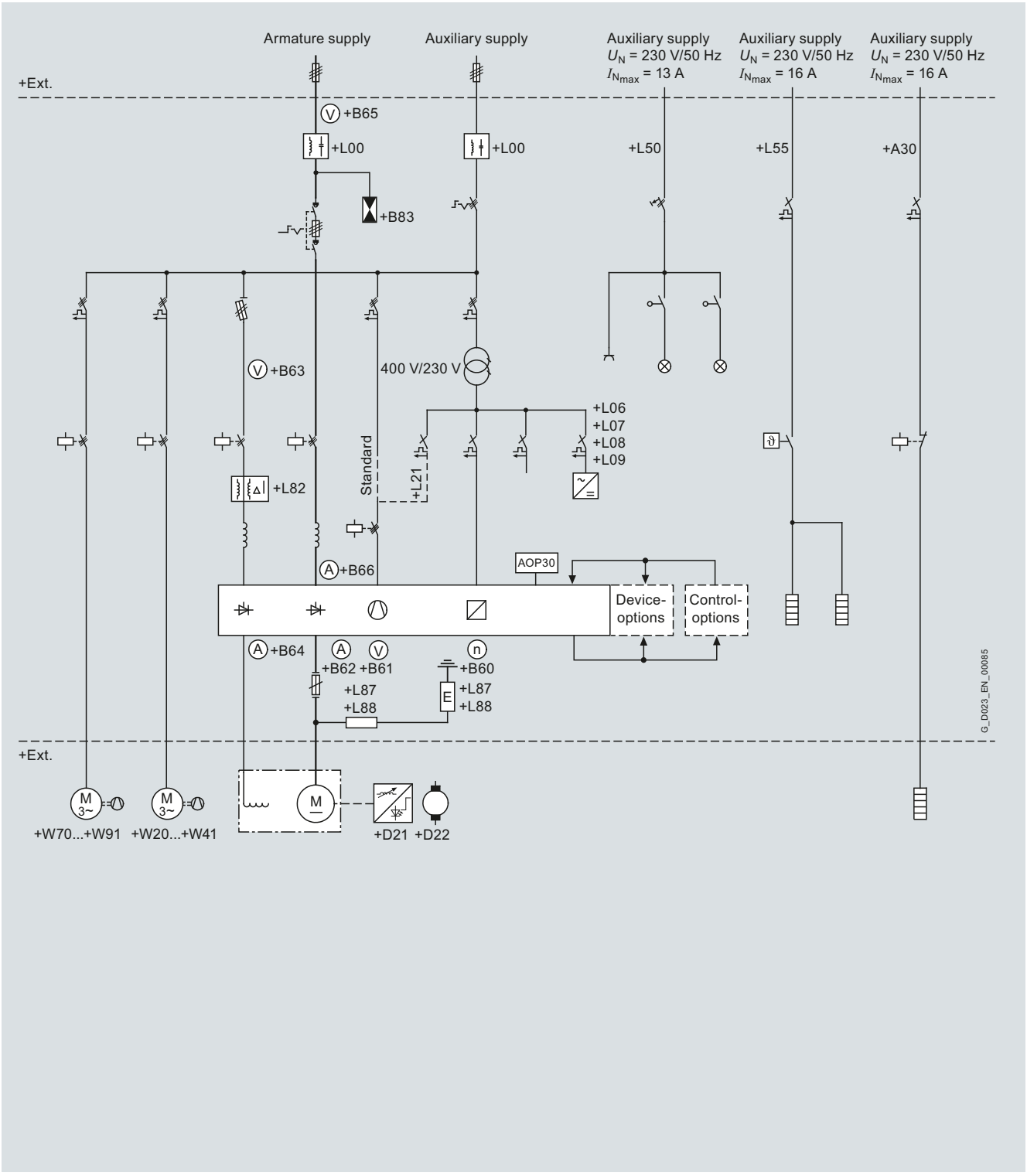
Single-line circuit diagram, rated DC current ≤ 850 A

Schematics (continued)



Single-line circuit diagram, rated DC current ≤ 3 000 A

Schematics (continued)



Single-line circuit diagram showing the options that are relevant from an electrical perspective

Schematics (continued)

Assignment of terminals and connectors

Overview

Overview of the terminals and connector assignment of SINAMICS DC MASTER Cabinet. When using special options, additional terminals are available. A description is then provided in the particular option description.

Terminal strip	Terminals	Function	Remark	Max. connectable conductor cross-section
-X0 armature circuit supply				
-X0	1 ... 3, PE	Supply, 3 AC armature circuit	Only from 15 up to 600 A, and only for option L00 (filter), otherwise connected directly at the main switch or circuit breaker, -X0 is then no longer applicable.	Dependent on the rated current, refer to the technical data.
-X1 auxiliary power supply 3 AC 400 V/50 Hz or 3 AC 460 V/60 Hz				
-X1	1 ... 3, PE	Supply, 3 AC auxiliary power supply	In the basic version, an auxiliary power supply of 3 AC 400 V/50 Hz or 3 AC 460 V/60 Hz is required. For different voltages, option Y04 (auxiliary voltage 3 AC not the same as the standard voltage) is required. If a 3 AC auxiliary voltage is not available, then option Y03 (auxiliary voltage 3 AC not available) can be specified, connection -X1 is then omitted. Note: For rated DC currents 15 up to 850 A, terminal X1 is only provided in conjunction with option L00.	Dependent on the option scope.
-X2 control terminals DC 24 V/AC 230 V				
-X2	1, 2	Group fault signal, tripped circuit breaker	Isolated contacts for 24 V DC up to max. 230 V AC.	2.5 mm^2
	3, 4	External Emergency Stop pushbutton	Not for option L57 or L59, circuit with 230 V AC, An isolated, external contact (NC contact) is expected, which initiates the external Emergency Stop.	2.5 mm^2
	5, 6	Control intervention, main contactor	Only for option B30 (intervention possibility for the supply circuit breaker interlocking), circuit with 230 V AC, an external isolated contact to open the main contactor (up to 850 A) or infeed circuit breaker (from 950 A and higher) is expected. The wire jumpers inserted between these terminals in the factory must be removed.	2.5 mm^2
	21, 22	External EMERGENCY OFF/ EMERGENCY STOP reset	Only for option L57 or L59, 24 V DC circuit.	2.5 mm^2
	23 ... 26	External EMERGENCY OFF/ EMERGENCY STOP pushbutton	Only for option L57 or L59, the external EMERGENCY OFF pushbutton should be connected with channel 1 (NC contact) at terminals 23, 24, and with channel 2 (NC contact) at terminals 25, 26. The wire jumpers inserted between these terminals in the factory must be removed. 24 V DC circuit.	2.5 mm^2
	31 ... 40	Ground fault signal, fault and alarm	Only for option L87 or L88 (ground fault monitoring in an ungrounded line supply), two isolated changeover contacts of the ground fault monitor for 24 V DC up to max. 230 V AC. These contacts can be parameterized to the required signals. A test can be initiated using an external pushbutton connected at terminals 37 and 38. A reset can be initiated using an external pushbutton (NC contact) connected at terminals 39, 40.	2.5 mm^2
	31 ... 40	Fault current relay trip	Only for option L82 (fault current monitoring in an ungrounded line supply), an isolated changeover contact of the fault current relay for 24 V DC up to max. 230 V AC at terminals 31 to 33 signals the trip; an external pushbutton can be connected to terminals 37 and 38 to initiate a test trip. A reset can be initiated using an external pushbutton (NC contact) connected at terminals 39, 40.	2.5 mm^2
	41 ... 43	Ruptured fuse/disconnector position 7VV3002	Only for option B83 (overvoltage protection), isolated signaling contact, which signals a ruptured fuse or the disconnector position in the overvoltage protection, for 24 V DC up to max. 230 V AC.	2.5 mm^2
	51, 52, PE	24 V DC supply voltage	Only for option L07 (24 V DC external power supply).	4 mm^2
	61 ... 64, PE	Motor holding brake	Only for option Y51 (motor holding brake), supply and feeder for a motor holding brake, 1 AC 230 V.	2.5 mm^2

Schematics (continued)

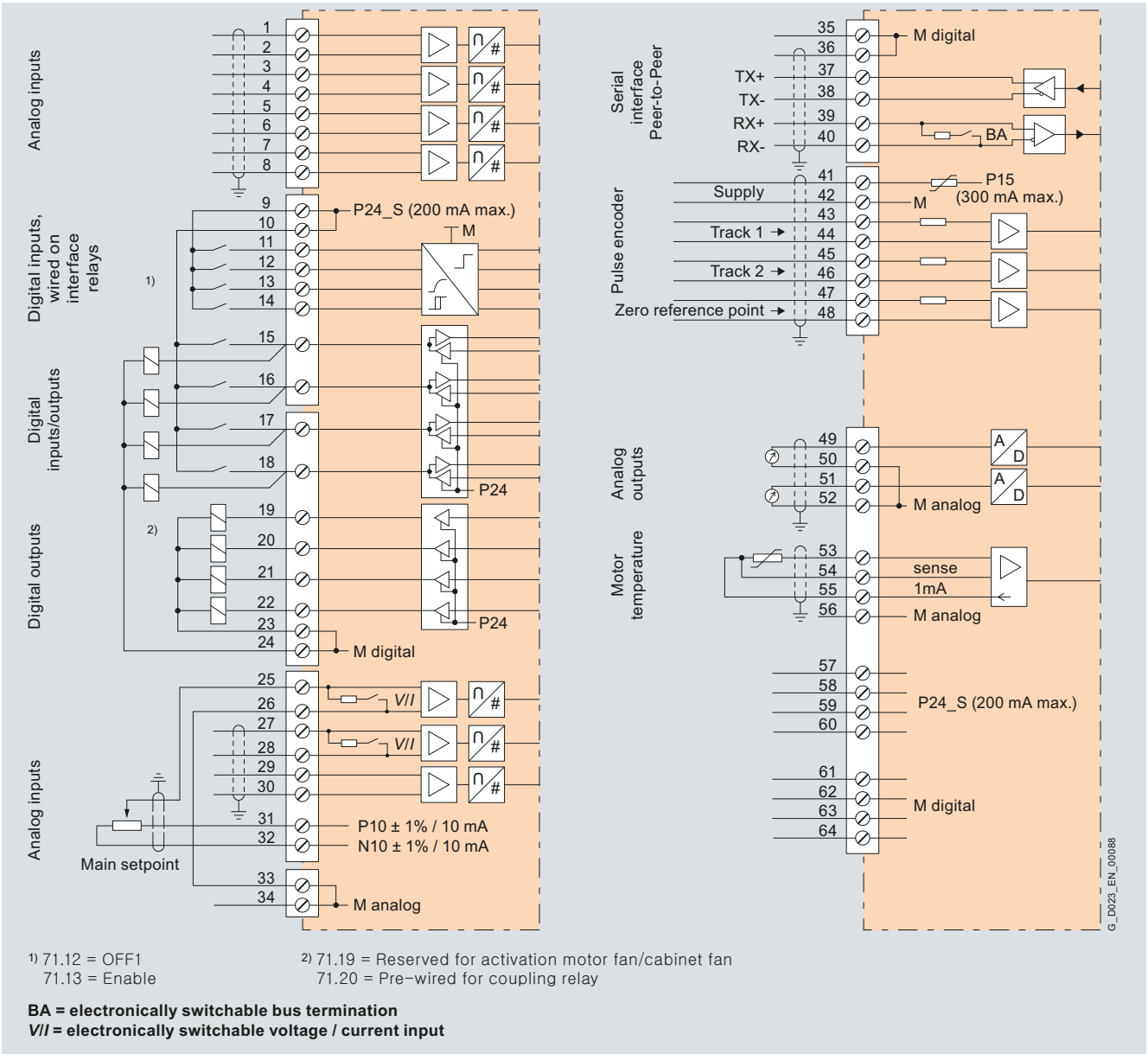
Terminal strip	Terminals	Function	Remark	Max. connectable conductor cross-section
-X3 motor interface (field, fan)				
-X3	1, 2, PE	Motor connection, field circuit	Connectable cross-section depends on the selected cabinet type of at least 2.5 mm^2 up to 10 mm^2 at 40 A - and for option L85 (field current 85 A) up to 35 mm^2 can be connected.	Dependent on the cabinet type, refer to the technical data.
	3 ... 5, PE	Feeder, motor fan 1		4 mm^2
	6 ... 8, PE	Feeder, motor fan 2	Only for options W70 to W91.	4 mm^2
-X4 auxiliary power supply 1 AC 230 V (optional)				
-X4	1, 2, PE	Supply, cabinet lighting	Only for option L50 (cabinet lighting and service socket outlet), 1 AC 230 V, max. fuse 16 A, connectable cross-section, max. 2.5 mm^2.	2.5 mm^2
	3, 4, PE	Supply, cabinet heating	Only for option L55 (cabinet anti-condensation heating), 1 AC 230 V, max. fuse 16 A.	2.5 mm^2
	5, 6, PE	Supply, motor heating	Only for option A30 (anti-condensation heating for the motor up to max. 2 000 W, 230 V), 1 AC 230 V, max. fusing 16 A.	2.5 mm^2
	Terminals 1-3-5 and 2-4-6 can be connected on the customer side by inserting a wire jumper, so that these three options can also be supplied together.			
	6, 7, PE	Feeder, motor heating	Only for option A30 (anti-condensation heating for the motor up to max. 2 000 W, 230 V), 1 AC 230 V.	2.5 mm^2
-X71 TMC for CUD left (standard)				
-X71	1 ... 64	Input/output signals of the left-hand CUD	On the terminal strip, all signals are available that exist at the CU, binary inputs/outputs, analog inputs/outputs, input for an incremental encoder, temperature measuring input, peer-to-peer interface.	1.5 mm^2
-X72 TMC for CUD right (optional)				
-X72	1 ... 64	Input/output signals of the right-hand CUD	Only for option G10 or G11 (additional CU right) On the terminal strip, all signals are available that exist at the CU, binary inputs/outputs, analog inputs/outputs, input for an incremental encoder, temperature measuring input, peer-to-peer interface.	1.5 mm^2
SINAMICS DC MASTER Converter interfaces				
	X100, X101	DRIVE-CLiQ	Only at the Advanced CUD (option G00, G11)	
	X126	PROFIBUS	At the standard CUD and/or Advanced CUD, or for commissioning, integrated in the cabinet door (option L91).	
	X165, X166	Parallel interface	At the Standard CUD and/or Advanced CUD.	
	X178	RS485 interface	Assigned as standard, as this is used to connect the AOP30.	
	(X179)	(RS232 interface)	For use as USS interface; cannot be used in parallel to interface X178.	
	XT1	Analog tachometer		

Schematics (continued)

The Terminal Module Cabinet (TMC -X71, -X72)

The Terminal Module Cabinet (TMC) allows cables associated with CUD standard signals to be connected in the lower section of the SINAMICS DC MASTER Cabinet that is easy to access (e.g. digital and analog inputs/outputs, peer-to-peer interface, incremental encoder, temperature sensor). This is possible, as the appropriate interfaces (X177 of the CUD) are routed to the TMC using an adapter board (X71, X72).

TMC terminals



1) 71.12 = OFF1
71.13 = Enable

2) 71.19 = Reserved for activation motor fan/cabinet fan
71.20 = Pre-wired for coupling relay

BA = electronically switchable bus termination
***V/I* = electronically switchable voltage / current input**

Connection diagram of the TMC with typical connections (max. 1.5 mm^2)

Schematics (continued)

Terminals at the Terminal Module Cabinet X71/X72

Assignment of terminals X71 (left-hand CUD) and X72 (right-hand CUD)

Terminal X71/X72	Function		Technical data
Analog inputs (user-assignable inputs)			
1 2	AI3 + AI3 –	Analog input 3	Input type (signal type): Differential input ± 10 V; 150 kΩ Resolution approx. 5.4 mV (± 11 bit) Common-mode controllability: ± 15 V
3 4	AI4 + AI4 –	Analog input 4	
5 6	AI5 + AI5 –	Analog input 5	
7 8	AI6 + AI6 –	Analog input 6	
Digital inputs (user-assignable inputs)			
9 10	DC 24 V	24 V supply (output)	24 V DC, short-circuit proof Max. load 200 mA or terminal open-circuit internal supply referred to internal ground
11	DI0	Digital input 0	H signal: +15 … +30 V L signal: –30 … +5 V or terminal open-circuit 8.5 mA at 24 V
12	DI1	Digital input 1	
13	DI2	Digital input 2	
14	DI3	Digital input 3	
Digital inputs/outputs (user-assignable inputs/outputs)			
15	DI/ DO4	Digital input/ output 4	Typ, Ein-/Ausgang parametrierbar Merkmale Eingänge: H-Signal: +15 … +30 V L-Signal: 0 … +5 V oder Klemme offen 8.5 mA bei 24 V Merkmale Ausgänge: H-Signal: +20 … +26 V L-Signal: 0 … +2 V kurzschlussfest 100 mA interne Schutzbeschaltung (Freilaufdiode) Bei Überlastung: Warnmeldung A60018
16	DI/ DO5	Digital input/ output 5	
17	DI/ DO6	Digital input/ output 6	
18	DI/ DO7	Digital input/ output 7	
19	DO0	Digital output 0	H signal: +20 … +26 V L signal: 0 … +2 V Short-circuit proof, 100 mA Internal protective circuit (free wheeling diode) For overload: Alarm A60018
20	DO1	Digital output 1	
21	DO2	Digital output 2	
22	DO3	Digital output 3	
23, 24	M	Ground, digital	
Analog inputs, setpoint inputs (user-assignable inputs)			
25 26	AI0 + AI0 –	Analog input 0 Main setpoint	Input type (signal type), parameterizable: - Differential input ± 10 V; 150 kΩ - Current input 0 … 20 mA; 300 Ω oder 4 … 20 mA; 300 Ω Resolution approx. 0.66 mV (± 14 bit) Common-mode controllability: ± 15 V
27 28	AI1 + AI1 –	Analog input 1	
29 30	AI2 + AI2 –	Analog input 2	Input type (signal type): - Differential input ± 10 V; 150 kΩ Resolution approx. 0.66 mV (± 14 bit) Common-mode controllability: ± 15 V
Reference voltage			
31 32	P10 N10	Reference voltage ± 10 V (output)	Tolerance ± 1 % at 25 °C Stability 0.1 % per 10 K 10 mA short-circuit proof
33, 34	M	Ground, analog	
Serial interface, peer-to-peer RS485			
35, 36	M	Ground, digital	
37	TX+	Send line +	4-wire send cable, positive differential output
38	TX–	Send line –	4-wire send cable, negative differential output
39	RX+	Receive cable +	4-wire receive cable, positive differential output
40	RX–	Receive cable –	4-wire receive cable, negative differential output

Schematics (continued)

Terminal X71/X72	Function		Technical data
Incremental encoder input			
41	Incremental encoder supply		+13.7 … +15.2 V, 300 mA short-circuit proof (electronically protected) For overload: Alarm A60018
42	Ground, incremental encoder		
43	Track 1, positive connection		Load: ≤ 5.25 mA at 15 V (without switching losses) Pulse duty factor: 1:1 Angaben zu Leitungen, Leitungslänge, Schirmauflage, Pegel der Eingangsimpulse, Hysterese, Spurversatz, Impulsfrequenz siehe unten
44	Track 1 negative connection		
45	Track 2 positive connection		
46	Track 2 negative connection		
47	Zero mark, positive connection		
48	Zero mark, negative connection		
Analog outputs (user-assignable outputs)			
49	AO0	Analog output 0	± 10 V, max. 2 mA short-circuit proof, resolution ± 15 bits
50	M	Ground, analog	
51	AO1	Analog output 1	
52	M	Ground, analog	
Connections for temperature sensor (motor interface 1)			
53	Temp 1		Sensor acc. to p50490 The cable to the temperature sensor on the motor must be shielded and connected to ground at both ends. The cables for the Temp 1 and Temp 3 connections to the temperature sensor must be approximately the same length. The sense cable (Temp 2) is used for compensating the cable resistances. If you are not using a sense cable, terminals 54 and 55 must be connected.
54	Temp 2 (sense cable)		
55	Temp 3		
Terminals for ground and the 24 V DC supply			
56	M	Ground, analog	
57, 58, 59, 60	DC 24 V	24 V supply (output)	24 V DC, short-circuit proof, max. load 200 mA (terminals 9, 10, 57, 58, 59 and 60 together), internal supply referred to ground, digital and ground, analog
61, 62, 63, 64	M	Ground, digital	

C98043-A7119 TMC (Terminal Module Cabinet)

More information

The documentation for SINAMICS DC MASTER Cabinet is split up into a project-specific part and in the documentation for SINAMICS DC MASTER DC Converter, SINAMICS DC MASTER Control Module and SINAMICS DC MASTER Cabinet. Included in the scope of supply is a DVD with the documentation for the SINAMICS DC MASTER; the project-specific documentation is provided on a separate data storage medium. In addition, the project-specific circuit diagram is provided in paper form. Further, the documentation of the various options is described in Chapter 4.

Project-specific documentation for SINAMICS DC MASTER Cabinet

- Dimension drawing
- Circuit manual
- Documentation of the installed components

The circuit manual is generated on a project for project basis and is split up into the following parts:

- Cover sheet
- List of documents
- Information sheets
- Single-line circuit diagram as overview
- Layout drawing
- Circuit diagram
- Terminal connection diagram
- Parts list

Documentation for SINAMICS DC MASTER

The standard languages of the documentation on DVD are German, English, French, Spanish, Italian, Russian and Chinese.

The technical documentation includes the following manuals:

- Operating Instructions for SINAMICS DCM DC Converter
- Operating Instructions for SINAMICS DCM Control Module
- Operating Instructions for SINAMICS DCM Cabinet [1)]
- List Manual (parameter lists and function diagrams)
- Function Manual SINAMICS Free Function Blocks [1)]

The following additional documentation and information is provided on the DVD:

- Safety instructions
- Applications
- Accessories
- Function block diagrams in the VISIO format (vsd)
- Dimension drawings in the dxf and pdf formats
- STARTER commissioning tool
- Spare parts, SparesOnWeb (Internet)
- Service, technical support
- Certifications
- Latest firmware (Internet)
- Configuring notes regarding dynamic overload capability
- List of secondary conditions
- FAQ (Internet)
- License conditions

The documentation can be separately ordered as accessory on paper or on DVD corresponding to the "Selection and ordering data".

Selection and ordering data, documentation on paper

Documentation	Language	Order No.
Operating Instructions **Cabinet**	German/ English	**6RX1800-0SD74**
Operating Instructions **DC Converter**	German	**6RX1800-0AD00**
	English	**6RX1800-0AD76**
	French	**6RX1800-0AD77**
	Spanish	**6RX1800-0AD78**
	Italian	**6RX1800-0AD72**
	Russian	**6RX1800-0AD56**
	Chinese	**6RX1800-0AD27**
Operating Instructions **Control Module**	German	**6RX1800-0BD00**
	English	**6RX1800-0BD76**
	French	**6RX1800-0BD77**
	Spanish	**6RX1800-0BD78**
	Italian	**6RX1800-0BD72**
	Russian	**6RX1800-0BD56**
List Manual	German	**6RX1800-0ED00**
	English	**6RX1800-0ED76**
	French	**6RX1800-0ED77**
	Spanish	**6RX1800-0ED78**
	Italian	**6RX1800-0ED72**
	Russian	**6RX1800-0ED56**
	Chinese	**6RX1800-0ED27**
Function Manual **SINAMICS** Free function blocks	German	**6RX1800-0FD00**
	English	**6RX1800-0FD76**
Set of manuals **DC Converter** includes the Operating Instructions, List Manual and Function Manual Free Function Blocks [2)]	German	**6RX1800-0GD00**
	English	**6RX1800-0GD76**
	French	**6RX1800-0GD77**
	Spanish	**6RX1800-0GD78**
	Italian	**6RX1800-0GD72**
	Russian	**6RX1800-0GD56**
	Chinese	**6RX1800-0GD27**
Set of manuals **Control Module** includes the Operating Instructions, List Manual and Function Manual Free Function Blocks [2)]	German	**6RX1800-0JD00**
	English	**6RX1800-0JD76**
	French	**6RX1800-0JD77**
	Spanish	**6RX1800-0JD78**
	Italian	**6RX1800-0JD72**
	Russian	**6RX1800-0JD56**

Selection and ordering data, documentation on DVD

Documentation	Order No.
All documentation in all languages on DVD	**6RX1800-0AD64**

[1)] Operating Instructions SINAMICS DCM Cabinet and Function Manual SINAMICS Free Function Blocks only in German and English.

[2)] Function Manual Free Function Blocks only in German and English.

Notes

Options

Overview

General information

Note:

A wide range of options allows the drive cabinets to be optimally adapted to the particular requirements. Further, all special application-specific features can be implemented on request.

Procedure when ordering:

When ordering a drive cabinet with options add the suffix "-Z" after the order number and then state the order code(s) for the desired option(s) after the suffix.

Example:
6RM8075-6GV62-0AA0-Z
G00+G20+L85+...

See also ordering examples.

Available options

The following table provides an overview of the available options. Detailed descriptions of the options are provided in the section "Description of the options".

Order code	Option	Description Page
A06	Brush length monitoring, limit value monitoring, isolated	4/12
A30	Anti-condensation heating for motor, up to max. 2 000 W, 230 V	4/11
A97	Air flow monitoring in the motor	4/12
B30	Intervention option for infeed circuit breaker interlocking	4/9
B60	Display instrument, "speed"	4/9
B61	Display instrument, "armature voltage"	4/9
B62	Display instrument, "armature current"	4/9
B63	Display instrument, "line voltage excitation"	4/9
B64	Display instrument, "excitation current"	4/9
B65	Display instrument, "line voltage armature circuit"	4/9
B66	Display instrument, "line current"	4/9
B83	Overvoltage protection	4/13
C51	24 V coil voltage of the coupling relay at the binary inputs	4/10
D02	Customer documentation (circuit diagram, terminal diagram, layout diagram) in the DXF format	4/22
D04	Customer documentation, paper	4/22
D14	Preliminary customer documentation	4/22
D19	Circuit diagram prepared for motor overtemperature monitoring using a limit value transmitter	4/22
D20	Circuit diagram prepared for motor temperature monitoring	4/22
D21	Circuit diagram prepared for speed actual value sensing (pulse encoder)	4/22
D22	Circuit diagram prepared for speed actual value sensing (analog tachometer)	4/22
D58	Documentation language: English/French	4/22
D60	Documentation language: English/Spanish	4/22
D61	Documentation language: English/Russian	4/22
D80	Documentation language: English/Italian	4/22
F03	Equipment acceptance with customer present: visual acceptance	4/21
F97	Equipment acceptance with customer present: customer-specific acceptance	4/21
G00	Advanced CUD left	4/6
G10	Standard CUD right	4/6
G11	Advanced CUD right	4/6
G20	Communication Board CBE20 left	4/6
G21	Communication Board CBE20 right	4/7
G60	Customer terminal strip extension TM31	4/16
G62	Customer terminal strip extension TM15	4/17
K07	Without Advanced Operator Panel AOP30	4/21
K50	Sensor Module Cabinet-Mounted SMC30	4/17
K85	Field reversal	4/10
L00	Radio interference suppression filter	4/10
L04	Armature supply with extra-low voltage 10 to 50 V	4/7
L05	Electronics power supply, SINAMICS DC MASTER for connection to 24 V DC	4/8
L06	24 V DC power supply with SITOP	4/8
L07	24 V DC power supply from an external supply	4/8
L09	24 V DC power supply with SITOP UPS	4/8
L10	Without field power section	4/7
L11	Field power section 2Q	4/7
L21	Unit fan for single-phase connection	4/7
L22	Elimination of the three-phase commutating reactor	4/10
L50	Cabinet lighting and service socket outlet	4/10
L52	ARC detector (arcing detector)	4/13
L55	Cabinet anti-condensation heating	4/10
L57	EMERGENCY OFF Category 0 for uncontrolled stopping in accordance with EN 60204-1	4/9
L59	EMERGENCY STOP Category 1 for controlled stopping in accordance with EN 60204-1	4/9
L82	Fault current monitoring in the grounded line supplies (TN or TT systems)	4/13
L84	PTC thermistor evaluation unit for alarm or fault for two sensors	4/13
L85	85 A field power section	4/7
L86	Evaluation units for the following temperature sensors: KTY84-130, PT100 2-wire and 3-wire, PT1000 2-wire and 3-wire, NTC	4/12

Overview (continued)

Order code	Option	Description Page
L87	Insulation monitoring in non-grounded line supplies (IT system) with insulating monitoring devices from the Bender company	4/14
L88	Insulation monitoring in non-grounded line supplies (IT system) with insulating monitoring devices from the AREVA company	4/14
L90	CCP (Converter Commutation Protector)	4/15
L91	Commissioning interface (PROFIBUS) brought out	4/21
L99	Monitoring the temperature inside the drive cabinet	4/15
M06	Base 100 mm high, RAL 7022	4/18
M07	Cable-marshaling space 200 mm high, RAL 7035	4/18
M08	Coated PCBs (only involves modules of the SINAMCS DC MASTER DC Converter)	4/7
M10	Nickel-plated copper busbars	4/7
M21	Degree of protection IP21	4/18
M23	Degree of protection IP23	4/19
M43	Degree of protection IP43	4/19
M54	Degree of protection IP54 with filter elements	4/20
M58	Degree of protection IP54 with climate control unit	4/20
M59	Cabinet door closed, entry from the bottom through an opening in the floor	4/20
M60	Additional shock hazard protection	4/20
M66	Marine version	4/21
M90	Crane transport aid (mounted at the top)	4/21
M91	Packaging type: wooden crate	4/22
M92	Packaging type: crate	4/22
M93	Packaging type: crate, seaworthy packaging	4/22
M94	Packaging type: additional packaging data IPPC ISPM15 (according to country-specific regulations)	4/22
P11	Display instrument for line quantities with PROFIBUS interface, installed in the cabinet door	4/9
Q80 … Q85	Extension of liability for defects – refer to the Section, Service & Support, Extension for the liability for defects	4/21
S01	Memory card left	4/7
S02	Memory card right	4/7
U09	Version according to UL Listing	4/21
V60	Control extension for a rated line frequency of 60 Hz	4/8
V70	Input isolating amplifier, input: 0 to 20 mA	4/10
V71	Input isolating amplifier, input: 4 to 20 mA	4/11
V72	Input isolating amplifier, input: 0 to +10 V	4/11
V73	Input isolating amplifier, input: –20 to +20 mA	4/11
V74	Input isolating amplifier, input: –10 to +10 V	4/11
W15	No output provided for a motor fan	4/11
W20 … W41	Setting range of the motor protection circuit breaker for the motor fan	4/11
W70 … W91	Feeder for a second motor fan	4/12
X30	Customer-specific requirement	4/21
Y01	Matching transformer for the motor fan	4/12
Y02	Matching transformer for the field supply	4/8
Y03	3 AC auxiliary voltage not available	4/8
Y04	3 AC auxiliary voltage not the same as the standard voltage	4/8
Y09	Special cabinet paint finish	4/21
Y32	Labeling plate to identify the system, two lines, 40 × 180 mm	4/21
Y51	Motor holding brake	4/11
Y52	Output isolating amplifier, output: 0 to 20 mA	4/11
Y53	Output isolating amplifier, output: 4 to 20 mA	4/11
Y54	Output isolating amplifier, output: 0 to 10 V	4/11
Y55	Output isolating amplifier, output: –20 to +20 mA	4/11
Y56	Output isolating amplifier, output: –10 to 10 V	4/11
Y60	Coupling relay for binary output	4/11

Overview (continued)

Options-selection matrices

The following selection matrices include options, which mutually exclude one another. Only the options, where an exclusion is not obvious, are shown.

Components		G00	G10	G11	G20	G21	L04	L05	L06	L07	L09	L10	L11	L85	L00	L22	Y02
Advanced CUD left	G00		✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
Standard CUD right	G10	✔		–	✔	–	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
Advanced CUD right	G11	✔	–		✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
Communication Board CBE20 left	G20	✔	✔	✔		✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
Communication Board CBE20 right	G21	✔	–	✔	✔		✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
Armature supply with extra-low voltage 10 to 50 V	L04	✔	✔	✔	✔	✔		✔	✔	✔	✔	✔	✔	✔	–	✔	✔
Electronics power supply, SINAMICS DC MASTER for connection to 24 V DC	L05	✔	✔	✔	✔	✔	✔		✔	✔	✔	✔	✔	✔	✔	✔	✔
24 V DC power supply with SITOP	L06	✔	✔	✔	✔	✔	✔	✔		–	–	✔	✔	✔	✔	✔	✔
24 V DC power supply from an external supply	L07	✔	✔	✔	✔	✔	✔	✔	–		–	✔	✔	✔	✔	✔	✔
24 V DC power supply with SITOP UPS	L09	✔	✔	✔	✔	✔	✔	✔	–	–		✔	✔	✔	✔	✔	✔
Without field power section	L10	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔		–	–	✔	✔	–
Field power section 2Q	L11	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	–		✔	✔	✔	✔
85 A field power section	L85	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	–	✔		✔	✔	✔
Radio interference suppression filter	L00	✔	✔	✔	✔	✔	–	✔	✔	✔	✔	✔	✔	✔		–	✔
Elimination of the three-phase commutating reactor	L22	✔	✔	✔	✔	✔	4	✔	✔	✔	✔	✔	✔	✔	–		✔
Matching transformer for the field supply	Y02	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	–	✔	✔	✔	✔	

Degree of protection		M21	M23	M43	M54	M58	M59
Degree of protection IP21	M21		–	–	–	–	✔
Degree of protection IP23	M23	–		–	–	–	✔
Degree of protection IP43	M43	–	–		–	–	–
Degree of protection IP54	M54	–	–	–		–	–
Degree or protection IP54 with filter elements	M58	–	–	–	–		–
Cabinet door closed, entry from the bottom through an opening in the floor	M59	✔	✔	–	–	–	

Auxiliary voltage		Y03	Y04
3 AC auxiliary voltage not available	Y03		–
3 AC auxiliary voltage not the same as the standard voltage	Y04	–	

✔ Options can be combined without any restrictions

– Options cannot be combined

Overview

Application:
An unwinder for paper in a reeler-slitter is to be modernized – but the existing motor is to be kept. The power section is to be supplied from the existing 690 V supply. The technological control is to be implemented in the higher-level PCS7 system. The client specified PROFIBUS as the control and setpoint interface. The following measured values and status displays are to be visualized in the drive cabinet door to facilitate fast and simple diagnostics for the service and maintenance personnel: Armature current, armature voltage, speed, field current, status messages – operation and fault.

The customer explained that he repeatedly had problems with the existing converter relating to overvoltage in the motor armature circuit – and as a consequence, this resulted in tension fluctuations in the paper web when the motor when into the field-weakening range. As a result of instability in the control voltage supply, in the past, there were repeatedly failures that had a negative impact on the availability.

Solution:
As a result of the data of the existing motor and the customer specifications relating to acceleration and braking ramps, tambour roll weight and max. diameter, a four-quadrant converter was selected with a rated supply voltage of 690 V and a rated current of 1 500 A. The dynamic overload capability of the units is utilized to brake the drive when the paper web breaks.

The technological control with current setpoint interface is realized in the higher-level control. This is the reason that for this particular application, the standard CUD is sufficient, which already has an integrated PROFIBUS interface.

The problem with armature overvoltages when entering the field weakening range has now been resolved by selecting the two-quadrant field power section option. By actively reducing the current using a counter-voltage, the field current actual value can now follow the field current setpoint – even for steep acceleration ramps – and therefore overvoltages are avoided in the armature circuit. The tension fluctuations in the paper web are consequentially eliminated.

Selecting the electronics power supply option for connection to 24 V DC and SITOP UPS allows a favorably-priced, low-maintenance DC UPS system to be created.

The requirements regarding actual value and status displays can be optionally realized using pointer-type instruments, or using the Advanced Operator Panel AOP30 included as standard.

Coated PCBs and nickel-plated copper busbars were selected as a result of the aggressive atmosphere with a high percentage of H_2S. Roof sections are available for the cabinets in order to achieve IP21. The motor is equipped with a motor fan, which has a rated current of 4.5 A.

The availability of equipment is extremely important in the paper industry. This is the reason that the option "memory card left" was selected to allow service and maintenance personnel short repair times in the case of faults. Firmware and additional languages of the AOP text are saved on this card. Further, parameter values can be additionally saved and there is a reserved memory area for offline long-time trace records, which can be centrally read-out from a control room via routing. Further, the memory card allows DCC to be used, with which a winder application can be implemented.

To commission the application, in the switchgear room, the PC is directly connected to the drive via PROFIBUS. This is a straightforward operation using the "Commissioning interface brought out" option with the cabinet door closed.

The following options must be selected for this particular application:
L05 (electronics power supply for connection to 24 V DC)
L11 (field power section 2Q)
M08 (coated PCBs)
M10 (nickel-plated copper busbars)
S01 (memory card left)
M21 (degree of protection IP21)
L09 (24 V DC supply with SITOP UPS)
W35 (setting range of the motor protection circuit breaker for the motor fan (4.5 up to 6.3 A)
L91 (commissioning interface (PROFIBUS) brought out)

The ordering data are as follows:
6RM8093-4KV62-0AA0-Z
L05+L11+M08+M10+S01+M21+L09+W35+L91

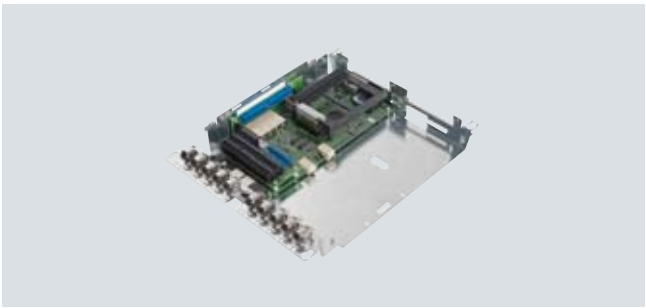
Description of the options

Overview

DC Converter

G00

Advanced CUD left



Advanced CUD in left-hand slot.
In addition to the connections and functions of the standard CUD, the Advanced CUD has two DRIVE-CLiQ connections and one option slot. The use of an Advanced CUD also provides the opportunity of inserting an additional CUD (Standard or Advanced) to increase the computational performance and the number of terminals. For example, this can be used to implement additional technological functions.
By using an Advanced CUD, which is located in the left-hand slot instead of the standard CUD, the SINAMICS SMC30, TM15, TM31 and CBE20 components can be connected to the SINAMICS DC MASTER.

G10

Standard CUD right

Standard CUD in the right-hand slot (precondition for option G00).
Selecting option G10 provides the possibility of further increasing the performance of technological functions for the SINAMICS DC MASTER. As a result of the additional standard CUD that is inserted in the right-hand slot of the electronics tray, users have additional computational performance at their fingertips in order to fulfill even the highest demands when it comes to closed-loop control performance.

G11

Advanced CUD right

Advanced CUD in the right-hand slot (precondition for option G00).
With option G11, users can address the highest demands regarding the closed-loop control performance and use the wide range of interfaces. With this option, in addition to the Advanced CUD located in the left-hand slot, an additional Advanced CUD can be mounted in the right-hand slot. This therefore doubles the number of interfaces of the SINAMICS DC MASTER.

G20

Communication Board CBE20 left

CBE20 PROFINET left-hand side (precondition for option G00). The Communication Board CBE20 allows a connection to be established to a PROFINET IO network via the Advanced CUD.

The SINAMICS DC MASTER then assumes the function of a PROFINET IO device in the sense of PROFINET and offers the following functions:

- PROFINET IO Device
- 100 Mbit/s full duplex
- Supports real-time classes of PROFINET IO:
- RT (Real-Time)
- Connection to control systems as PROFINET IO devices in accordance with PROFIdrive, Specification V4.1.
- In addition to PROFIBUS (standard), PROFINET can also be used for engineering with the STARTER commissioning tool.
- Integrated 4-port switch with four RJ45 sockets based on the PROFINET ASIC ERTEC400. The optimum topology (line, star, tree) can therefore be configured without additional external switches.
- The SINAMICS Link function can be used in conjunction with option S01 or S02 (memory card).

The CBE20 is inserted in the option slot of the Advanced CUD, which is inserted in the left-hand slot.

Accessories for CBE20	Type
Industrial Ethernet FC	
• RJ45 Plug 145 (1 unit)	6GK1901-1BB30-0AA0
• RJ45 Plug 145 (10 units)	6GK1901-1BB30-0AB0
• Stripping tool	6GK1901-1GA00
• Standard cable GP 2x2	6XV1840-2AH10
• Flexible cable GP 2x2	6XV1870-2B
• Trailing cable GP 2x2	6XV1870-2D
• Trailing cable 2x2	6XV1840-3AH10
• Marine cable 2x2	6XV1840-4AH10

The cable is available as cable sold by the meter.

Overview (continued)

G21

Communication Board CBE20 right

CBE20 PROFINET right-hand side (possible with option G11). With option G21, an Advanced CUD can be inserted in the right-hand slot, which is used to expand CBE20. More detailed information on the functionality, selection and ordering data of the CBE20 is provided under option G20.

L10

Without field power section

The SINAMICS DC MASTER is supplied without field power section. It also includes the complete field circuit (not possible for 15 and 30 A units).

L11

Field power section 2Q

For applications that demand high speed field current changes, by specifying option L11, the SINAMICS DC MASTER can be equipped with a two-quadrant field with active current reduction. Further, this field power section has an integrated field overvoltage protection function. This option cannot be ordered for units with rated DC currents from 15 to 30 A.

L21

Unit fan for single-phase connection

Converter units from 400 A up to and including 1 200 A rated DC current can, using this option, be equipped with a fan for connection to a single-phase supply. This is supplied from the internally generated 230 V AC control voltage, and from a circuit perspective, is treated in exactly the same way as a standard fan. Cabinet fans, which are installed in the converter cabinet in order to implement higher degrees of protection, are not affected by the option. The fans are protected using an integrated overtemperature protection function.

L85

85 A field power section

All components in the field circuit and the field power section in the SINAMICS DC MASTER are dimensioned for a rated current of 85 A (possible for units with a rated DC current, armature ≥ 1 500 A; also in conjunction with option L11 (field power section 2Q)). With option L85, the maximum connection cross-section of the auxiliary supply is increased up to 50 mm^2 and for the field, up to 35 mm^2. The max. permissible protection on the customer side is 125 A.

M08

Coated PCBs

(only involves modules of the SINAMICS DC MASTER DC Converter)

In order to improve the reliability for increased degrees of pollution and climatic stress, it is possible to order modules of the SINAMICS DC MASTER that are coated on both sides by specifying option M08.
The AOP30 as well as the Sensor Modules and Terminal Modules have PCBs modules as standard.

M10

Nickel-plated copper busbars

Nickel-plated copper busbars are used, which means that an increased degree of availability can be achieved in aggressive atmospheres. Cabinets with rated current of 1 500, 1 600, 1 900, 2 000 and 2 200 A have aluminum busbars as standard. Nickel-plated copper busbars can also be supplied by specifying option M10.

S01

Memory card left

With option S01, users receive a memory card for one Standard CUD or one Advanced CUD, which is inserted in the left-hand slot.

This memory card offers the following options:

- Additional languages can be downloaded to the Advanced Operator Panel AOP30. When using two CUDs, option S01 and option S02 must be ordered.
- Performing an offline long-time trace.
- Download the DCC block library into the drive.
- Update the firmware.

The SINAMICS Link function requires that the memory card is always inserted.

S02

Memory card right

With option S02, users receive a memory card for one Standard CUD or one Advanced CUD, which is inserted in the right-hand slot. This option is only possible, if one of the options G10 or G11 is ordered for installing a CUD in the right-hand slot.

Other voltages, frequencies

L04

Armature supply with extra-low voltage 10 to 50 V

With option L04, the SINAMICS DC MASTER Cabinet is re-equipped for operation with 10 to 50 V AC. This is frequently required especially for electrochemical applications, when controlling solenoids, when using the converter to supply the fields of special motors or Ward-Leonard converters (MG sets).

Note:

This option can only be selected for units with rated supply voltages of up to 575 V. The commutating reactor is omitted (option L22), and on the plant or system side, a converter transformer is required for the armature circuit. In this case, it is not possible to order option L00 (radio interference suppression filter).

Description of the options

Overview (continued)

L05

Electronics power supply, SINAMICS DC MASTER for connection to 24 V DC

The power interface in the SINAMICS DC MASTER is supplied with the electronics power supply for connection to 24 V DC. In addition to this option, one of the options L06, L07 or L09 must be selected to define the type of 24 V DC supply.

L06

24 V DC power supply with SITOP

A SITOP power supply unit is installed in the cabinet to generate 24 V DC. The SITOP power supply unit is supplied from the 230 V 1 AC control voltage internally generated in the cabinet. The power supply unit is used to supply the internal 24 V DC loads (for example, options L05, G60, G62, K50, V70 to V74, Y52 to Y56).

L07

24 V DC power supply from an external supply

The 24 V DC must be provided on the plant or system side. Terminals are provided to connect this supply.
This voltage is used to supply the internal 24 V DC loads (for example, options L05, G60, G62, K50, V70 to V74, Y52 to Y56).

L09

24 V DC power supply with SITOP UPS

A SITOP power supply unit to generate 24 V DC and the SITOP UPS500S basic module for the uninterruptible power supply of max.15 A load current for 3 s are installed in the cabinet. The power supply unit is supplied from the 230 V 1 AC control voltage internally generated in the cabinet, and is used to supply the internal 24 V DC loads (for example, options L05, G60, G62, K50, V70 to V74, Y52 to Y56).

V60

Rated line frequency 60 Hz

This option must be specified if the line frequency of the armature and auxiliary circuits is 60 Hz instead of the standard 50 Hz. The commutating reactors for the armature circuit and the field circuit as well as the motor protection circuit breaker of the unit fan (for units with 400 A rated DC current) are then appropriately adapted.

Y02

Matching transformer for the field supply

This option can be selected if the 3-phase AC auxiliary supply deviates from 400 V 50 Hz or 460 V 60 Hz, or if the field voltage is to be adapted to the actual motor field voltage. The required secondary voltage of the adaptation transformer and the rated field current must be specified in plain text. The adaptation transformer is, up to a primary voltage of 500 V 3 AC, implemented as autotransformer. For certain option combinations, this option can result in increased cabinet dimensions.

Y03

3 AC auxiliary voltage not available

This option should be selected if a 3-phase AC auxiliary power supply is not available. In this case, the auxiliary power supply is taken from inside the cabinet in front of the main armature switch of the armature circuit.

Note:

Option L22 (no armature commutating reactor) cannot be selected at the same time as this option! The rated input voltage must be specified.

Y04

3 AC auxiliary voltage not the same as the standard voltage

As standard, the cabinet should be supplied with a 400 V 3 AC, 50 Hz auxiliary voltage, with clockwise rotating field, TN or TT supply system, grounded transformer neutral point. When selecting option V60 (rated line frequency of 60 Hz) this auxiliary voltage must be 460 V 3 AC.
Option Y04 should be selected if the 3-phase AC auxiliary voltage deviates from these values, or if an IT line supply or grounded main conductor is being used. The required voltage must be specified in plain text. The auxiliary voltage must not exceed 690 V. The auxiliary power supply must be protected against short-circuit and overload on the plant side. Data for the fuses for the auxiliary power supply (supplies) should be taken from the type and order-specific circuit diagram.

Note:

Depending on the particular version, it may be necessary to additionally select options Y01 and/or Y02.

Overview (continued)

OFF functions

B30

Intervention option for infeed circuit breaker interlocking

An external intervention option (terminals to integrate an external NC contact) is provided so that the infeed circuit breaker or main contactor can be externally opened. For instance, this can be a leading auxiliary switch of a circuit breaker on the line side, so that an overvoltage occurring when switching off the transformer on the primary side cannot be propagated to the SINAMICS DC MASTER. An EMERGENCY STOP must be simultaneously issued; terminals are provided as standard for this function. An internally generated 230 V AC control voltage is available at the terminals; an isolated contact should be externally connected.

L57

EMERGENCY OFF Category 0 for uncontrolled stopping in accordance with EN 60204-1

The function includes interrupting the power feed for the converter (armature circuit and field circuit) via the line contactor or circuit breaker and bypassing the microprocessor controller using a safety combination according to EN 60204-1. The motor then coasts down. It must be carefully ensured that an abrupt switch off does not represent any risk or potential danger.

L59

EMERGENCY STOP Category 1 for controlled stopping in accordance with EN 60204-1

The function includes shutting down the drive via a fast stop along a deceleration ramp to be parameterized by the user. The power feed to the DC converter is then interrupted as described for EMERGENCY OFF Category 0.
A four-quadrant converter is required to achieve the required stopping times.

Display instruments

B60 to **B66**

B60

Display instrument, "speed"

Analog display instrument, door mounting, black front frame, 96 × 96 mm, scale 0 to 125 % for two-quadrant units and ± 125 % with center zero point for four-quadrant units. The display value is output via the SINAMICS DC MASTER analog output. A maximum of six display instruments can be ordered for various display values.
From a total of three display instruments (B60, B61, B62, B64), option G60 must also be ordered.

B61

Display instrument, "armature voltage"

Analog display instrument, door mounting, black front frame, 96 × 96 mm, scale ± max. DC voltage that can be reached, with center zero point. The display value is output via the SINAMICS DC MASTER analog output. A maximum of six display instruments can be ordered for various display values. From a total of three display instruments (B60, B61, B62, B64), option G60 must also be ordered.

B62

Display instrument, "armature current"

Analog display instrument, door mounting, black front frame, 96 × 96 mm, scale 0 to 200 % for two-quadrant units and ± 200 % with center zero point for four-quadrant units. The display value is output via the SINAMICS DC MASTER analog output. A maximum of six display instruments can be ordered for various display values. From a total of three display instruments (B60, B61, B62, B64), option G60 must also be ordered.

B63

Display instrument, "line voltage excitation"

Analog display instrument, door mounting, black front frame, 96 × 96 mm, scale 0 up to the supply field voltage, as standard, 400 V at 50 Hz and 460 V at 60 Hz. The display value is taken at the field circuit input, in front of the SINAMICS DC MASTER.

B64

Display instrument, "excitation current"

Analog display instrument, door mounting, black front frame, 96 × 96 mm, scale 0 to the rated field current. The display value is output via the SINAMICS DC MASTER analog output. A maximum of six display instruments can be ordered for various display values. From a total of three display instruments (B60, B61, B62, B64), option G60 must also be ordered.

B65

Display instrument, "line voltage armature circuit"

Analog display instrument, door mounting, black front frame, 96 × 96 mm, scale 0 to the armature supply voltage. The displayed value is taken from the armature voltage supply in the cabinet before the main switch using a voltmeter changeover switch (L1-L2/L2-L3/L1-L3).

B66

Display instrument, "Line current armature circuit"

Analog display instrument, door mounting, black front frame, 96 × 96 mm, scale 0 to the rated armature input current. The display value is sensed by a CT, which is located on the line side in the converter cabinet, and routed to a display instrument.

P11

Display instrument for line quantities with PROFIBUS interface, installed in the cabinet door

A display instrument with digital display, installed in the cabinet door, acquires power supply measured values. In addition, other system values are calculated from the measured values (e.g. power, power factor, etc.). The display instrument has a PROFIBUS interface that enables a communication rate of up to 16 Mbaud.

Overview (continued)

Supplementary circuits

C51

24 V coil voltage of the coupling relay at the binary inputs

The four coupling relays at the binary inputs of the SINAMICS DC MASTER, which are as standard equipped with a 230 V AC coil, are supplied with 24 V DC coil.

K85

Field reversal

Changes over the field circuit for the DC motor for braking and direction of rotation reversal for two-quadrant units with rated DC currents of ≥ 400 A. The following additional data is required in plain text:

1. Rated motor field current
2. Rated motor field voltage
3. Energy content or inductance of the field winding
4. Max. switching frequency per hour

Note:

Longer delivery time! Field overvoltage protection is configured for the particular application. Price on request.

L00

Radio interference suppression filter

Radio interference suppression filters are used on the line side, both for the armature as well as the auxiliary circuits. With radio interference suppression filter, the cabinets comply with standard EN 61800-3 Category C2. For a rated DC current of 400 A and higher, a supplementary cabinet is required.

Note:

This option is intended for operation on grounded line supplies. Options L00 and L22 (elimination of the three-phase commutating reactor) cannot be combined.

L22

Elimination of the three-phase commutating reactor

A three-phase commutating reactor is not mounted in the drive cabinet, it is also not supplied. This option cannot be combined with option Y03 (no auxiliary power supply available).

On the plant or system side it must be ensured that there is sufficiently high inductance to allow commutation. This is generally guaranteed if the converter has its own converter transformer with an adequate short-circuit voltage.

Note:

Options L22 and L00 (radio interference suppression filter) cannot be combined.

L50

Cabinet lighting and service socket outlet

The panel has its own universal lamp; the control cabinet also has a service socket outlet. When the cabinet door is opened, a motion sensor automatically switches on the light. The power supply (230 V 1 AC, 50/60 Hz) must be available externally from a grounded line supply and fused/protected in the low-voltage distribution on the plant side with maximum 16 A. A combined miniature circuit breaker/residual current-operated circuit breaker 13 A/30 mA is installed in the cabinet.

L55

Cabinet anti-condensation heating

For high air humidity (e.g. in tropical countries) and/or low ambient temperatures, it is recommended that the drive cabinets are equipped with anti-condensation heating to guarantee reliable operation. A 150 W heating element is installed in each cabinet panel; these heating elements are thermostatically controlled. An external power supply is required (230 V 1 AC, 50/60 Hz) and must be protected with max. 16 A.

V70

Input isolating amplifier, input: 0 to 20 mA

To connect an external analog setpoint, a DC isolating amplifier with galvanic isolation and three-way separation is used.

When ordering, additional plain text is required in the circuit manual specifying the input quantity to be transferred.

Notes:

- A universal isolating amplifier is used. When required, the preset (default) input/output configuration can be changed. A readjustment is required in this case. The operating instructions for the isolating amplifier are included in the scope of delivery
- If more than one option V70 to V74 is required, then when ordering, this should be specified using a multiple selection. In this case, the analog inputs that are to be used can be seen from the order-specific circuit diagram.

Overview (continued)

V71

Input isolating amplifier, input: 4 to 20 mA

Version, see order code V70

V72

Input isolating amplifier, input: 0 to +10 V

Version, see order code V70

V73

Input isolating amplifier, input: –20 to +20 mA

Version, see order code V70

V74

Input isolating amplifier, input: –10 to +10 V

Version, see order code V70

Y51

Motor holding brake

Connection data: 230 V 1 AC, 50/60 Hz. The brake is controlled via the SINAMICS DC MASTER Cabinet. When ordering, the type plate and power data of the motor holding brake should be additionally specified in plain text!

Y52

Output isolating amplifier, output: 0 to 20 mA

A DC isolating amplifier with galvanic isolation and three-way separation is used to transfer analog output signals with electrical isolation. When ordering, additional plain text is required in the circuit manual specifying the output quantity to be transferred.

Note:

- A universal isolating amplifier is used. When required, the preset (default) input/output configuration can be changed. A readjustment is required in this case. The operating instructions for the isolating amplifier are included in the scope of delivery.
- If more than one option Y52 to Y56 is required, then when ordering, this should be specified using a multiple selection. Precisely two analog outputs are available for each CUD. This must be observed if more than two isolating amplifiers are connected, or additional display instrument options B60 to B62 or B64 are selected, as the latter are also supplied via analog outputs. If required, a second Control Unit (option G10 or G11) and/or one or several TM31 customer terminal strips must then be additionally installed. In this case, the analog outputs that are to be used can be seen from the order-specific circuit diagram.

Y53 to **Y56**

Version, see order code Y52

Y53

Output isolating amplifier, output: 4 to 20 mA

Y54

Output isolating amplifier, output: 0 to 10 V

Y55

Output isolating amplifier, output: –20 to +20 mA

Y56

Output isolating amplifier, output: –10 to +10 V

Y60

Coupling relay for binary output

A binary output of the DC converter is provided for customers via an output coupling relay and its isolated changeover contact. The relay is in the form of a terminal relay, so that customers can directly connect their cables at these -XK terminals. The relay function can be freely selected. When ordering, the use must also be specified in plain text so that it can be included in the circuit manual (e.g.: "Drive running"). If several output isolating amplifiers are required, then the option should be specified several times.

Motor-relevant options

A30

Anti-condensation heating for motor, up to max. 2 000 W, 230 V

An external supply is used (230 V 1 AC, 50/60 Hz), must be protected with max. 16 A on the plant side. As soon as the "Operation" state no longer exists, the motor anti-condensation heating is switched on. The feeder is protected against short-circuits in the drive converter using a 10 A miniature circuit breaker, characteristic C.

For heating elements with a max. 2 000 W heating power.

W15

No output provided for a motor fan

No output is provided for a motor fan.

W20 to **W41**

Setting range of the motor protection circuit breaker for the motor fan

Order code	Setting range A
W20	0.11 … 0.16
W21	0.14 … 0.2
W22	0.18 … 0.25
W23	0.22 … 0.32
W24	0.28 … 0.4
W25	0.35 … 0.5
W26	0.45 … 0.63
W27	0.55 … 0.8
W28	0.7 … 1.0
W29	0.9 … 1.25
W30	1.1 … 1.6
W31	1.4 … 2.0
W32	1.8 … 2.5
W33	2.2 … 3.2
W34	2.8 … 4.0
W35	3.5 … 5.0
W36	4.5 … 6.3
W37	5.5 … 8.0
W38	7.0 … 10.0
W39	9.0 … 12.5
W40	11 … 16
W41	14 … 20

Note:

These options are intended for operation on grounded line supplies.

Overview (continued)

W70 to **W91**

Feeder for a second motor fan

Order code	Setting range A
W70	0.11 … 0.16
W71	0.14 … 0.2
W72	0.18 … 0.25
W73	0.22 … 0.32
W74	0.28 … 0.4
W75	0.35 … 0.5
W76	0.45 … 0.63
W77	0.55 … 0.8
W78	0.7 … 1.0
W79	0.9 … 1.25
W80	1.1 … 1.6
W81	1.4 … 2.0
W82	1.8 … 2.5
W83	2.2 … 3.2
W84	2.8 … 4.0
W85	3.5 … 5.0
W86	4.5 … 6.3
W87	5.5 … 8.0
W88	7.0 … 10.0
W89	9.0 … 12.5
W90	11 … 16
W91	14 … 20

Note:

These options are intended for operation on grounded line supplies.

Y01

Matching transformer for the motor fan

This option should be selected if the supply voltage for the motor fan differs from the 3-phase auxiliary voltage. The rated voltage and the rated current of the motor fan should be specified in plain text. The adaptation transformer is, up to a primary voltage of 500 V 3 AC, implemented as autotransformer. Under unfavorable secondary conditions, this option can result in increased cabinet dimensions.

A06

Brush length monitoring, limit value monitoring, isolated

The evaluation is realized using an isolated signaling contact in the motor (order code A06 according to Catalog DA 12, Part 1, Protection and monitoring devices). The signaling contact is connected to terminal strip -X2, where it is supplied with 24 V.

A97

Air flow monitoring in the motor

Evaluation is realized using an airflow monitor "vent captor" (type: 3201.03) in the motor (order code A97 according to Catalog DA 12 Part 1, Protection and monitoring devices and Supplement DA 12, May 2001, Part 4).

In the case of a fault, a "Fault" message is output and the converter is switched off. The "Fault" can be reparameterized for "Alarm". "Alarm" and "Fault" messages can be additionally evaluated via the fieldbus interface.

No additional evaluation units are required. However, the data must be appropriately documented in the circuit manual.

L86

Evaluation unit for the following temperature sensors: KTY84-130, PT100 2-wire and 3-wire, PT1000 2-wire and 3-wire, NTC

The PT100 evaluation unit can monitor up to three sensors. The sensors can be connected in a two- or three-wire system. With the two-wire system, inputs xT1 and xT3 must be assigned. With the three-wire system, input xT2 must also be connected (x = 1, 2, 3). The limit values can be freely programmed for each channel. Shielded signal cables are recommended. If this is not possible, the sensor cables should have at least have twisted-pair wires.

Unused channels can be suppressed via parameters.

The output relays are integrated in the internal fault and alarm circuit of the drive cabinet. Customers can access the signals via two freely assignable signaling relays.

The power supply for the PT100 evaluation unit and the evaluation are realized in the converter.

Overview (continued)

B83

Overvoltage protection

A SICROWBAR AC overvoltage protection device is installed to protect the power semiconductors and is connected to the armature voltage supply. Overvoltages that occur on the AC side of converters are mainly caused by switching operations when disconnecting from the line supply at the transformer primary. This applies both to operational switching operations (shutdown at no-load) as well as in the case of a fault (shutdown under load).

Mode of operation:
If an overvoltage occurs, which reaches the response voltage of the integrated firing module, then the break-over diodes trigger and in turn trigger their associated thyristors. As a consequence, the varistors are switched to the line supply. The varistors absorb the overvoltage energy. An RC protective circuit protects the thyristors against an excessively steep voltage rate of rise when the current is interrupted. Details on the overvoltage protection device are described in Catalog D 23.1.

Note:

A supplementary cabinet is required with this option, 400 mm or 600 mm wide. The delivery time and installation altitude above 2 000 m for this option are available on request.

Monitoring functions

L52

ARC detector (arcing detector)

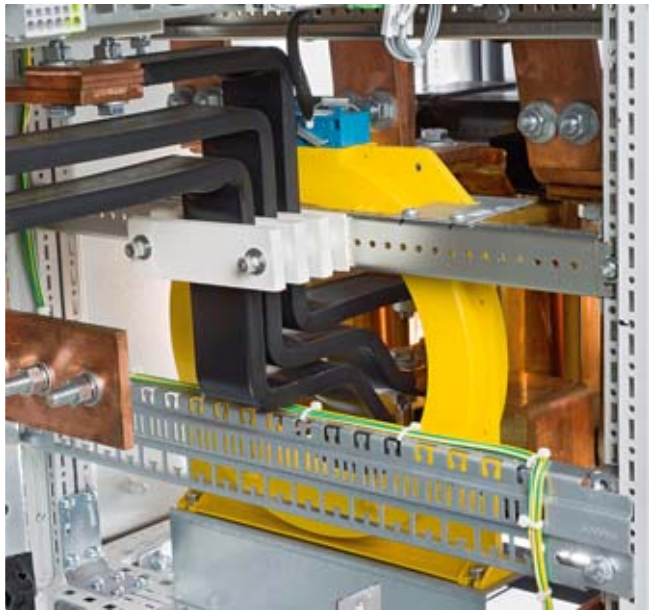
A sensor is installed to monitor the cabinet system for any arcing. Here, light sensors inside the cabinet senses any arcing and if arcing is detected, the system is shut down with an Emergency Stop; the main contactor or supply circuit breaker are opened.

Note:

A 24 V DC power supply is required (option L06, L07 or L09).

L82

Fault current monitoring in the grounded line supplies (TN or TT supply systems)



An electronic differential relay monitors the fault current in the armature circuit with respect to ground (PE). If a ground fault occurs, then the "Ground fault" signal is issued. The drive is simultaneously switched off. This option only includes monitoring the armature circuit, the fault current monitoring for the auxiliary circuit must be realized on the plant side.

Note:

For protection using a differential current monitor for shutdown, the protective conductor or PEN conductor of the cables for the cabinet supply and motor armature circuit are dimensioned according to DIN VDE 0100, Part 540. Main conductor cross-section according to DIN VDE 0160. As a consequence, generally the cable cross-section can be reduced.

L84

PTC evaluation device for alarm and fault for two sensors

This option includes a thermistor motor protection device (with PTB approval) for PTC temperature sensors (PTC thermistors, type A) for alarm and trip. The power supply for the thermistor motor protection device is realized in the cabinet.

Overview (continued)

L87

Insulation monitoring in non-grounded line supplies (IT system) with insulating monitoring devices from the Bender company

An insulation monitor is used in the armature circuit (three-phase and DC connections). If a ground fault occurs, this is signaled using a signal lamp (yellow) and the "Earth leakage" signal at a terminal. An additional coupling device is used for rated supply voltages above 690 V 3 AC.

Notes:

- For protection using insulation monitoring in non-grounded line supplies, potential bonding is required for the cabinet and motor as well as the conductive parts that can be simultaneously touched. Protective conductor cross-section according to DIN VDE 0100, Part 540. Main conductor cross-section according to DIN VDE 0160. When the main switch/circuit breaker is closed, external ground faults, which occur in the line supply outside the converter system, are also detected and signaled by the ground fault monitoring in the drive cabinet. Insulation monitor settings should be made during commissioning.
- The auxiliary power supply in the basic version is not influenced by this option. The auxiliary power supply must be provided from a grounded line supply. Other versions are possible on request.

L88

Insulation monitoring in non-grounded line supplies (IT system) with insulating monitoring devices from the AREVA company

An insulation monitor is used in the armature circuit (three-phase and DC connections). If a ground fault occurs, this is signaled using a signal lamp (yellow) and the "Earth leakage" signal at a terminal. An additional coupling device is used for rated supply voltages above 690 V 3 AC.

Notes:

- For protection using insulation monitoring in non-grounded line supplies, potential bonding is required for the cabinet and motor as well as the conductive parts that can be simultaneously touched. Protective conductor cross-section according to DIN VDE 0100, Part 540. Main conductor cross-section according to DIN VDE 0160. When the main switch/circuit breaker is closed, external ground faults, which occur in the line supply outside the converter system, are also detected and signaled by the ground fault monitoring in the drive cabinet. Insulation monitor settings should be made during commissioning.
- The auxiliary power supply in the basic version is not influenced by this option. The auxiliary power supply must be provided from a grounded line supply. Other versions are possible on request.

Overview (continued)

L90

CCP (Converter Commutation Protector)

The Converter Commutation Protector SIMOREG CCP is used to protect line-commutated SINAMICS DC MASTER converters in inverter operation against inverter commutation faults. SIMOREG CCP limits the current that flows when inverter commutation faults occur to a non-hazardous value so that the thyristors and the associated super-fast fuses are protected.

For line-commutated inverters, an appropriate line-side counter voltage is required in order to commutate the current between the individual power semiconductors. Commutation can be prevented from being completed (commutation fault) as a result of uncontrolled switching operations, line supply dips (weak line supplies, thunderstorms, etc.). As a result, in the regenerative feedback direction, a high current flows through the line supply or a cross-current in the converter. This can result in fuses blowing or under certain circumstances can destroy the semiconductors.

The firmware of the SINAMICS DC MASTER identifies if inverter commutation faults are pending and then issues the command to turn off the power semiconductors in the converter to the SIMOREG CCP. SIMOREG CCP then turns off the power semiconductors, ensures that the conditions to reduce the current in the motor are present and absorbs the magnetic energy stored in the motor as electric energy.

Benefits:
This eliminates the complex and time consuming replacement of fuses after inverter commutation faults.

Although inverter commutation faults cannot be prevented, their effects can be.

- Gearboxes and the driven machine are protected by shutting off the current in time before it reaches its possible maximum value in the case of a fault therefore protecting them against inadmissibly high torque surges.
- For high rated system currents, high-speed DC circuit-breakers were used up until now to protect the fuses against rupture. By using the CCP, protection is now cost-effectively possible even for lower line currents, whereby SIMOREG CCP has the following advantages when compared to high-speed DC circuit-breakers even at high current levels:
  - Protection also for circulating currents
  - Lower system costs
  - Lower space requirements
  - No additional air reactor to reduce the current rate-of-rise when a fault occurs
  - Lower operating costs, as it requires no maintenance
  - High degree of availability

Additional information for commissioning and the function of the SIMOREG CCP can be taken from the operating manual and Catalog D 23.1.

Note:

The option must be accommodated in an additional cabinet section; depending on the SIMOREG CCP required, the converter cabinet becomes significantly wider.
For installation altitudes above 1 000 m, with this option, on request, the transport and storage temperature should not fall below -25 °C.
In order to be able to assign the matching SIMOREG CCP for the option, when ordering, the following data must be provided:

- Line supply voltage and power section
- Required undervoltage range of the power section
- Rated motor armature voltage
- Rated motor current
- Details on the required overcurrent where necessary (magnitude, cycle duration)
- Inductance of the load (motor, cable plus, if required, a smoothing reactor)

L99

Monitoring the temperature inside the drive cabinet

The temperature is monitored in two stages. The response temperature for the alarm is 5 °C below the fault message threshold. This is oriented to the overload capability of the converter and results in the drive being shut down. The fault message can be deselected by making the appropriate parameter settings.

Description of the options

Overview (continued)

Supplementary modules

G60

Customer terminal strip extension TM31

The following are located on the TM31 Terminal Module:

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

A detailed description is provided in the operating instructions for SINAMICS DC MASTER DC Converter and in Catalog D 23.1.

Terminal Module TM31	
Digital inputs	
• Voltage	–3 … +30 V
• Low level (an open digital input is interpreted as "low")	–3 … +5 V
• High level	15 … 30 V
• Current consumption at 24 V DC, typ.	10 mA
• Conductor cross-section, max.	1.5 mm^2
Digital outputs (continuously short-circuit-proof)	
• Voltage	24 V DC
• Summed current of digital outputs, max.	1 000 mA
• Conductor cross-section, max.	1.5 mm^2
Analog inputs	
• As voltage input	
- Voltage range	–10 … +10 V
- Internal resistance R_i	100 kΩ
• As current input	
- Current range	4 … 20 mA, –20 … +20 mA, 0 … 20 mA
- Internal resistance R_i	250 Ω
- Resolution [2]	11 bit + sign
• Conductor cross-section, max.	1.5 mm^2
Analog outputs (continuously short-circuit-proof)	
• Voltage range	–10 … +10 V
• Load current, max.	–3 … +3 mA
• Current range	4 … 20 mA, –20 … +20 mA, 0 … 20 mA
• Load resistance, max.	500 Ω for outputs in the range –20 … +20 mA
• Resolution	11 bit + sign
• Conductor cross-section, max.	1.5 mm^2
Relay outputs (changeover contacts)	
• Load current, max.	8 A
• Switching voltage, max.	250 V AC, 30 V DC
• Switching capacity, max.	
- at AC 250 V	2 000 VA (cos φ = 1) 750 VA (cos φ = 0.4)
- at DC 30 V	240 W (resistive load)
• Required minimum current	100 mA
• Conductor cross-section, max.	2.5 mm^2

Note:

For this option, an Advanced CUD with DRIVE-CLiQ port (G00, G11) and a 24 V DC power supply (L06, L07 or L09) are required.

Overview (continued)

G62

Customer terminal strip extension TM15

The following are located on the TM15 Terminal Module: 24 bidirectional digital inputs/outputs (isolation in 3 groups, each with 8 channels). A detailed description is provided in the operating instructions for SINAMICS DC MASTER DC Converter and in Catalog D 23.1.

Terminal Module TM15	
I/O	
• Digital inputs/outputs	Channelwise parameterizable as DI or DO
• Number of digital inputs/outputs	24
• Electrical isolation	Yes, in groups of 8
• Connection system	Plug-in screw terminals
• Conductor cross-section, max.	1.5 mm^2
Digital inputs	
• Voltage	–30 … +30 V
• Low level (an open digital input is interpreted as "low")	–30 … +5 V
• High level	15 … 30 V
• Current consumption at 24 V DC	5 … 11 mA
Digital outputs (continuously short-circuit-proof)	
• Voltage	24 V DC
• Load current per digital output, max.	0.5 A
• Summed current of outputs (per group), max.	
- Up to 60 °C	2 A
- Up to 50 °C	3 A
- Up to 40 °C	4 A

Note:

For this option, an Advanced CUD with DRIVE-CLiQ port (G00, G11) and a 24 V DC power supply (L06, L07 or L09) are required.

K50

Sensor Module Cabinet-Mounted SMC30

The CUD of the SINAMICS DC MASTER can already evaluate the signals of an incremental encoder. For applications where more than one encoder must be evaluated, either a second CUD and/or Sensor Module Cabinet-Mounted SMC30 can be used. The SMC30 can be used to evaluate SSI encoders with incremental signals, which for instance, are used for positioning functions. Encoders, which have a DRIVE-CLiQ interface, cannot be evaluated at the SINAMICS DC MASTER or at the SMC30. These encoders are generally not used in DC drive technology.

The following encoder signals can be evaluated:

- Incremental encoders TTL/HTL with and without wire break detection (wire break detection is only available with bipolar signals)
- SSI encoder with TTL/HTL incremental signals
- SSI encoder without incremental signals

The motor temperature input, available on the SMC30, is not evaluated for SINAMICS DC MASTER. A motor temperature sensor can be evaluated using the temperature measurement input provided on each CUD.

Sensor Module Cabinet-Mounted SMC30	
Encoders which can be evaluated	• Incremental encoder TTL/HTL • SSI encoder with TTL/HTL incremental signals • SSI encoder without incremental signals
• Encoder supply	24 V DC/0.35 A or 5 V DC/0.35 A
• Encoder frequency, max.	300 kHz
• SSI baud rate	100 … 250 kBaud
• Frequency limit	300 kHz
• Resolution absolute position SSI	30 bit
• Cable length, max.	
- TTL encoder	100 m (only bipolar signals permitted) [1]
- HTL encoder	100 m for unipolar signals 300 m for bipolar signals [1]
- SSI encoder	100 m

Note:

For this option, an Advanced CUD with DRIVE-CLiQ port (G00, G11) and a 24 V DC power supply (L06, L07 or L09) are required.

[1] Twisted pair and shielded signal cables.

Description of the options

Overview (continued)

Mechanical options

M06 and **M07**

M06

Base 100 mm high, RAL 7022

All of the cabinets are mounted on a 100 mm high base. The front socket cover can be removed to introduce the connecting cables. Paint finish in RAL 7022.

M07

Cable-marshaling space 200 mm high, RAL 7035

All of the cabinets are mounted on a 200 mm high base. On one side, the basic cover is split into 2 × 100 mm and can be used to introduce the connecting cables. Paint finish in RAL 7022.

M21

Degree of protection IP21

Cabinet version in IP20, but with additional roof or canopy. This increases the cabinet height by 75 up to 250 mm depending on the size. For transport-related reasons, the roofs or canopies are delivered separately and must be fitted on site.

Important:
The roof or canopies are painted in RAL 7035 as standard. If a special color is requested for the cabinet, the top covers or canopies will also be painted this color.

[1] It must be ensured that the required volume of air is available for the drive cabinet in a suitable quality (depending on the degree of protection). The minimum clearance between the upper edge of the cabinet and the ceiling height can be seen from the dimension drawings and is defined in the operating instructions.

Overview (continued)

M23

Degree of protection IP23

Converter cabinets with IP23 degree of protection are supplied with additional roof covers with integrated fans, as well as plastic ventilation grilles and a filter medium in the air inlet. The cabinet height is increased by between 130 and 400 mm. The filter medium (1 mm mesh size) must be maintained according to the local environmental conditions. For transport-related reasons, the roof sections are delivered separately and must be fitted by the customer.

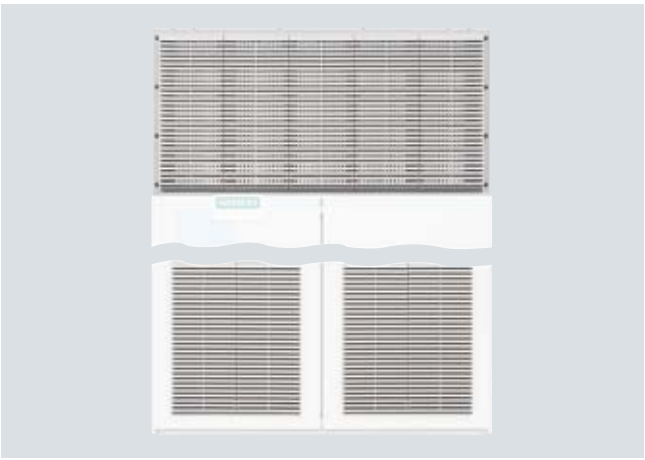
Important:
The roof sections are painted in RAL 7035 as standard. If a special color is requested for the cabinet, the roof sections are also painted this color. The molded plastic parts (e.g. ventilation grilles) are finished in RAL 7035, and cannot be painted.

Due to degree of protection IP23 deviating technical data from the basic version (IP20)

Rated DC current	Cooling air requirement [1]	Sound pressure level
400 … 600 A	3 000 m^3/h	81 dB(A)
720 … 850 A	3 000 m^3/h	80 dB(A)
950 … 1 200 A	3 000 m^3/h	84 dB(A)
1 500 … 3 000 A	as basic version	83 dB(A)

M43

Degree of protection IP43



Converter cabinets with IP43 degree of protection are supplied with additional roof covers with integrated fans, as well as plastic ventilation grilles and a filter medium (1 mm mesh size) in the air inlet and air outlet. The cabinet height is increased by between 130 and 400 mm. The filter medium must be maintained according to the local environmental conditions. For transport-related reasons, the roof sections are delivered separately and must be fitted by the customer.

Important:
The roof sections are painted in RAL 7035 as standard. If a special color is requested for the cabinet, the roof sections are also painted this color. The molded plastic parts (e.g. ventilation grilles) are finished in RAL 7035, and cannot be painted.

Due to degree of protection IP43 deviating technical data from the basic version (IP20)

Rated DC current	Cooling air requirement [1]	Sound pressure level
400 … 600 A	3 000 m^3/h	81 dB(A)
720 … 850 A	3 000 m^3/h	80 dB(A)
950 … 1 200 A	3 000 m^3/h	84 dB(A)
1 500 … 3 000 A	as basic version	83 dB(A)

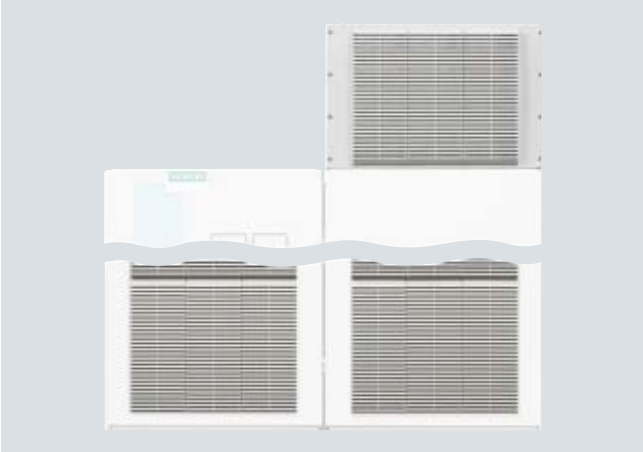
[1] It must be ensured that the required volume of air is available for the drive cabinet in a suitable quality (depending on the degree of protection). The minimum clearance between the upper edge of the cabinet and the ceiling height can be seen from the dimension drawings and is defined in the operating instructions.

Description of the options

Overview (continued)

M54

Degree or protection IP54 with filter elements



SINAMICS DC MASTER Cabinet in IP54 degree of protection is supplied with additional roof section with integrated fan, plastic ventilation grilles, and a filter medium in the air inlet and outlet, which ensures compliance with IP54 degree of protection. The cabinet height is therefore increased by 400 mm. The filters must be maintained according to the local environmental conditions. For transport-related reasons, the roof sections are delivered separately and must be fitted by the customer.

Important:

- The roof sections are painted in RAL 7035 as standard. If a special color is requested for the cabinet, the roof sections are also painted this color. The molded plastic parts (e.g. ventilation grilles) are finished in RAL 7035, and cannot be painted.
- For the version in degree of protection IP54 with the filter element, the derating factors can differ from the data provided in the table in Section "General technical data". The corresponding values are available on request.

Due to degree of protection IP54 deviating technical data from the basic version (IP20)

Rated DC current	Cooling air requirement [1)]	Sound pressure level
15 … 125 A	1 000 m^3/h	74 dB(A)
210 … 280 A	1 000 m^3/h	74 dB(A)
400 … 600 A	3 000 m^3/h	81 dB(A)
720 … 850 A	3 000 m^3/h	80 dB(A)
950 … 1 200 A	3 000 m^3/h	84 dB(A)
1 500 … 3 000 A	as basic version	83 dB(A)

M58

Degree or protection IP54 with climate control unit

SINAMICS DC MASTER Cabinet in degree of protection IP54 is equipped with additional climate controlled units to ensure adequate cooling when the cabinet is closed. In addition to avoiding pollution and dirt and preventing the ingress of foreign bodies and water, this also allows the drive units to be operated in hot environments, as a result of the climate and/or process heat.

M59

Cabinet door closed, entry from the bottom through an opening in the floor

If SINAMICS DC MASTER Cabinet are mounted on a false floor or duct which forms part of a forced ventilation system, the modules can be ordered with closed cabinet doors. To ensure an adequate air inlet cross-section, the units are shipped without the standard base plates. In this case, the customer must ensure that no dirt, conductive dust, moisture or small animals can enter the inside of the cabinets. Cables must not be routed in such a way that they impede the flow of air through the cabinet floor opening. If the area beneath the drive units can be accessed, then the customer must provide touch protection.

M60

Additional shock hazard protection

In the basic version of the SINAMICS DC MASTER Cabinet, in compliance with the current standards, finger and back of hand protection is ensured when the cabinet doors are open. With option M60, the drive cabinets are equipped with additional touch protection corresponding to BGV A3.

[1)] It must be ensured that the required volume of air is available for the drive cabinet in a suitable quality (depending on the degree of protection). The minimum clearance between the upper edge of the cabinet and the ceiling height can be seen from the dimension drawings and is defined in the operating instructions.

Overview (continued)

M66

Marine version

Corresponding to the requirements of the marine classification societies Lloyds Register, American Bureau of Shipping, Germanischer Lloyd or Det Norske Veritas, individual acceptance tests are carried out in the factory.

M90

Crane transport aid (mounted at the top)

A top-mounted crane transport assembly can be ordered as an option for SINAMICS DC MASTER Cabinet. Depending on the width of the cabinet, it consists of either transport eyebolts (width ≤ 1 600 mm) or transport rails (width > 1 600 mm).

Other options

F03

Equipment acceptance with customer present: visual acceptance

The acceptance scope includes:

- The degree of protection is checked
- The integrated components are checked to ensure that they are complete (checked against the parts list)
- The equipment codes are checked
- The clearance and creepage distances are checked
- The cable tags are checked
- Customer documentation is checked
- Acceptance report is handed over

All the above checks are performed with the equipment in a no-voltage condition.

F97

Equipment acceptance with customer present: customer-specific acceptance

If acceptance tests are requested, which are not covered by option F03, customized acceptance tests/supplementary tests can be ordered using order code F97 on request and following technical clarification.

K07

Without Advanced Operator Panel AOP30

The Advanced Operator Panel AOP30 is not provided. The AOP30 is not installed in the cabinet door and is not supplied the equipment.

L91

Commissioning interface (PROFIBUS) brought out

The commissioning interface (PROFIBUS) is brought through the cabinet door of the control cabinet. This interface is intended for commissioning purposes only and cannot be used to continually control the drive. The cable entry in the cabinet is equipped with a protective cover.

Q80 to **Q85**

Extension of the liability for defects

A detailed description of the options is provided in the catalog section, Services, Section Service & Support under Liability for defects.

U09

Version according to UL Listing

The converter cabinet is designed and built corresponding to UL specifications. The option does not include any certification. Individual certification can be performed in the factory after prior agreement.

X30

Customer-specific requirement

If options are requested, which are not covered by the catalog, customer-specific requirements can be ordered specifying order code X30 on request and following technical clarification.

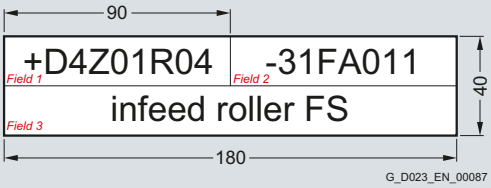
Y09

Special cabinet paint finish

As standard, the drive cabinets are delivered in RAL 7035. The special paint finish must be specified in plain text when ordering. All RAL colors which are available as powder coatings can be selected. If roof sections or canopies (order code M21), top covers (codes M23/M43/M54) are required for the drive cabinets, these will also be painted the same color as the cabinet. The molded plastic parts (e.g. ventilation grilles) as well as options such as cable marshaling space (order code M07) are finished in RAL 7035, and cannot be painted. A special paint finish is also not available for the optional socket (option M06).

Y32

Labeling plate to identify the system, two lines, 40 × 180 mm



Plastic labels (white with black engraving) are available to mark the drive cabinets. The labels are glued to the cabinet door.

Dimensions H × W: 40 × 180 mm.

The text must be specified in plain text when ordering.
Field 1: Max. 9 characters, font size 10 mm
Field 2: Max. 9 characters, font size 10 mm
Field 3: Max. 20 characters, font size 10 mm.

Overview (continued)

Documentation

D02

Customer documentation (circuit diagram, terminal diagram, layout diagram) in the DXF format

Option D02 can be used to order documents such as circuit diagrams, terminal diagrams, layout diagrams, and dimension drawings in the DXF format, e.g. for further processing in AutoCAD systems.

D04

Customer documentation, paper

Equipment documentation is supplied electronically on DVD as standard. If the customer also requires a hard copy of the documentation and selects option D04, the following documents will be included in a document folder with the converter cabinet:

- Operating instructions
- Circuit diagram
- Terminal diagram
- Layout diagram
- Dimension drawing

Independent of selecting option D04, safety and transport instructions, the circuit manual with circuit diagram, terminal diagram, single-line block diagram and layout diagram as well as the dimension drawing are always provided as hard copy in the drive cabinet.

Note:

The documentation language is selected using options D58 to D80 (standard, German and English).

D14

Preliminary customer documentation

If documents such as circuit diagrams, terminal diagrams, layout diagrams and dimension drawings are required in advance for the purpose of system engineering (integration of drive into higher-level systems, interface definition, installation, building planning, etc.), it is possible to order a draft copy of the documentation when ordering. These documents are then supplied electronically a few working days after the order has been clarified. For project-specific, special solutions, option D14 is only available on request.

D19

Circuit diagram prepared for motor overtemperature monitoring using a limit value transmitter

The evaluation is realized using an isolated signaling contact in the motor (order code A31 according to Catalog DA 12 · 2008, Protection and monitoring).

D20

Circuit diagram prepared for motor temperature monitoring

PT100, PT1000, KTY84-130, PTC or NTC motor temperature monitoring devices can be directly evaluated in the SINAMICS DC MASTER. When specifying the option, for the corresponding temperature input, this is documented in the circuit diagram. The customer connection is realized at the TMC terminal adapter.

D21

Circuit diagram prepared for speed actual value sensing (pulse encoder)

The connection of the speed actual value sensing using a pulse encoder is shown in the circuit diagram. The customer connection is realized at the TMC terminal adapter.

D22

Circuit diagram prepared for speed actual value sensing (analog tachometer)

The connection of the speed actual value sensing using an analog tachometer is shown in the circuit diagram. The customer connection is established at the power interface of the SINAMICS DC MASTER.

D58 to **D80**

Documentation language

The following options refer to the operating instructions and the List Manual for SINAMICS DC MASTER DC Converter as well as the standard information texts in the circuit diagram. Parts lists are in English/German.

Order code	Languages
D58	English/French
D60	English/Spanish
D61	English/Russian
D80	English/Italian

Packing

M91

Packaging type: wooden crate

Cabinet bolted to a pallet, air cushion + shrink foil + additional air cushion at the top. Wooden frame with approximate 100 mm clearance to the cabinet, nailed with wooden strips with approximately 200 mm space between them (low level of protection against mechanical damage).

M92

Packaging type: crate, packed for air freight

Cabinet bolted to a pallet, air cushion + shrink foil + additional air cushion at the top. Packed in a wooden crate.

M93

Packaging type: crate, seaworthy packaging

Cabinet bolted to a pallet, air cushion + aluminum foil + air cushion at the top, desiccant added, and welded, vacuum sealed and packed in a wooden crate.

M94

Packaging type: additional packaging data IPPC ISPM15 (according to country-specific regulations)

Protection against insects that can cause damage, all of the wooden parts manufactured out of plywood. The factory is certified for packing according to ISPM15.

Engineering information

5

Dynamic overload capability

Overview

Dimensioning the units for optimized load current

In the catalog, the components in the cabinets, for example, contactor, commutating reactor and busbars are dimensioned and installed based on the rated converter current. In practice, when referred to the actual motor load current, these components can be overdimensioned. On request, and when specifying the load cycle and the motor currents, a check can be made as to whether it makes economic sense to adapt the current-carrying components to the plant requirements.

Determining the dynamic overload capability

Function overview

The rated DC current specified on the unit rating plate (max. permissible continuous DC current) may be exceeded in operation. The extent to which this value is exceeded and how long this lasts are subject to certain limits, which are explained in more detail in the following.

The absolute upper limit for the absolute value of the overload currents is 1.8 x the rated DC current. The max. overload duration depends on the time characteristic of the overload current as well as on the load history of the unit and also depends on the specific unit.

Each overload phase must be preceded by an underload phase (load phase with load current < rated DC current). Once the max. permissible overload duration has elapsed, the load current must return to at least an absolute value ≤ the rated DC current.

The dynamic overload duration is made possible by thermally monitoring the power section (I^2t monitoring. I^2t monitoring uses the time characteristic of the actual load current to calculate the time characteristic of a substitute value for the increase of the depletion layer temperature of the thyristors above the ambient temperature. In this case, unit-specific properties (e.g. thermal resistances and time constants) are incorporated in the calculation. When the converter unit is switched on, the calculation process starts with the initial values that were determined before the shutdown/line supply failure. The environmental conditions (ambient temperature and installation altitude) must be taken into account when setting a parameter.

I^2t monitoring responds when the calculated substitute depletion layer temperature rise exceeds the permissible value. Two alternatives can be parameterized as response:

- Alarm with a reduction of the armature current setpoint to the rated DC current or
- Fault with unit shutdown

The I^2t monitoring can be disabled. In this case, the armature current is limited to the rated DC current.

Configuring for the dynamic overload capability

The configuring sheets contain the following information:

- The max. overload duration t_{an} when starting with a cold power section and specified, constant overload,
- The max. zero current interval t_{ab} (max. cooling down time) until the "cold" thermal state of the power section is reached, and
- Limit characteristic fields for determining the overload capability during thermally stabilized, intermittent operation with overload (periodic duty cycles)

Remark: The power section is considered to be "cold" if the calculated substitute depletion layer temperature rise is less than 5 % of its max. permissible value. This state can be queried using a binary user-assignable output.

Structure of the limit characteristic fields for intermittent operation with overload

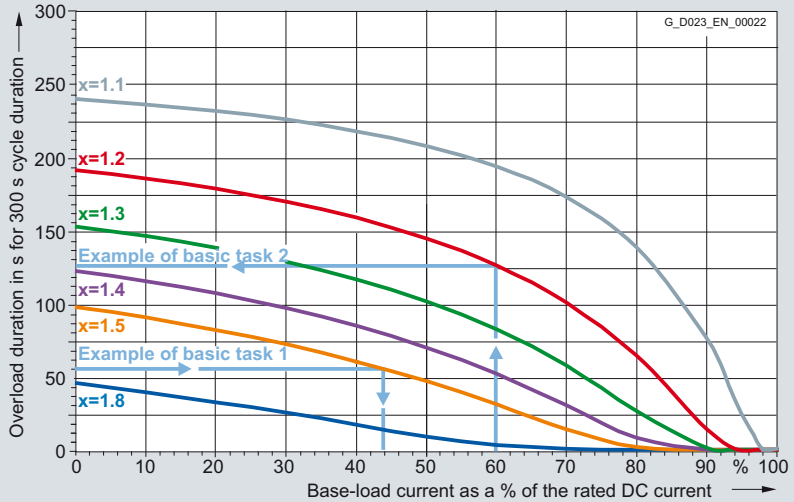
The limit characteristic fields refer to a duty cycle of the intermittent overload operation with a total duration (time period) of 300 s. Such a duty cycle comprises two time sections – the base-load duration (armature current actual value ≤ rated DC current) and the overload duration (armature current actual value ≥ rated DC current).

Each limit characteristic represents a unit-specific max. base-load current for a specific overload factor (limiting base-load current, specified as a % of the rated DC current) over the min. base-load duration (limiting base-load duration). For the remaining duration of the duty cycle, the max. permissible overload current is determined by the overload factor. If no limit characteristic has been specified for the required overload factor, then it will be subject to the limiting characteristic for the next highest overload factor.

The limit characteristic fields of the particular SINAMICS DC MASTER DC Converter are shown in Catalog D 23.1. The characteristic for the corresponding DC Converter should be used for the SINAMICS DC MASTER Cabinet. Derating data that influence the rated DC current of the unit and therefore the associated characteristic, for example, the installation altitude and the ambient temperature, should be taken from this Catalog D 23.2 Chapter "Technical data".

The limit characteristic fields are valid for a duty cycle of 300 s. Using basic algorithms, duty cycles can be configured with duty cycle durations of longer than or shorter than 300 s. This will now be shown using two basic tasks.

Overview (continued)



Overload with x-times rated DC current	t_{an} (s)
x=1.1	1438
x=1.2	906
x=1.3	631
x=1.4	455
x=1.5	333
x=1.8	123

t_{ab} (s) = 2193

Characteristic example for basic tasks 1 and 2

Basic task 1

- Given:
  Unit, cycle duration, overload factor, overload duration
- To be found:
  (Min.) base-load duration and max. base-load current
- Solution:

	Cycle duration	
	< 300 s	**≥ 300 s**
1. Determine the characteristic	Select the limit characteristic for the specific unit and the specific overload factor	
2. Overload duration$_{300}$ =	300 s/cycle duration × overload duration	Overload duration$_{300}$
3. Base-load duration$_{300}$ =	300 s – overload duration$_{300}$	
4. Base-load duration$_{300}$ < base-load duration$_{300}$ for max. base-load current = 0	Yes: Required duty cycle cannot be configured No: Read the max. base-load current for overload duration$_{300}$ from the limit characteristic	
5. Determine the percentage for the base-load current	Read the percentage for the base-load currents from the diagram	

Example for basic task 1

- Given:
  - Unit with 30 A
  - Cycle duration 113.2 s
  - Overload factor 1.45
  - Overload duration 20 s
- To be found:
  - (Min.) base-load duration
  - Max. base-load current
- Solution:
  - Limit characteristic for a unit with 30 A
  - Overload factor 1.5
  - Overload duration$_{300}$ = 300 s / 113.2 s × 20 s = 53 s →
    (see the characteristic example for basic tasks 1 and 2)
  - Max. base-load current = 44 % I_{rated} = 13.2 A

Dynamic overload capability

Overview (continued)

Basic task 2

- Given:
  Unit, cycle duration, overload factor, base-load current
- To be found:
  Maximum overload duration, minimum base-load duration
- Solution:

	Cycle duration	
	< 300 s	**≥ 300 s**
1. Determine the characteristic	Select the limit characteristic for the specific unit and the specific overload factor	
2. Max. overload duration =	(Cycle duration/300 s) × overload duration$_{300}$	300 s – base-load duration$_{300}$
3. Min. base-load duration =	Cycle duration – max. overload duration	Cycle duration – max. overload duration

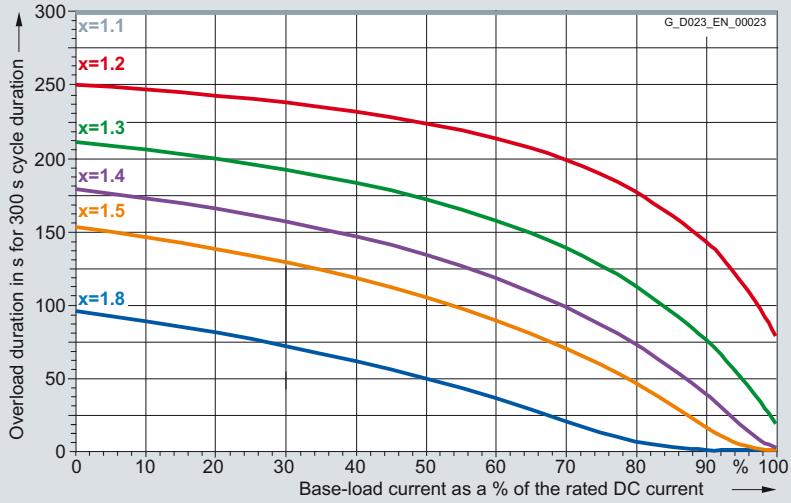
Example for basic task 2

- Given:
  - Unit with 30 A
  - Cycle duration 140 s
  - Overload factor 1.15
  - Base-load current = 0.6 × I_{rated} = 18 A
- To be found:
  - Maximum overload duration
  - Minimum base-load duration

Solution:
- Limit characteristic for a unit with 30 A
- Overload factor 1.2
- Base load current = 60 % I_{rated} →
  (see characteristic example for basic tasks 1 and 2)
- Overload duration$_{300}$ = 127 s
- Max. overload duration = 140 s / 300 s × 127 s = 59 s
- Min. base-load duration = 140 s - 59 s = 81 s

Base-load duration$_{300}$ = min. base-load duration for 300 s cycle duration (300 s overload duration)

Overload duration$_{300}$ = max. overload duration für 300 s Cycle duration



Overload with x-times rated DC current	t_{an} (s)
x=1.1	9227
x=1.2	1633
x=1.3	1112
x=1.4	833
x=1.5	651
x=1.8	342
t_{ab} (s) = 2303	

6RM8013-6DV62-0AA0 15 A/four-quadrant operation 400 V,
6RM8013-6FV62-0AA0 15 A/four-quadrant operation 480 V

Load classes

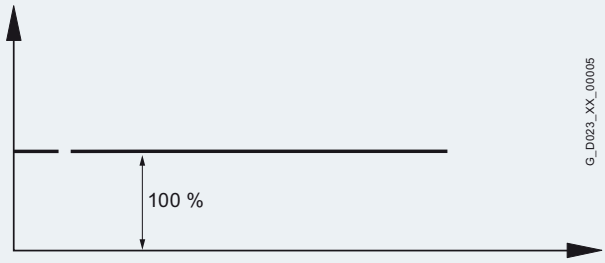
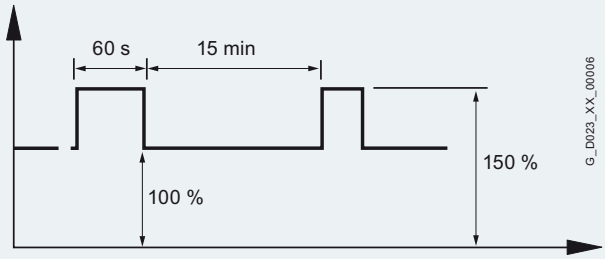
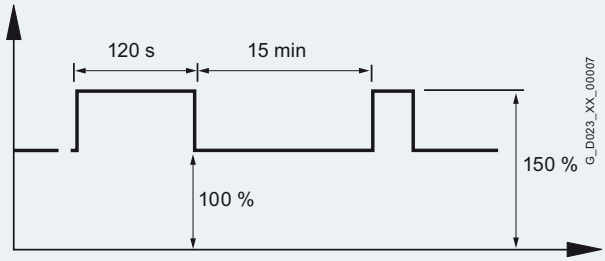
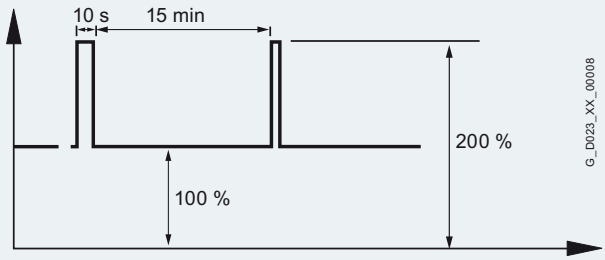
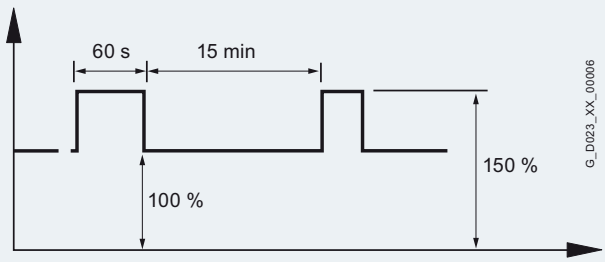
In order to be able to adapt the SINAMICS DC MASTER as simply as possible to the load profile of the driven machine, in addition to the individual dimensioning using the limit characteristics of the dynamic overload capability, these can also be dimensioned using pre-selected load cycles that are simple to parameterize.

Note:

SINAMICS DC MASTER does not monitor whether the load class – set using parameters – is maintained. If the power section permits it, the unit can operate for overload durations in excess of those defined by the load class. This means that the driven machine of the mechanical system is not protected against overload!

The overload duration that is actually permitted for the power section in question is always longer than the duration defined by the load class, and the SINAMICS DC MASTER does monitor whether the overload duration that is actually permitted for the power section is being adhered to.

Overview (continued)

Load class (parameter)	Load for the converter	Load cycle
DC I	$I_{DC\ I}$ continuous (I_{dN})	
DC II	$I_{DC\ II}$ for 15 min and 1.5 × $I_{DC\ II}$ for 60 s	
DC III	$I_{DC\ III}$ for 15 min and 1.5 × $I_{DC\ III}$ for 120 s	
DC IV	$I_{DC\ IV}$ for 15 min and 2 × $I_{DC\ IV}$ for 10 s	
US rating	I_{US} for 15 min and 1.5 × I_{US} for 60 s Note: With this setting, for all drive cabinet types, an ambient and/or cooling medium temperature of 40 °C is permissible.	

Dynamic overload capability

Overview (continued)

Duty cycles for two-quadrant operation

Supply voltage	SINAMICS DC MASTER converter	T_u [1]	Duty cycles								
			DC I	DC II		DC III		DC IV		US rating T_u = 40 °C	
			continu-ous	15 min 100 %	60 s 150 %	15 min 100 %	120 s 150 %	15 min 100 %	10 s 200 %	15 min 100 %	60 s 150 %
V	Type	°C	A	A	A	A	A	A	A	A	A
3 AC 400	6RM8025-6DS22-0AA0	40	60	51.4	77.1	50.2	75.3	46.4	92.8	51.4	77.1
	6RM8028-6DS22-0AA0	40	90	74.4	111	72.8	109	65.4	130	74.4	111
	6RM8031-6DS22-0AA0	40	125	106	159	103	155	96.3	192	106	159
	6RM8075-6DS22-0AA0	35	210	164	247	161	242	136	273	157	236
	6RM8078-6DS22-0AA0	35	280	226	340	219	328	201	402	215	323
	6RM8081-6DS22-0AA0	35	400	290	435	282	423	244	488	278	417
	6RM8085-6DS22-0AA0	35	600	462	693	446	669	413	826	443	665
	6RM8087-6DS22-0AA0	35	850	652	978	622	933	609	1 219	619	929
	6RM8091-6DS22-0AA0	35	1 200	884	1 326	857	1 286	768	1 537	842	1 263
	6RM8093-4DS22-0AA0	35	1 600	1 255	1 883	1 213	1 819	1 139	2 279	1 190	1 785
	6RM8095-4DS22-0AA0	35	2 000	1 477	2 216	1 435	2 152	1 326	2 653	1 404	2 106
	6RM8098-4DS22-0AA0	35	3 000	2 288	3 432	2 189	3 283	2 164	4 328	2 178	3 267
3 AC 480	6RM8025-6FS22-0AA0	40	60	51.4	77.1	50.2	75.3	46.4	92.8	51.4	77.1
	6RM8028-6FS22-0AA0	40	90	74.4	111	72.8	109	65.4	130	74.4	111
	6RM8031-6FS22-0AA0	40	125	106	159	103	155	96.3	192	106	159
	6RM8075-6FS22-0AA0	35	210	164	247	161	242	136	273	157	236
	6RM8078-6FS22-0AA0	35	280	226	340	219	328	201	402	215	323
	6RM8082-6FS22-0AA0	35	450	320	480	311	466	274	548	306	460
	6RM8085-6FS22-0AA0	35	600	462	693	446	669	413	826	443	665
	6RM8087-6FS22-0AA0	35	850	652	978	622	933	609	1 219	619	929
	6RM8091-6FS22-0AA0	35	1 200	884	1 326	857	1 286	768	1 537	842	1 263
3 AC 575	6RM8025-6GS22-0AA0	40	60	51.4	77.1	50.2	75.3	46.4	92.8	51.4	77.1
	6RM8031-6GS22-0AA0	40	125	106	159	103	155	96.3	192	106	159
	6RM8075-6GS22-0AA0	35	210	164	247	161	242	136	273	157	236
	6RM8081-6GS22-0AA0	35	400	290	435	282	423	244	488	278	417
	6RM8085-6GS22-0AA0	35	600	462	693	446	669	413	826	443	665
	6RM8087-6GS22-0AA0	35	800	607	911	581	872	559	1 118	578	867
	6RM8090-6GS22-0AA0	35	1 100	804	1 207	782	1 173	689	1 379	766	1 150
	6RM8093-4GS22-0AA0	35	1 600	1 255	1 883	1 213	1 819	1 139	2 279	1 190	1 785
	6RM8095-4GS22-0AA0	35	2 000	1 663	2 494	1 591	2 386	1 568	3 136	1 569	2 354
	6RM8096-4GS22-0AA0	35	2 200	1 779	2 669	1 699	2 549	1 697	3 394	1 678	2 517
	6RM8097-4GS22-0AA0	35	2 800	2 136	3 204	2 044	3 066	2 022	4 044	2 024	3 036
3 AC 690	6RM8086-6KS22-0AA0	35	720	553	829	527	791	515	1 031	525	788
	6RM8090-6KS22-0AA0	35	1 000	737	1 105	715	1 072	639	1 279	702	1 053
	6RM8093-4KS22-0AA0	35	1 500	1 171	1 757	1 140	1 710	1 036	2 073	1 116	1 674
	6RM8095-4KS22-0AA0	35	2 000	1 589	2 383	1 522	2 283	1 505	3 011	1 503	2 255
	6RM8097-4KS22-0AA0	35	2 600	1 992	2 989	1 906	2 859	1 887	3 774	1 876	2 815
3 AC 830	6RM8088-6LS22-0AA0	35	950	700	1 051	679	1 019	607	1 215	667	1 001
	6RM8093-4LS22-0AA0	35	1 500	1 171	1 757	1 140	1 710	1 036	2 073	1 116	1 674
	6RM8095-4LS22-0AA0	35	1 900	1 485	2 228	1 421	2 132	1 396	2 793	1 414	2 121
3 AC 950	6RM8096-4MS22-0AA0	35	2 200	1 674	2 511	1 603	2 404	1 570	3 141	1 588	2 382

[1] For other temperatures, see under "Coolant temperature and installation altitude" in the catalog part "SINAMICS DC MASTER Cabinet", Section "Ordering and technology" – "Technical data".

Overview (continued)

Duty cycles for four-quadrant operation

Supply voltage	SINAMICS DC MASTER converter	T_u [1]	Duty cycles								
			DC I	DC II		DC III		DC IV		US rating T_u = 45 °C	
			continu-ous	15 min 100 %	60 s 150 %	15 min 100 %	120 s 150 %	15 min 100 %	10 s 200 %	15 min 100 %	60 s 150 %
V	Type	°C	A	A	A	A	A	A	A	A	A
3 AC 400	6RM8013-6DV62-0AA0	40	15	13.9	20.8	13.5	20.2	12.6	25.2	13.9	20.8
	6RM8018-6DV62-0AA0	40	30	24.9	37.3	24.2	36.3	22.4	44.8	24.9	37.3
	6RM8025-6DV62-0AA0	40	60	53.1	79.6	51.8	77.7	47.2	94.4	53.1	79.6
	6RM8028-6DV62-0AA0	40	90	78.2	117	76	114	72.2	144	78.2	117
	6RM8031-6DV62-0AA0	40	125	106	159	103	155	95.4	190	106	159
	6RM8075-6DV62-0AA0	35	210	164	247	161	242	136	273	157	236
	6RM8078-6DV62-0AA0	35	280	226	340	219	328	201	402	215	323
	6RM8081-6DV62-0AA0	35	400	300	450	292	438	247	494	285	428
	6RM8085-6DV62-0AA0	35	600	470	706	453	680	410	820	450	675
	6RM8087-6DV62-0AA0	35	850	658	987	634	951	579	1 159	626	939
	6RM8091-6DV62-0AA0	35	1 200	884	1 326	857	1 286	768	1 537	842	1 263
	6RM8093-4DV62-0AA0	35	1 600	1 255	1 883	1 213	1 819	1 139	2 279	1 190	1 785
	6RM8095-4DV62-0AA0	35	2 000	1 477	2 216	1 435	2 152	1 326	2 653	1 404	2 106
	6RM8098-4DV62-0AA0	35	3 000	2 288	3 432	2 189	3 283	2 164	4 328	2 178	3 267
3 AC 480	6RM8013-6FV62-0AA0	45	15	13.9	20.8	13.5	20.2	12.6	25.2	13.9	20.8
	6RM8018-6FV62-0AA0	45	30	24.9	37.3	24.2	36.3	22.4	44.8	24.9	37.3
	6RM8025-6FV62-0AA0	45	60	53.1	79.6	51.8	77.7	47.2	94.4	53.1	79.6
	6RM8028-6FV62-0AA0	45	90	78.2	117	76	114	72.2	144	78.2	117
	6RM8031-6FV62-0AA0	45	125	106	159	103	155	95.4	190	106	159
	6RM8075-6FV62-0AA0	35	210	164	247	161	242	136	273	157	236
	6RM8078-6FV62-0AA0	35	280	226	340	219	328	201	402	215	323
	6RM8082-6FV62-0AA0	35	450	320	480	311	466	274	548	306	460
	6RM8085-6FV62-0AA0	35	600	470	706	453	680	410	820	450	675
	6RM8087-6FV62-0AA0	35	850	658	987	634	951	579	1 159	626	939
	6RM8091-6FV62-0AA0	35	1 200	884	1 326	857	1 286	768	1 537	842	1 263
3 AC 575	6RM8025-6GV62-0AA0	40	60	53.1	79.6	51.8	77.7	47.2	94.4	53.1	79.6
	6RM8031-6GV62-0AA0	40	125	106	159	103	155	95.4	190	106	159
	6RM8075-6GV62-0AA0	35	210	164	247	161	242	136	273	157	236
	6RM8081-6GV62-0AA0	35	400	300	450	292	438	247	494	285	428
	6RM8085-6GV62-0AA0	35	600	470	706	453	680	410	820	450	675
	6RM8087-6GV62-0AA0	35	850	658	987	634	951	579	1 159	626	939
	6RM8090-6GV62-0AA0	35	1 100	804	1 207	782	1 173	689	1 379	766	1 150
	6RM8093-4GV62-0AA0	35	1 600	1 255	1 883	1 213	1 819	1 139	2 279	1 190	1 785
	6RM8095-4GV62-0AA0	35	2 000	1 663	2 494	1 591	2 386	1 568	3 136	1 569	2 354
	6RM8096-4GV62-0AA0	35	2 200	1 779	2 669	1 699	2 549	1 697	3 394	1 678	2 517
	6RM8097-4GV62-0AA0	35	2 800	2 136	3 204	2 044	3 066	2 022	4 044	2 024	3 036
3 AC 690	6RM8086-6KV62-0AA0	35	760	598	898	575	863	532	1 065	569	853
	6RM8090-6KV62-0AA0	35	1 000	737	1 105	715	1 072	639	1 279	702	1 053
	6RM8093-4KV62-0AA0	35	1 500	1 171	1 757	1 140	1 710	1 036	2 073	1 116	1 674
	6RM8095-4KV62-0AA0	35	2 000	1 589	2 383	1 522	2 283	1 505	3 011	1 503	2 255
	6RM8097-4KV62-0AA0	35	2 600	1 992	2 989	1 906	2 859	1 887	3 774	1 876	2 815
3 AC 830	6RM8088-6LV62-0AA0	35	950	700	1 051	679	1 019	607	1 215	667	1 001
	6RM8093-4LV62-0AA0	35	1 500	1 171	1 757	1 140	1 710	1 036	2 073	1 116	1 674
	6RM8095-4LV62-0AA0	35	1 900	1 485	2 228	1 421	2 132	1 396	2 793	1 414	2 121
3 AC 950	6RM8096-4MV62-0AA0	35	2 200	1 674	2 511	1 603	2 404	1 570	3 141	1 588	2 382

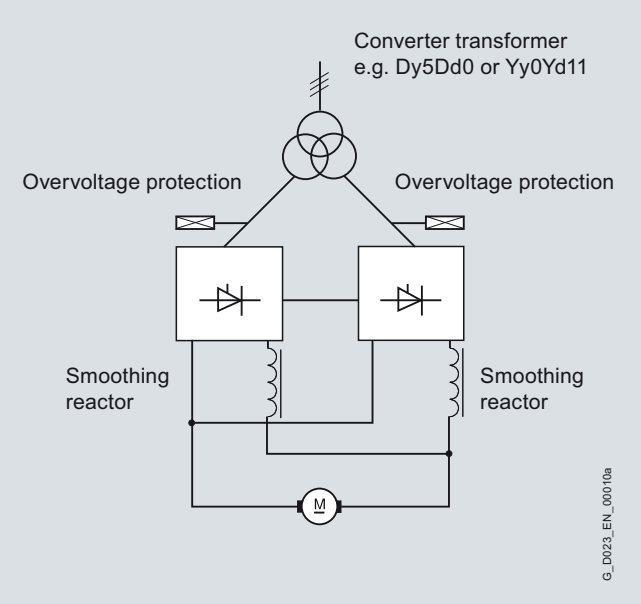
[1] For other temperatures, see under "Coolant temperature and installation altitude" in the catalog part "SINAMICS DC MASTER Cabinet", Section "Ordering and technology" – "Technical data".

Overview

Parallel connection and 12-pulse applications of SINAMICS DC MASTER integrated in the drive cabinet

Under certain preconditions it may make sense to connect converters in parallel, e.g. to increase the power rating or to provide redundancy (operating mode "(n+m operation")). SINAMICS DC MASTER are suitable for these types of applications and on request, the appropriate configuration can also be implemented as cabinet version. You are provided with a ready-to-connect cabinet system with components that are optimally harmonized with one another, including detailed documentation and circuit diagrams.

Further, for 12-pulse applications, the smoothing reactor on the DC side can be dimensioned and integrated in the drive cabinet.



12-pulse operation

SINAMICS DC MASTER can also be used in redundant operation. In this operating mode, at least two units are connected in parallel. This means that it is possible to maintain operation with the remaining SINAMICS DC MASTER units if one unit fails (e.g. if a fuse fails in the power section). When appropriately configured and interconnected, both the armature circuit as well as the field circuit can be redundantly operated.

SINAMICS DC MASTER units that is still functionable, continue to operate without any interruption when a unit fails. When configuring the system, it is important to note that in redundant applications, the power rating of only n units (instead of n+m units) must be sufficient.

In the case of a fault, the master functionality is automatically transferred. As a consequence, this operating mode is possible both when power sections of the slaves fail and when the power section of the master fails. (MTBF data in redundant operation are available on request.)

The parallel connection can also be used to increase the power rating. Up to six SINAMICS DC MASTER can be connected in parallel. Further, it is possible to select and dimension system-specific power sections, build them up and control them using the Control Module. The power section and the closed-loop control part are shipped as complete cabinet system that is ready to be connected up.

SINAMICS DC MASTER to feed high inductances

To supply high inductances – such as the fields of large DC or synchronous motors or lifting solenoids – the gating unit is changed over to long pulses using the appropriate parameter settings. At high levels of inductance, the long pulses ensure that the thyristors are reliably triggered. In this case, the armature circuit of the units is not used to supply the armature of DC motors, but to supply large field windings.

Note:

An external overvoltage protective circuit must be provided at the DC voltage output of the SINAMICS DC MASTER (see Catalog D 23.1, section, Accessories).

Protection against condensation and cabinet anti-condensation heating

SINAMICS DC MASTER are designed in compliance with climate class 3K3 (EN 60721-3-3) without condensation.

When supplied to tropical countries, we recommend that the drive cabinets are equipped with cabinet heating elements. (option L55).
As option, the converter units are equipped with coated PCBs (option M08), which are insensitive to adverse ambient conditions. (The AOP30 and the optionally available Sensor and Terminal Modules also have coated PCBs/boards).

In order to guarantee safe and reliable operation, under all circumstances, it should be avoided that the units are commissioned with PC boards with moisture condensation.

Overview

Incremental encoders, input pulse levels

The evaluation electronics can process encoder signals (symmetrical as well as asymmetrical) up to a max. differential voltage of 27 V. The encoder type is selected via parameter. The evaluation electronics are adjusted electronically to the encoder signal voltage. With the parameter setting, a sub-division is made into two rated input voltage ranges.

	Rated input voltage range	
	5 V	15 V
Low level	Differential voltage < 0.8 V	Differential voltage < 5 V
High level	Differential voltage > 2 V	Differential voltage > 8 V [1]
Hysteresis	> 0.2 V	> 1 V
Common-mode controllability	± 10 V	± 10 V

If the incremental encoder does not supply any symmetrical encoder signals, it must be grounded with each signal cable twisted in pairs and connected to the negative connections of track 1, track 2, and zero mark.

Incremental encoder, maximum frequency that can be evaluated

The max. frequency of the encoder pulses that can be evaluated is 300 kHz. To ensure the encoder pulses are evaluated correctly, the minimum edge clearance T_{min} between two encoder signal edges (track 1, track 2), as listed in the table, must be adhered to.

	Rated input voltage range				
	5 V		15 V		
Differential voltage [2]	2 V	> 2.5 V	8 V	10 V	> 14 V
T_{min} [3]	630 ns	380 ns	630 ns	430 ns	380 ns

If the incremental encoder is incorrectly matched to the encoder cable, disturbing cable reflections will occur at the receiving end. To ensure that encoder pulses of this type can be evaluated without errors, these reflections need to be damped. The limit values listed in the table below must be maintained in order to prevent the resulting power losses in the evaluation electronics adaptor from being exceeded.

	F_{max}				
	50 kHz	100 kHz	150 kHz	200 kHz	300 kHz
Differential voltage [4]	Up to 27 V	Up to 22 V	Up to 18 V	Up to 16 V	Up to 14 V

Incremental encoder, cable, cable length, shield support

The encoder cable capacitance must be recharged at each encoder edge change. The rms value of this current is proportional to the cable length and pulse frequency, and must not exceed the current permitted by the encoder manufacturer. A suitable cable that meets the recommendations of the encoder manufacturer must be used, and the max. cable length must not be exceeded.

Generally speaking, a twisted cable pair with a single pair shield is sufficient for each track. This reduces crosstalk between the cables. Shielding all the pairs provides protection against interference pulses. The shield should be connected to the SINAMICS DC MASTER Cabinet shield bar through a large surface area.

[1] Restriction: See "Maximum frequency that can be evaluated"

[2] Differential voltage at the terminals of the evaluation electronics

[3] The phase error L_G (deviation of 90°), caused by the encoder and cable and which is permissible, can be calculated from T_{min}:
$L_G = + (90° - f_p \times T_{min} \times 360° \times 10^{-6})$
L_G Phase error in °
f_p Pulse frequency in kHz
T_{min} Minimum edge clearance in ns

[4] Differential voltage of the encoder pulses without load (approximate encoder power supply voltage)

Notes for EMC-compliant drive installation

Overview

When designing a plant or system, the EMC concept is an important component and is essential when it comes to achieving a high plant availability. When developing our cabinets, a lot of emphasis was placed on an EMC-compliant design. The cabinets are designed based on an EMC zone concept, and cables are routed so that there is a clean demarcation. In addition, the customer interfaces – that are easy to access – provide sufficient space to connect cable shields. Noise emission can be additionally reduced by selecting the radio interference suppression filter option (L00).

Basic information about EMC

What is EMC?

EMC stands for "ElectroMagnetic Compatibility" and describes "the capability of a device to function satisfactorily in an electromagnetic environment without itself causing interference unacceptable for other devices in the environment". Therefore, the various units should not mutually interfere with one another.

Interference emission and interference immunity

EMC is dependent upon two properties of the units involved in the system: interference emission and interference immunity. Electrical units can be sources of interference (senders) and/or potentially susceptible equipment (receivers).

Electromagnetic compatibility is ensured when the existing sources of interference do not impair the function of potentially susceptible equipment.

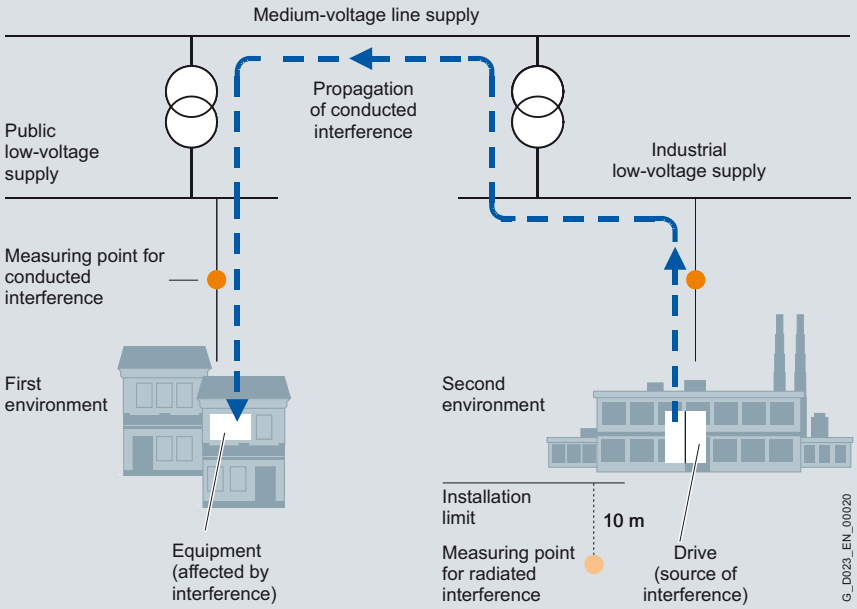
A unit may even be a source of interference and potentially susceptible equipment at the same time. For example, the power section of a converter unit should be viewed as a source of interference and the control unit as potentially susceptible equipment.

Product standard EN 61800-3

The EMC requirements for "Variable-speed drive systems" are described in the product standard EN 61800-3. A variable-speed drive system (or Power Drive System PDS) consists of the drive converter and the electric motor including cables. The driven machine is not part of the drive system. EN 61800-3 defines different limits depending on the location of the drive system, referred to as the first and second environments.

Residential buildings or locations at which the drive system is directly connected to a public low-voltage supply without intermediate transformer are defined as the **first environment**.

The term **second environment** refers to all locations outside residential areas. These are basically industrial areas which are supplied from the medium-voltage line supply via their own transformers.



Definition of the first and second environments

Overview (continued)

Four different categories are defined in EN 61800-3 Ed.2 depending on the location and the power of the drive:

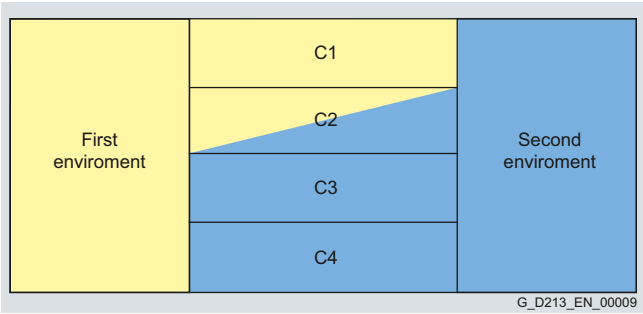
Category C1: Drive systems for rated voltages < 1 000 V for unlimited use in the first environment.

Category C2: Stationary drive systems for rated voltages < 1 000 V for use in the second environment. Use in the first environment is possible if the drive system is marketed and installed by qualified personnel. The warning information and installation instructions supplied by the manufacturer must be observed.

Category C3: Drive systems for rated voltages < 1 000 V for exclusive use in the second environment.

Category C4: Drive systems for rated voltages ≥ 1 000 V or for rated currents ≥ 400 A for use in complex systems in the second environment.

The following diagram shows how the four categories are assigned to the first and second environments:



Definition of Categories C1 to C4

SINAMICS DC MASTER is almost exclusively used in the second environment (Categories C3 and C4).

Radio interference suppression filters are always required for use in Category C2 (option L00); further, the commutating reactor cannot be deselected.

SINAMICS DC MASTER conforms to the interference immunity requirements defined in EN 61800-3 for the second environment, and thus also with the lower requirements in the first environment.

Standard EN 55011

Some situations require compliance with standard EN 55011. This defines limit values for interference emissions in industrial and residential environments. The values that are measured are conducted interference at the line supply connection as interference voltage, and electromagnetically radiated interference as radio interference, under standardized conditions.

The standard defines limit values "A1" and "B1" which, for interference voltage, apply to the 150 kHz – 30 MHz range and, for radio interference, the 30 MHz – 2 GHz range. Since SINAMICS DC MASTER converter units are used in industrial applications, they are subject to the limit value "A1". To achieve limited value "A1", radio interference suppression filters (option L00) are always necessary; further, the commutating reactor must not be deselected.

SINAMICS DC MASTER, industrial applications

Industrial applications demand that units demonstrate an extremely high level of interference immunity, but by contrast place very low requirements on them in terms of interference emission levels. The limit values for interference emission "A1" of EN 55011 are maintained when using the additional radio interference suppression filter (option L00) and EMC-compliant connection of the cabinets. If the drive cabinet forms part of a plant or system, it does not initially need to fulfill any interference emission requirements. However, EMC legislation does stipulate that the plant or system as a whole must be electromagnetically compatible with its environment.

Non-grounded line supplies

Non-grounded line supplies (IT line supplies) are used in some branches of industry in order to increase the availability of the plant. In the event of a ground fault, no fault current flows and the plant can continue with production. However, in conjunction with radio interference suppression filters, in the case of a fault, a fault current flows, which can cause the drives to shut down or possibly even destroy the radio interference suppression filter. This is the reason that the product standard does not define any limit values for these types of line supplies. From an economic perspective, any necessary EMC conformance measures should be taken on the grounded primary side of the supply transformer.

EMC planning

If two units are not electromagnetically compatible, you can reduce the interference emission level of the source of interference or increase the interference immunity of the potentially susceptible equipment.

Sources of interference are generally power electronics units with high power consumption. Reducing their interference emission levels requires complex filters. Potentially susceptible equipment usually refers to controlgear and sensors, including their evaluation circuit. Lower costs are involved with increasing the interference immunity of units with lower power ratings. This means, that from an economic perspective, increasing the interference immunity is generally a more favorable option for industrial applications than reducing the interference emission level. For example, to maintain limit value class A1 of EN 55011, the radio interference voltage at the line supply connection point between 150 and 500 kHz can be a max. of 79 dB (µV) and between 500 kHz and 30 MHz, a max. of 73 dB (µV) (9 or 4.5 mV).

In industrial applications, EMC between units should be based on a carefully-balanced combination of the interference emission and interference immunity levels.

The most cost-effective measure that can be put in place to achieve EMC conformance is to physically separate sources of interference and potentially susceptible equipment – provided that you have taken this option into account during the planning stage of your machine/plant. In the first instance, it is necessary to determine whether each unit used is a potential source of interference or potentially susceptible equipment. Within this context, converter units and contactors, for example, can be counted as sources of interference. While examples of potentially susceptible equipment include PLCs, encoders and sensors.

The components in the drive cabinet (sources of interference and potentially susceptible equipment) must be physically separated, by means of partition plates if necessary, or by installing them in metal enclosures.

Overview (continued)

EMC-compliant drive installation (installation instructions)

General information

Not only are drives operated in a wide variety of environments, but the electrical components used (controls and switched mode power supplies, and so on) can also differ widely with respect to interference immunity and interference emission levels, meaning that all installation guidelines of any kind can offer is a practical compromise. For this reason, EMC rules do not need to be always precisely implemented, provided that measures are tested on a case-by-case basis.

In order to ensure electromagnetic compatibility (EMC) in your control cabinets in rugged electrical environments and adhere to the standards required by the relevant legislating body, the EMC rules listed below should be followed during the construction and design stages.

Rules 1 to 8 are generally valid. Rules 9 to 11 must be followed in order to fulfill interference emission standards.

Rules for EMC-compliant installation

Rule 1
Signal cables [1] if at all possible, should only be routed at just one level in the cabinet.

Rule 2
Unshielded cables in the same circuit (outgoing/incoming conductors) must be twisted wherever possible, or the area between them minimized, to prevent the unnecessary formation of frame antennae.

Rule 3
Connect spare wires at both ends to the cabinet ground (ground [2]). This provides an additional shielding effect.

Rule 4
Avoid unnecessary cable lengths. This keeps coupling capacitances and inductances low.

Rule 5
Crosstalk is generally reduced, if cables are routed close to the control cabinet ground. Therefore, do not route cables freely around the cabinet, but route them as close as possible to the cabinet enclosure or to the mounting plates. This also applies to spare cables.

Rule 6
Signal and power cables must be physically separated (to prevent coupling paths). A minimum distance of 20 cm must be observed.

If it is not possible to physically separate the encoder and motor cables, the encoder cable must be decoupled either using a partition or by routing it in a metal conduit. The partition or metal conduit must be grounded at several points.

Rule 7
Ground the shields of digital signal cables at both ends (source and destination), ensuring maximum contact area and good conductivity. In the event of poor equipotential bonding between the shield connections, run an additional equipotential bonding conductor with a cross-section of at least 10 mm^2 parallel to the shield for the purpose of reducing the shield current. Generally speaking, the shields may also be connected to the cabinet enclosure (ground) at several points. The shields can be connected several times even outside the drive cabinet.

Foil-type shields should be avoided, as they are at least 5 times less effective than braided shields.

Rule 8
Shields for analog signal cables may be connected to ground at both ends if the equipotential bonding is good (this must be done through a large surface area with good conductivity). It can be assumed that equipotential bonding is good if all of the metal parts are interconnected with one another through a good electrical connection and the electronics components are supplied from a single source.

Connecting shields at one end prevents low-frequency, capacitive interference from being coupled in (e.g. 50 Hz hum). In this case, the shield should be connected in the drive cabinet; whereby the shield can also be connected using a separate wire.

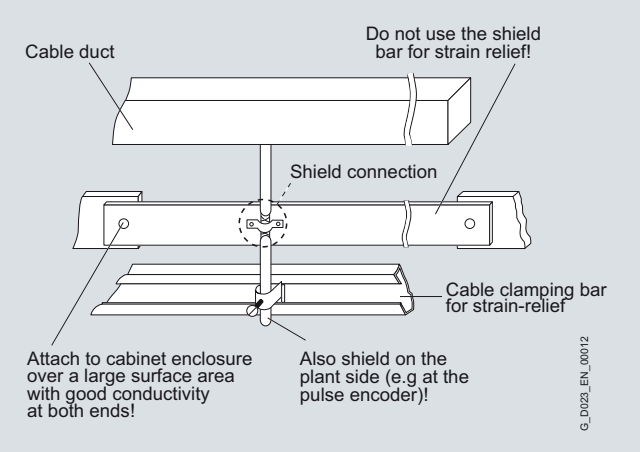
Rule 9
A line reactor must be included in the field circuit for controlled field power supplies.

Rule 10
A commutating reactor must be included in the armature circuit of the converter.

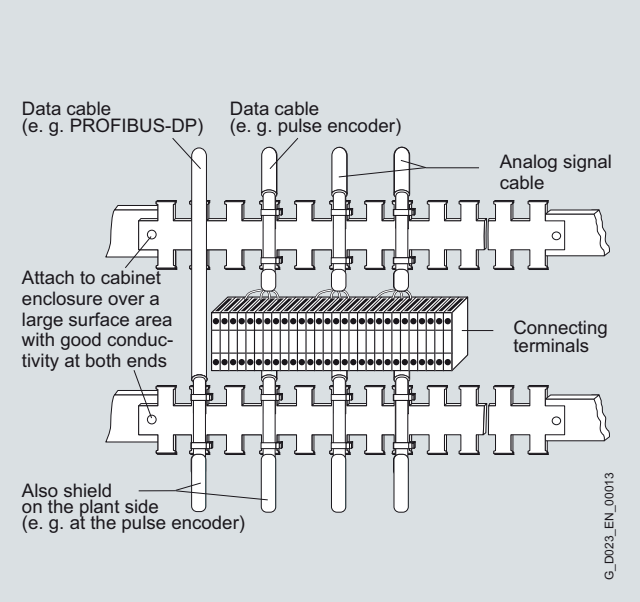
Rule 11
The motor cables do not have to be shielded. There must be a clearance of at least 20 cm between the line supply feeder cable and the motor cables (field, armature). If necessary, a separating metal partition should be used.

Additional diagrams show details that are not immediately clear in the overview diagram and which may also have an effect on the resistance to interference/interference emission levels of the drive cabinet as well as different shield connection techniques.

Overview (continued)

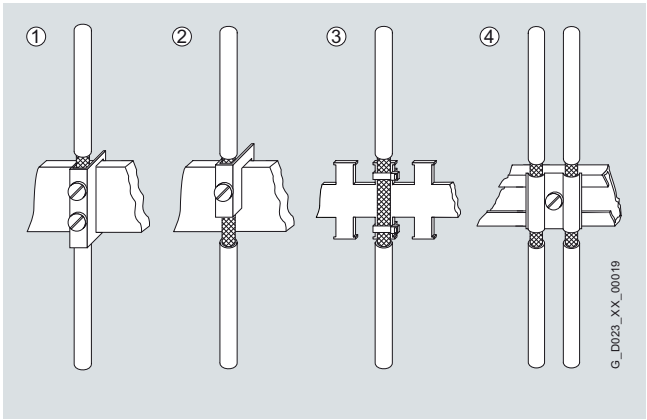


Shielding at the cable entry to the cabinet



Shielding in the cabinet

Shield connection



Shield connection

① Connecting terminal on a copper bar, max. cable diameter 15 mm

② Bar-mounting terminal on a copper bar, max. cable diameter 10 mm

③ Metal tube or cable tie on a bare-metal comb-type/toothed bar

④ Clamp with metal backing plate on a cable support rail

[1] Signal cables are defined as:
Digital signal cable:
Cables for pulse encoders,
Serial interfaces, e.g. PROFIBUS DP or
analog signal cable, e.g. ± 10 V setpoint cable.

[2] Generally speaking, "ground" refers to all metallic conductive parts that can be connected to a protective conductor, such as the cabinet enclosure, motor enclosure, or foundation ground etc.

Overview

Line-side harmonics produced by converter units in a fully-controlled three-phase bridge circuit (B6C and (B6)A(B6)C)

The majority of converter units for medium-power applications have a fully-controlled three-phase bridge circuit. Below is an example of the harmonics that can be found in a typical system configuration for two firing angles ($\alpha = 20°$ and $\alpha = 60°$).

The values have been taken from a previous publication, "Oberschwingungen im netzseitigen Strom sechspulsiger netzgeführter Stromrichter (Harmonics in the Line-Side Current of Six-Pulse, Line-Commutated Converters)" by H. Arremann and G. Möltgen, Siemens Research and Development Division, Volume 7 (1978) No. 2, © Springer-Verlag 1978.

In addition, the formulas are specified which, depending on the actual operating data in use (no-load voltage V_{V0}, line frequency f_N, and DC current I_d), can be used to calculate the short-circuit power S_K and armature inductance L_a for the motor to which the specified harmonics spectrum applies.

If the actual line short-circuit power and/or actual armature inductance deviate from the values calculated in this way, then they will need to be calculated on a case-by-case basis.

The harmonics spectrum shown below is obtained if the values for the short-circuit powerS_K at the point where the unit is connected and the armature inductance L_a of the motor, calculated using the following formulas, match the actual values of the plant or system. If the values do not match, the harmonics will have to be separately calculated.

ν	I_ν/I_1	
	at $\alpha = 20°$ fundamental factor $g = 0.962$	at $\alpha = 60°$ fundamental factor $g = 0.953$
5	0.235	0.283
7	0.100	0.050
11	0.083	0.089
13	0.056	0.038
17	0.046	0.050
19	0.035	0.029
23	0.028	0.034
25	0.024	0.023
29	0.018	0.026
31	0.016	0.019
35	0.011	0.020
37	0.010	0.016
41	0.006	0.016
43	0.006	0.013
47	0.003	0.013
49	0.003	0.011

The fundamental component of current I_1 as a reference variable is calculated using the following formula:

$I_1 = g \times 0.817 \times I_d$

I_d DC current of the operating point being investigated
g basic fundamental content

The harmonics currents calculated according to the table only apply for:

a) Short-circuit power S_K at the point point where the converter unit is connected

$S_K = V_{V0}^2/X_N$ (VA)

where

$X_N = X_K - X_D = 0.03536 \times V_{V0}/I_d - 2\pi \times f_N \times L_D$ (Ω)

V_{V0} No-load voltage at the point where the converter unit is connected in V

I_d DC current of the operating point being investigated in A

f_N Line frequency in Hz

L_D Inductance of the commutating reactor being used in H

b) Armature inductance L_a

$L_a = 0.0488 \times V_{V0}/(f_N \times I_d)$ (H)

If the actual values for the short-circuit power S_K and/or armature inductance L_a deviate from the values calculated using the formulas above, a separate calculation will need to be made.

Example:

Let us assume a drive with the following data:

$V_{V0} = 400$ V

$I_d = 150$ A

$f_N = 50$ Hz

$L_D = 0.169$ mH (4EU2421-7AA10) with $I_{LN} = 125$ A

where

$X_N = 0.03536 \times 400/150 - 2\pi \times 0.169 \times 10^{-3} = 0.0412\ \Omega$

The following short-circuit power of the line supply required at the point where the converter is connected:

$S_K = 400^2/0.0412 = 3.88$ MVA

and the following armature inductance of the motor is required:

$L_a = 0.0488 \times 400/(50 \times 150) = 2.0$ mH

The harmonic currents I_ν (with $I_1 = g \times 0.817 \times I_d$ for firing angles $\alpha = 20°$ and $\alpha = 60°$) that can be taken from the tables, only apply for the values S_K and L_a that have been calculated in this way. If the actual values deviate from these, a separate calculation will have to be made.

For the purpose of dimensioning filters and compensation equipment with reactors, it is only possible to draw on the information provided by the harmonic values calculated in this way if the calculated values S_K and L_a match the actual drive values. In all other cases, a separate calculation will have to be made (this particularly applies when using compensated motors as they have very low armature inductance levels).

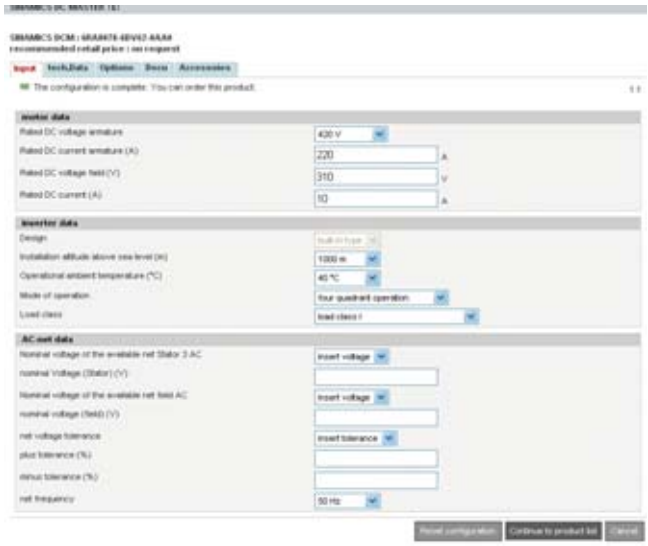
Tools and engineering

6

SIZER WEB ENGINEERING
STARTER commissioning tool

Overview

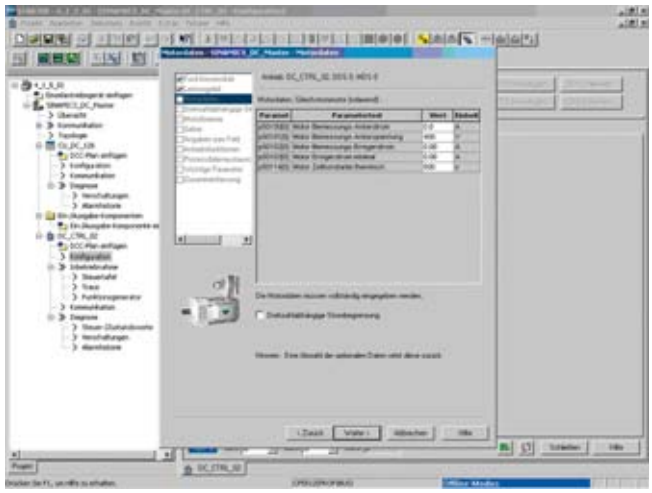
SIZER WEB ENGINEERING



SIZER WEB ENGINEERING or the DT Configurator can be used to select the DC Converter. However, it is necessary to check the load capability of the converter taking into account the selected or specified degree of protection and cooling type of the drive cabinet based on the information provided in Section, "Coolant temperature and installation altitude" of this catalog. The order number of the drive cabinet and the matching options can be selected from this catalog.

The converter can be commissioned using the AOP30 installed as standard; or also in a user-friendly fashion using the PC-based STARTER commissioning tool.

STARTER commissioning tool



The user-friendly STARTER commissioning tool can be used for

- Commissioning
- Optimizing and
- Diagnostics

This software can either be operated as a stand-alone PC application or can be integrated into the SCOUT engineering system (with SIMOTION) or STEP 7 (with Drive ES Basic). The basic functions and handling are the same in both cases.

Engineering can be performed online, directly connected with the drive, or offline. If several drives are connected to a communication bus, then an online connection can be established to several drives simultaneously.

SINAMICS DC MASTER is supported from STARTER 4.1.5; it is not possible to use older STARTER versions.

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

Entry level personnel are interactively supported in a solution-oriented way.

First commissioning is guided by a wizard which makes all the basic settings in the drive. Therefore, getting a motor up and running is merely a question of setting a few parameters as part of the drive configuration process. The travel commands can be simply entered via the control panel from the PC.

The individual settings can be made using the graphic parameterizing screen forms, which precisely visualize the drive mode of operation.

Examples of individual settings that can be made include:

- Terminals
- Bus interface
- BICO interconnections
- Diagnostics

Overview (continued)

Experts can quickly access all of the parameters via the Expert List and do not have to navigate through dialogs.

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

- Trace to precisely trace signals

Diagnostic functions provide information about:

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

Performance features

- Easy to use: Only a small number of settings need to be made for successful first commissioning: the motor turns
- Solution-based user navigation simplifies commissioning
- The built-in trace function provides optimum support during commissioning, optimization and troubleshooting

Minimum hardware and software requirements

PG or PC with Pentium III 1 GHz

512 MB RAM (1 GB RAM recommended)

Screen resolution 1 024 × 768 pixels, 16 bit color depth

Free hard disk memory: 2 GB

Microsoft Windows 2003 Server SP1, SP2

Windows XP Professional SP2 or SP3

Windows Vista Business SP1, Windows Vista Ultimate SP1

Microsoft Internet Explorer 6.0

Integration

Communication between the Control Unit of the drive and the programming device (PG) or PC can be established via a serial interface, via PROFIBUS or PROFINET.

Option L91 "Commissioning interface brought out" allows commissioning and diagnostics to be especially simply and reliably performed. With this option, the PROFIBUS interface is integrated in the cabinet door. This means that when the cabinet door is closed, a PROFIBUS connection can be established with the PG directly at the drive cabinet. A PROFIBUS communication module and a connecting cable for the PC are required to establish communication between a PG/PC and a CUD.

For example, the **PROFIBUS communication module** CP 5512 (PCMCIA type 2 card + adapter with 9-pin SUB-D socket for connection to PROFIBUS. For MS Windows 2000/XP Professional and PCMCIA 32)
Order No.: **6GK1551-2AA00**

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

Selection and ordering data

	Order No.
STARTER commissioning tool for SINAMICS and MICROMASTER German, English, French, Italian, Spanish	**6SL3072-0AA00-0AG0**

SINAMICS DC MASTER can be configured with STARTER version 4.1 and higher with Service Pack 5, Hotfix 1.
The actual STARTER version as well as updates can be downloaded from the Internet under
http://support.automation.siemens.com/WW/view/en/10804985/133100,
and is provided in the product DVD supplied with each unit.

Accessories

Connection

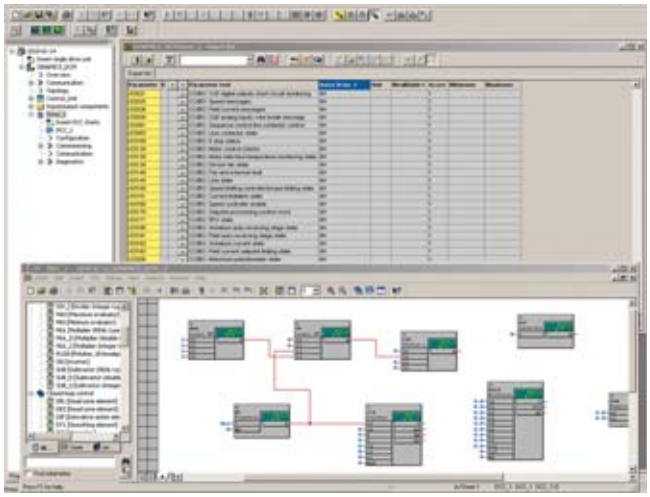
Depending on the version of the Control Unit, the Control Unit (CU) of the drive unit can communicate with the programming device (PG) or PC via a serial interface, PROFIBUS, or Ethernet/PROFINET. Accessories can be ordered for the relevant drive system as shown in the table below.

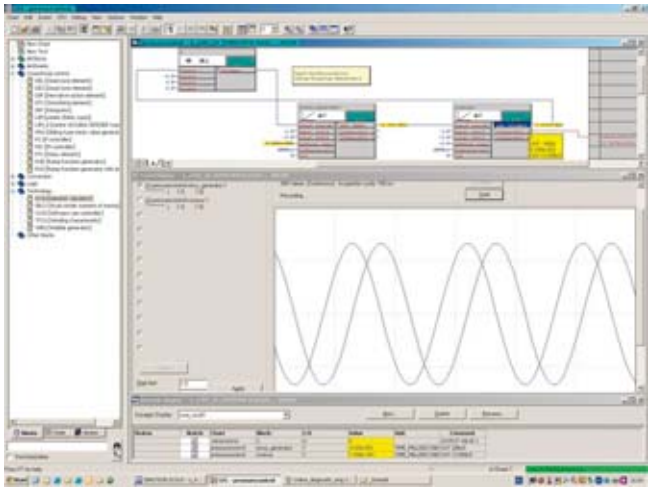
	Order No.
PROFIBUS communications module CP 5512 PCMCIA type 2 card + adapter with 9-pin SUB-D socket for connection to PROFIBUS. For MS Windows 2000/XP Professional and PCMCIA 32	**6GK1551-2AA00**
Connecting cable between CP 5512 and PROFIBUS	**6ES7901-4BD00-0XA0**

Drive Control Chart (DCC)

Overview

Graphically configuring and expanding the device functionality using the freely available closed-loop control, arithmetic, and logic blocks





Drive Control Chart (DCC) extends the possibility of very simply configuring technological functions – both for the SIMOTION motion control system as well as for the SINAMICS DC MASTER drive system. For users, this opens up a new dimension regarding the adaptability of the systems mentioned to the specific functions of their machines. DCC has no restrictions with regard to the number of usable functions; this is only limited by the performance capability of the target platform.

The user-friendly DCC editor enables easy graphics-based configuration, allows control loop structures to be clearly represented and provides a high degree of reusability of diagrams that have already been created.

The open-loop and closed-loop control functions are defined by using multi-instance-capable blocks (Drive Control Blocks (DCBs)) from a pre-defined library (DCB library) that are selected and graphically linked with one another by dragging and dropping. Test and diagnostic functions allow the program behavior to be verified and in the case of a fault, the cause identified.

The block library encompasses a large selection of closed-loop, arithmetic and logic blocks, as well as comprehensive open-loop and closed-loop control functions.

For logically combining, evaluating and acquiring binary signals, all commonly used logic functions are available for selection (AND, XOR, on/off delay, RS flipflop, counter, etc.). A wide range of arithmetic functions, such as absolute value generation, dividers and minimum/maximum evaluation are available to monitor and evaluate numerical quantities. In addition to the closed-loop drive control, axial winder functions, closed-loop PI controllers, ramp-function generators or wobble generators can be configured simply and easily.

Closed-loop control structures can be programmed with almost no restrictions in conjunction with the SIMOTION motion control system. These can then be combined with other program sections to form an overall program.

Further, Drive Control Chart for SINAMICS DC MASTER provides a user-friendly basis to handle drive-related open-loop and closed-loop control tasks directly in the converter. This further extends the possibility of adapting SINAMICS to the particular application. Local data processing in the drive supports the implementation of modular machine concepts and results in an increase in the overall machine performance.

Minimum hardware and software requirements

See the SCOUT or STARTER engineering software, since DCC is installed in addition to this.

Selection and ordering data

DCC comprises the graphic configuring tool (DCC Editor) and the block library (DCB Library).

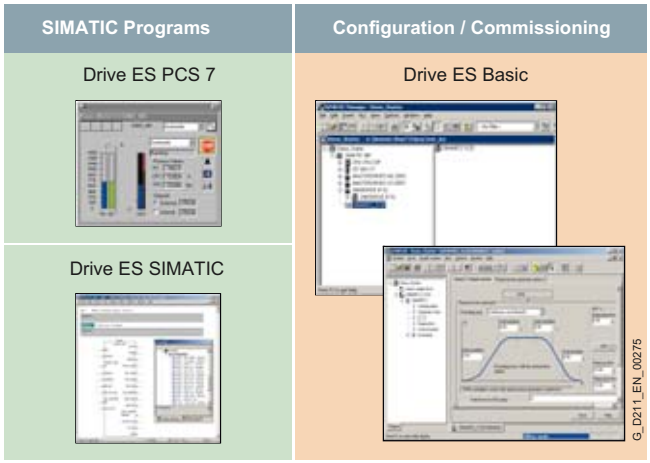
DCC is installed in addition to the SCOUT or STARTER engineering software.

The necessary engineering license for each PC (floating) for DCC is acquired at the same time the order is placed; additional run time licenses are not required.

DCC can be ordered in two versions: The version for SIMOTION and SINAMICS applications, or the version for SINAMICS applications only.

	Order No.
DCC-SIMOTION/-SINAMICS V2.1 for SCOUT/STARTER V4.2 (single-user engineering license, with DCC data carrier) DCC editor + DCB libraries for use on SIMOTION V4.1 SP1 and SINAMICS S120, from V2.5 SP1 and higher German, English, French, Italian (SIMOTION) German, English, French, Italian, Spanish (SINAMICS)	**6AU1810-1JA21-0XA0**
DCC-SINAMICS V2.1 for STARTER V4.2 (single-user engineering license, with DCC data carrier) DCC editor + DCB library for use on SINAMICS S120/S150/G130/G150, from V2.5 SP1, SINAMICS DCM from V1.2 and higher German, English, French, Italian, Spanish	**6AU1810-1HA21-0XA0**

Overview



Drive ES is the engineering system used to integrate Siemens drive technology into the SIMATIC automation world easily, efficiently and cost-effectively in terms of communication, configuration and data management.

It is based on the operator interface of the STEP 7 Manager, the essential element when it comes to engineering.

Application

The Drive ES (**D**rive **E**ngineering **S**oftware) engineering software fully integrates drives from Siemens into the world of Totally Integrated Automation.

The table provides a general overview of the Drive ES software packages available for each drive.

Drive	Drive ES Basic V5.4 and higher	Drive ES SIMATIC V5.4 and higher	Drive ES PCS 7 V6.0 and higher
SIMOVERT MASTERDRIVES	●	●	●
SIMOREG DC-MASTER	●	●	●
SIMODRIVE 611 universal HRS	●	●	
SIMODRIVE POSMO A/SI/CD/CA	●	●	
MICROMASTER/ MIDIMASTER/COMBIMASTER Third generation	●	●	●
MICROMASTER 4 Fourth generation	●	●	●
SINAMICS S110	●	●	
SINAMICS S120	●	●	● 1)
SINAMICS S150	●	●	● 1)
SINAMICS G120	●	●	● 1)
SINAMICS G120D	●	●	● 1)
SINAMICS G130	●	●	● 1)
SINAMICS G150	●	●	● 1)
SINAMICS GL150	●	●	● 1)
SINAMICS GM150	●	●	● 1)
SINAMICS SM150	●	●	● 1)
SINAMICS DC MASTER	● 2)	● 3)	On request

Design

Various software packages are available for selection:

- **Drive ES Basic**
- **Drive ES SIMATIC**
- **Drive ES PCS 7**

Drive ES Basic

Drive ES Basic is for first-time users of the world of Totally Integrated Automation and the basic software for setting the parameters of all drives online and offline in this environment. Drive ES Basic enables both the automation system and the drives to be handled using the SIMATIC Manager software. Drive ES Basic is the starting point for common data archiving for complete projects and for extending the use of the SIMATIC teleservice to drives. Drive ES Basic provides the configuration tools for the new Motion Control functions – slave-to-slave communication, equidistance and isochronous operation with PROFIBUS DP and ensures that drives with PROFINET IO are simply integrated into the SIMATIC environment.

Drive ES SIMATIC

Drive ES SIMATIC is used for simple parameterization of STEP 7 communication and eliminates time-consuming programming. It requires STEP 7 to be installed. It features a SIMATIC function block library, thereby making the programming of the PROFIBUS and/or PROFINET IO interface in the SIMATIC CPU for the drives easy and secure.
There is no need for separate, time-consuming programming of the data exchange between the SIMATIC CPU and the drive.
All Drive ES users need to remember is: Copy – Modify – Load – Finished.
Customized, fully-developed function blocks are copied from the library into user-specific projects.

Frequently used functions are set to run in program format:

- Read out complete diagnostics buffer automatically from the drive
- Download complete parameter set automatically from the SIMATIC CPU to the drive, e.g. when a device has to be replaced
- Automatically download partial parameter sets (e.g. for recipe or product change) from the SIMATIC CPU to the drive
- Upload the complete parameter assignment or partial parameter sets from the drive to the SIMATIC CPU, i.e. update.

1) Drive ES PCS 7 V6.0 SP2 and higher.
2) Drive ES Basic V5.4 SP5 and higher.
3) Drive ES SIMATIC V5.4 SP3 and higher.

Design (continued)

Detailed contents of the Drive ES SIMATIC package

- **"PROFIBUS DP" communications software** for SIMATIC S7-300 with CPUs with integrated DP interface (function block libraries DRVDPS7, POSMO), SIMATIC S7-400 with CPUs with integrated DP interface or with CP 443-5 (DRVDPS7, POSMO function block libraries) and SIMATIC S7-300 with CP 342-5 (DRVDPS7C function block library)
- **"USS protocol" communications software** for SIMATIC S7-300 with integral PtP interfaces or with CP 340/341 and SIMATIC S7-400 with CP 441 (DRVUSSS7 function block library)
- **STEP 7 slave object manager** for easy configuration of drives and non-cyclic PROFIBUS DP communication with the drives
- **STEP 7 device object manager** for easy configuration of drives with PROFINET IO interfaces (V5.4 and higher)
- **SETUP program** for installing the software in the STEP 7 environment
- **"PROFINET IO"** communications software for SIMATIC S7-300 with CPUs with integral PN interface, SIMATIC S7-400 with CPUs with integral PN interface or with CP (DRVDPS7 function block library, respectively). PROFINET IO and PROFIBUS DP use the same blocks from the DRVDPS7 library, i.e. the blocks are able to serve both buses with a common block (only for V5.4 and higher)

Drive ES PCS 7

Drive ES PCS 7 links the drives with a PROFIBUS DP interface into the SIMATIC PCS 7 process control system, and it requires that SIMATIC PCS 7, V6.1 or higher has first been installed. Drive ES PCS 7 provides a function block library with function blocks for the drives and the corresponding faceplates for the operator station which enables the drives to be operated from the PCS 7 process control system. From version V6.1 and higher, drives will also be able to be represented in the PCS 7 Maintenance Station.

Detailed contents of the Drive ES PCS 7 package

- **Function block library for SIMATIC PCS 7** Faceplates and control blocks for SIMOVERT MASTERDRIVES VC and MC, as well as MICROMASTER/MIDIMASTER of the third and fourth generation and SIMOREG DC MASTER and SINAMICS
- **STEP 7 slave object manager** for convenient configuration of drives and non-cyclic PROFIBUS DP communication with the drives
- **SETUP program** for installing the software in the PCS 7 environment

Selection and ordering data

Description	Order No.
Drive ES Basic V5.5 SPx *)	
Configuration software for the integration of drives into TIA (Totally Integrated Automation)	
Precondition: STEP 7 from V5.3, SP3 and higher	
Supplied as: DVD Languages: Eng, Fr, Ger, It, Sp with electronic documentation	
• Floating license, 1 user	**6SW1700-5JA00-5AA0**
• Floating license (copy license), 60 users	**6SW1700-5JA00-5AA1**
• Update service for single-user license	**6SW1700-0JA00-0AB2**
• Update service for copy license, 60 users	**6SW1700-0JA00-1AB2**
• Upgrade from V5.x to V5.5 SPx *)	**6SW1700-5JA00-5AA4**
Drive ES SIMATIC V5.5 SPx *)	
Function block library for SIMATIC for the parameterization of communication with the drives	
Precondition: STEP 7 from V5.3, SP3 and higher	
Supplied as: CD-ROM Languages: Eng, Fr, Ger, It, Sp with electronic documentation	
• Single-user license incl. 1 runtime license	**6SW1700-5JC00-5AA0**
• Runtime license (without data carrier)	**6SW1700-5JC00-1AC0**
• Upgrade from V5.x to V5.5 SPx *)	**6SW1700-5JC00-5AA4**
Drive ES PCS 7 V6.1 SPx *)	
Function block library for PCS 7 for the integration of drives	
Precondition: PCS 7 V6.1 and higher	
Supplied as: CD-ROM Languages: Eng, Fr, Ger, It, Sp with electronic documentation	
• Single-user license incl. 1 runtime license	**6SW1700-6JD00-1AA0**
• Runtime license (without data carrier)	**6SW1700-5JD00-1AC0**
• Update service for single-user license	**6SW1700-0JD00-0AB2**
Drive ES PCS 7 V7.0 SPx *)	
Function block library for PCS 7 for the integration of drives	
Precondition: PCS 7 V7.0 and higher	
Supplied as: CD-ROM Languages: Eng, Fr, Ger, It, Sp with electronic documentation	
• Single-user license incl. 1 runtime license	**6SW1700-7JD00-0AA0**
• Runtime license (without data carrier)	**6SW1700-5JD00-1AC0**
• Update service for single-user license	**6SW1700-0JD00-0AB2**
• Upgrade from V5.x to V7.0 SPx *)	**6SW1700-7JD00-0AA4**
Drive ES PCS 7 V7.1 SPx *)	
Function block library for PCS 7 for the integration of drives	
Precondition: PCS 7 V7.1 and higher	
Supplied as: CD-ROM Languages: Eng, Fr, Ger, It, Sp with electronic documentation	
• Single-user license incl. 1 runtime license	**6SW1700-7JD00-1AA0**
• Runtime license (without data carrier)	**6SW1700-5JD00-1AC0**
• Update service for single-user license	**6SW1700-0JD00-0AB2**
• Upgrade from V6.x to V7.1 SPx *)	**6SW1700-7JD00-1AA4**

1) Orders are always automatically supplied with the latest SP.

Options

Drive ES software update service

A software update service can also be purchased for the Drive ES software. The user will automatically receive the latest software, service packs and full versions for one year after ordering.

The update service can only be ordered in addition to an existing (i.e. previously ordered) full version.

- Period of update service: 1 year

The update service is automatically extended by 1 further year unless canceled up to 6 weeks prior to expiration.

Description	Order No.
Drive ES Basic	
• Update service for single-user license	**6SW1700-0JA00-0AB2**
• Update service for copy license	**6SW1700-0JA00-1AB2**
Drive ES PCS 7	
• Update service for single-user license	**6SW1700-0JD00-0AB2**

More information

More information is available on the Internet at:
www.siemens.com/drivesolutions

Notes

Services

SINAMICS DCM demonstration case

Overview

Demonstration case, opened

The SINAMICS DC MASTER demonstration model is installed ready to be connected-up in a rugged transport case and is immediately ready for operation. It comprises a DC converter 480 V 3 AC, 30 A DC, a 0.55 kW DC motor as well as numerous options and accessories. The case has two integrated transport wheels and a hinged handle.

Scope of delivery

The following main components are included in the SINAMICS DC MASTER demonstration case, including all of the required wiring, connection and signal cables:

- DC converter 6RA8018-6FV62-0AA0-Z;
  Z=G00+G10+G20+S01+L05
  G00 = Advanced CUD left
  G10 = Standard CUD right
  G20 = Communication Board CBE20 left
  S01 = memory card left
  L05 = electronics power supply for connection to 24 V DC

Option L05 permits operation on a three-phase line supply or a single-phase line supply, e.g. 230 V. Presentations or training courses can be carried out locally without requiring a three-phase supply; for instance in hotels or office buildings.

- Terminal Module TM31
- Terminal Module TM15
- Advanced Operator Panel AOP30
- Radio interference suppression filter
- Three-phase commutating reactor for the armature circuit
- Single-phase commutating reactor for the field circuit
- DC motor 0.55 kW, 1 750 rpm
- Pulse encoder OG 60 DN 2040 CI
- Analog tachometer GT 5.05 L/410, U_o = 10 V/1 000 rpm
- Commissioning box for SINAMICS DC MASTER to control analog and digital inputs and outputs

Free function blocks and Drive Control Chart can be used without any restrictions.

The demonstration case is also available without integrated DC motor to operate an externally mounted DC motor. (The rated converter data must be observed.)

Application

- Demonstrating DC drives to customers
- Training Siemens employees and customers
- Test configurations

An automation group using a SIMATIC demonstration case together with one or several SINAMICS DC MASTER demonstration cases can be implemented.

Function

Operator control

The converter can be operated from:

- the commissioning box, which is connected to the terminals of the unit or the TM15 and TM31,
- the AOP30 operator panel
- the PROFIBUS interface
- the PROFINET interface

A description is provided with the demonstration case. This clearly shows the principle operator panel design and the possible functions of the operator controls.
To use the STARTER commissioning tool, users require a programming device or PC. The system requirements are described in Chapter, STARTER.

Technical specifications

SINAMICS DCM demonstration case	
Line connection	
Supply voltage	110 … 480 V 3 AC (+15 %/-20 %) or 110 … 480 V 1 AC (+15 %)
Rated frequency	45 … 65 Hz
Connecting cables	with 16 A Cecon connector (5UR5076 3), length approx. 4 m and a 0.7 m long adapter cable with Cecon socket and connector with ground connection
Line connection fusing required	16 A
Dimensions and weights	
Width	Approx. 680 mm
Height	Approx. 700 mm
Depth	Approx. 430 mm
With integrated DC motor	Approx. 70 kg
Weight without motor	Approx. 55 kg

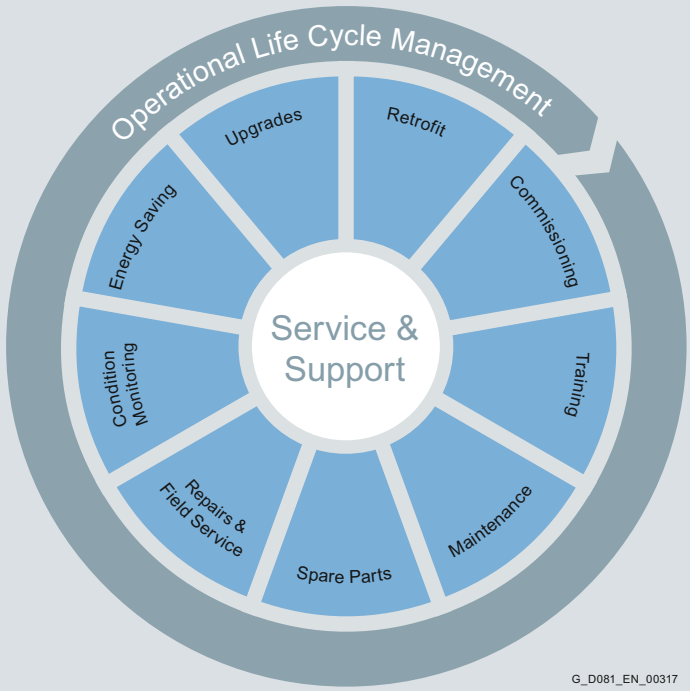
Selection and ordering data

SINAMICS DCM demonstration case	
Description	Order No.
With integrated DC motor	**6RX1800-0SM05**
Without motor	**6RX1800-0SV05**

The demonstration case with integrated DC motor is also available for rental.

Please contact your regional Siemens sales person.

Overview



You will find our regional contact partner as well as further information under:
http://www.siemens.com/automation/partner
http://www.siemens.com/ld-service

The correct solution in every phase of the **product life cycle**

Product Introduction	Operation	Product Phase-Out	Product Discontinuation
Delivery	**Support**		**Replacement**
■ Installation & Commissioning	■ Support & Remote Services	■ Support & Remote Services	■ Limited Availability of Spare Parts
■ Training	■ Training	■ Spare Parts & Repair Services	■ Repair Service is limited to Components
■ Support & Remote Services	■ Spare Parts & Repair Services	■ Maintenance & Field Service	■ Retrofit/ Modernization Services
■ Spare Parts	■ Maintenance & Field Service	■ Retrofit/ Modernization Services	■ Energy Optimization of Drive Systems
■ Product Support & Maintenance Contracts	■ Optimization Services	■ Energy Optimization of Drive Systems	

G_D081_EN_00318

Overview (continued)

Commissioning drive systems

Our services

In addition to commissioning plants and systems, we can also provide you with local service for motors, converters and auxiliary equipment for low-voltage variable-speed drives.

We focus on the following sectors and segments:

- Oil and gas
- Chemical Industry
- Power
- Steel
- Paper
- Shipbuilding
- Mining
- Cement
- Water and wastewater
- Metal forming technology
- Cranes
- Auxiliary equipment
- Water cooling systems
- Higher-level controls
- Protective equipment

The advantages at a glance

- High degree of flexibility and cost advantages thanks to a global network of qualified service personnel
- Direct contact between customer and manufacturer in close collaboration with the local service center
- Short communication paths across all organizational levels
- "Global resource management" for worldwide service calls, taking into account legal and tax-related directives
- Cross-sector drive know-how for the complete system
- Highly qualified specialists for variable-speed drives

Ordering information for our extensive range of services see Page 7/7.

Customer-specific drive training

Our services

We can offer you a wide range of individual training courses to expand existing know-how or to provide specific technical knowledge. These training courses can be implemented as

- Local training courses in the customer's plant in the form of a workshop, or as
- Training in the Siemens factory

The duration of the training course is adapted to the particular training-specific requirements and necessities. It goes without saying that we are more than willing to help you plan your individual training requirements.

The advantages at a glance

- Establish and expand the technical know-how of the customer's own maintenance and operating personnel
- Adherance to and correct implementation of drive-specific maintenance work
- Fast and competent troubleshooting and documentation of fault causes → real-time troubleshooting
- In the case of a fault, the customer's own maintenance personnel are able to make the correct decisions quickly and reliably
- Targeted contact with the Siemens service organization with a competent description of the fault
- Providing information and know-how to correctly select and stock a range of important spare parts to ensure quick replacement and resumption of operation in the case of a plant standstill

Ordering information for our extensive range of services see Page 7/7.

Overview (continued)

Maintenance and inspection of drives

Our services

In addition to regular inspections, we also provide the option of entering into specific maintenance contracts. These can be individually tailored to your requirements and specifically expanded by the options that you require.

Inspection

- Determining and documenting the actual condition of electric motors and converters
- Comprehensive plant or system assessment based on checklists that have been specifically developed for this purpose
- Definition of additional measures required, including reporting

Maintenance contracts

- Definition of the required maintenance intervals
- Remote support and availability of a technical contact person
- Agreed fixed inspection dates
- Spare parts, service materials and tools
- Training the customer's service and plant operating personnel

The advantages at a glance

- Professional investigation and assessment of the plant state
- Determination of the required maintenance work
- Recommendation for the optimum spare parts inventory
- Investigation of possibilities for improving the operating conditions
- Maximizing the drive lifetime
- Minimizing component wear
- Avoiding non-scheduled production downtimes and the associated costs
- Monitoring the product lifecycle and recommendations for alternatives

Ordering information for our extensive range of services see Page 7/7.

Spare parts for drives

Our services

For drives, which generally play an essential role in the production process, in addition to the general service requirements, the availability of spare parts is of crucial significance. In addition to ordering individual spare parts, we can also offer you complete spare part packages. The essential basis for creating these packages is our extensive experience regarding maintenance activities in the drive and component area that we have gained over decades.

Especially for low-voltage equipment, we recommend the following spare part packages:

- "Basic spare package"

Spare part package with the most important electronic components, for example for commissioning

- "Premium spare package"

Comprehensive spare part package, that also includes other spare parts to extend the lifetime.

On request, we are more than willing to also check the stock of spare parts in your operation and to provide you with a quotation to appropriately adapt this stock of spare parts. For instance, this can take place as part of an annual maintenance program.

The advantages at a glance

- Minimization of fault-related downtimes
- In the case of a fault, no additional waiting times for spare parts to be delivered
- Increased availability of the drive unit
- Individual package content corresponding to the customer and plant requirements over the complete lifecycle

By specifying the device-specific Siemens order number as well as the associated serial number, you can view our "SparesOnWeb" database to obtain spare parts information for almost all of our current drive products. To do this, use the following link:

https://b2b-extern.automation.siemens.com/spares_on_web

It goes without saying that your local Siemens contact person can provide you with individual quotations for inquiries, and is always available to provide ordering information.

Overview (continued)

Remote maintenance – expert knowledge available close at hand

Our services

Complex drive systems must have a high availability and when required demand competent and fast support. Specialist personnel cannot always be available locally. This is the reason that we offer you the option of remotely monitoring your plants or systems. Remote maintenance activities such as these include, for example, the following services:

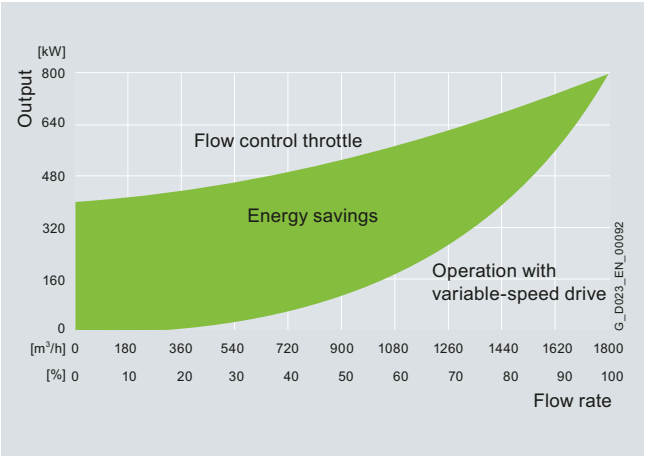
- Online condition monitoring
- Data is stored so that it cannot be lost in the event of a power failure
- Trend analysis, archiving and comparison of the saved data
- When required, expert support from the local service organization
- Video-based support for plant personnel
- Definition of additional measures required, including a report

The advantages at a glance

- Leading edge technology for highly secure connections with maximum availability
- High number of supported software applications
- Support service available 24/7
- Transparency through monitoring and reporting all connections
- Minimizing non-scheduled plant downtimes and avoiding possible subsequent costs
- Increased plant availability
- Basis for condition-oriented maintenance
- Optimization and planning of service and maintenance work
- Careful use of valuable resources by reducing plant visits
- Optimization of the spare part inventory
- Graded, flexible hardware and software concepts can be adapted in a scaled fashion to the appropriate drive system

Ordering information for our extensive range of services see Page 7/7.

Energy saving in drive technology



Our services

Drive technology represents about 2/3 of the industrial energy consumed. As a consequence, the efficient use of electrical energy in the drive sector plays a significant role and today represents high cost-saving potential. To optimize the energy usage, we have defined essential measures, which we can apply in your facility on request:

- Identification of potential savings

The energy requirement is determined and potential energy saving calculated

- Evaluation of the data obtained

The potential savings are evaluated using various methods, therefore providing a sound basis for making a decision

- Implemention of energy optimization measures

The appropriate products are determined and specific implementation measures performed

The advantages at a glance

- Efficient use of energy by using state-of-the-art, energy-saving drive technology
- Efficient use of energy by changing over to variable-speed drives
- Reduced line-side reactive power demand
- Improved starting behavior of motors
- Reduced line harmonics
- Reduced noise by using state-of-the-art technology
- Optimized production conditions
- Reduced wear by adapting the speed

Overview (continued)

Modernization of drives

Our services

Modernizing drives – also known as retrofitting – is one of the most important elements in the product lifecycle. You can only guarantee that your production runs smoothly if your machines, converters and plants operate safely and reliably.

To support you here, we can replace old technology by state-of-the-art converters and motors from our current product portfolio. Generally, it is not necessary to expand functions or plants – or to modify the drive concept.

The advantages at a glance

- Lower maintenance costs in later phases of the lifecycle
- Increased efficiency
- Process optimization
- Improved energy efficiency and adaptation to the current environmental legislation
- Reduced risk as a result of faults

Ordering information for our extensive range of services see the following section.

Service portfolio

Service products

Order No.	Service order type
9LD1030-0AB00	Repair order
9LD1350-0AB00	Product support and maintenance contract
9LD1130-0AB00	Field service call for commissioning and trouble-shooting
9LD1550-0AB00	Retrofit order

Notes:

Please contact your local Siemens contact person for questions relating to ordering information and requesting quotations.

For additional information, refer to:
www.siemens.com/ld-service

Extension of the liability for defects

We can offer you the possibility of extending liability for defect periods beyond the standard liability for defects period. The standard liability for defects period, as listed in our standard conditions of supply and delivery, is 12 months.

1. Extension of the liability for defects period when ordering new products

For an additional price, it is possible to extend the standard liability for defects period with a new order for a product. Various extension periods can be selected.

Extension of the liability for defects period for converters	
Order No. suffix **-Z** with order code	Supplementary text
Q80	Extension of the liability for defects period by 12 months to a total of 24 months (two years) from delivery.
Q81	Extension of the liability for defects period by 18 months to a total of 30 months (2½ years) from delivery.
Q82	Extension of the liability for defects period by 24 months to a total of 36 months (three years) from delivery.
Q83	Extension of the liability for defects period by 30 months to a total of 42 months (3½ years) from delivery.
Q84	Extension of the liability for defects period by 36 months to a total of 48 months (four years) from delivery.
Q85	Extension of the liability for defects period by 48 months to a total of 60 months (five years) from delivery.

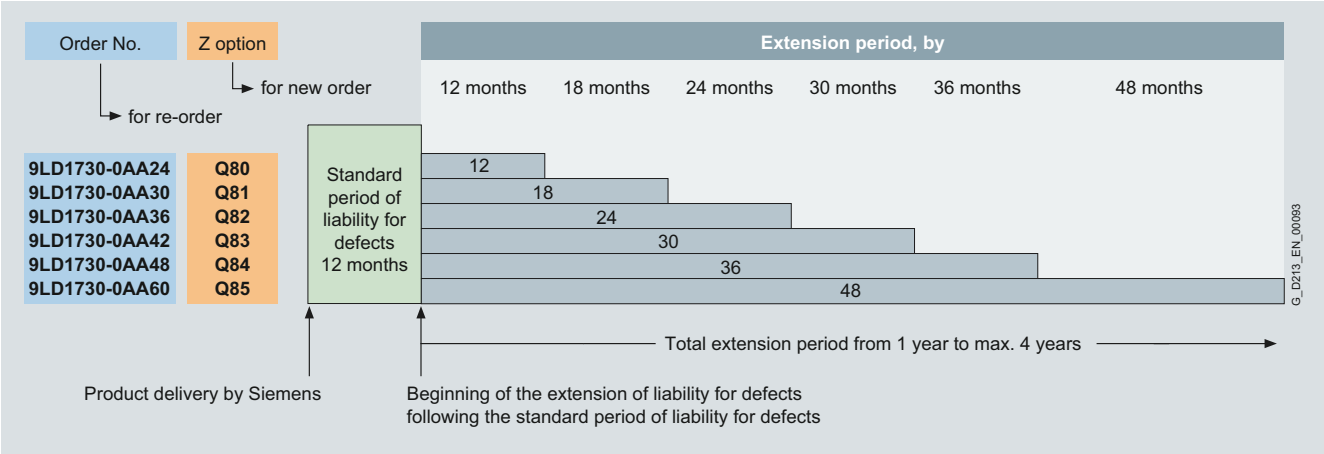
2. Extension of the liability for defects period after the product has already been delivered

If a product has already been delivered, an extended liability for defects period can be ordered, if the original liability for defects period has still not expired. When ordering, in addition to the order number specified on the type plate, the serial number is also required.

Extension of the liability for defects period for drives	
Order No.	Text
9LD1730-0AA24	Extension of the liability for defects period by 12 months to a total of 24 months (two years) from delivery.
9LD1730-0AA30	Extension of the liability for defects period by 18 months to a total of 30 months (2½ years) from delivery.
9LD1730-0AA36	Extension of the liability for defects period by 24 months to a total of 36 months (three years) from delivery.
9LD1730-0AA42	Extension of the liability for defects period by 30 months to a total of 42 months (3½ years) from delivery.
9LD1730-0AA48	Extension of the liability for defects period by 36 months to a total of 48 months (four years) from delivery.
9LD1730-0AA60	Extension of the liability for defects period by 48 months to a total of 60 months (five years) from delivery.

Overview (continued)

Overview of the extension of liability for defects



Conditions for an extension of the liability for defects:

1. For all extension periods of liability for defects, for new and subsequent orders, the final destination of the product must be specified. The EUNA process is available to obtain this information at www.siemens.com/euna, which must be performed by your local Siemens contact person.

2. All extensions of the liability for defects period to 4 and 5 years (Q84, Q85/9LD1730-0AA48, 9LD1730-0AA60) are only possible in conjunction with a corresponding service contract with regular inspection. This maintenance contract must be signed and concluded with the responsible service center. This must be documented using the EUNA procedure at www.siemens.com/euna which must be performed by your local Siemens contact person.

3. The general storage conditions described in the operating instructions must be adhered to, especially the specifications for long-term storage.

4. Commissioning must be performed by appropriately qualified personnel. When making claims under liability for defects, under certain circumstances, it may be necessary to submit the commissioning report to the department making the decision.

5. Periodic maintenance must be performed in accordance with the specifications of the operating instructions. When making claims under liability for defects, under certain circumstances, it may be necessary to submit the corresponding maintenance documentation and history.

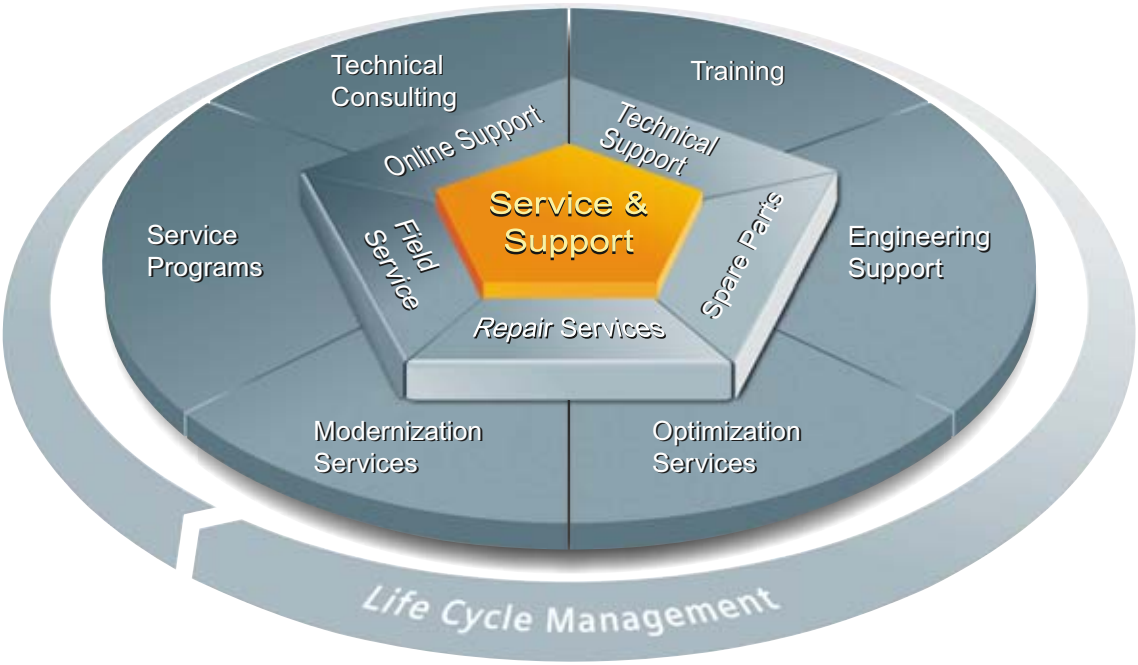
6. The operating conditions correspond to the specifications and data provided in the operating instructions, in the engineering/configuration manual or special conditions laid down in the specific contract.

7. The extended liability for defects excludes wearing parts such as fans or filters. This does not apply if it can be clearly proven that the failure is a premature one.

8. Otherwise, the general conditions regarding liability for defects applies as agreed in the supply agreement.

Ordering information for our extensive range of services see Page 7/7.

Service & Support – The unmatched complete service for the entire life cycle



For machine constructors, solution providers and plant operators: The service offering from Siemens Industry, Automation and Drive Technologies includes comprehensive services for a wide range of different users in all sectors of the manufacturing and process industry

To accompany our products and systems, we offer integrated and structured services that provide valuable support in every phase of the life cycle of your machine or plant – from planning and implementation through commissioning as far as maintenance and modernization.

Our Service & Support accompanies you worldwide in all matters concerning automation and drives from Siemens. We provide direct on-site support in more than 100 countries through all phases of the life cycle of your machines and plants.

You have an experienced team of specialists at your side to provide active support and bundled know-how. Regular training courses and intensive contact among our employees – even across continents – ensure reliable service in the most diverse areas.

Online Support

The comprehensive online information platform supports you in all aspects of our Service & Support at any time and from any location in the world.

www.siemens.com/automation/service&support

Technical Consulting

Support in planning and designing your project: From detailed actual-state analysis, definition of the goal and consulting on product and system questions right through to the creation of the automation solution.

Technical Support

Expert advice on technical questions with a wide range of demand-optimized services for all our products and systems.

www.siemens.com/automation/support-request

Training

Extend your competitive edge – through practical know-how directly from the manufacturer.

www.siemens.com/sitrain

Contact information is available in the Internet at:
www.siemens.com/automation/partner

Services

Service & Support – The unmatched complete service for the entire life cycle

Engineering Support

Support during project engineering and development with services fine-tuned to your requirements, from configuration through to implementation of an automation project.

Field Service

Our Field Service offers you services for commissioning and maintenance – to ensure that your machines and plants are always available.

Spare parts

In every sector worldwide, plants and systems are required to operate with constantly increasing reliability. We will provide you with the support you need to prevent a standstill from occurring in the first place: with a worldwide network and optimum logistics chains.

Repairs

Downtimes cause problems in the plant as well as unnecessary costs. We can help you to reduce both to a minimum – with our worldwide repair facilities.

Optimization

During the service life of machines and plants, there is often a great potential for increasing productivity or reducing costs. To help you achieve this potential, we are offering a complete range of optimization services.

Modernization

You can also rely on our support when it comes to modernization – with comprehensive services from the planning phase all the way to commissioning.

Service programs

Our service programs are selected service packages for an automation and drives system or product group. The individual services are coordinated with each over to ensure smooth coverage of the entire life cycle and support optimum use of your products and systems.

The services of a Service Program can be flexibly adapted at any time and used separately.

Examples of service programs:

- Service contracts
- Plant IT Security Services
- Life Cycle Services for Drive Engineering
- SIMATIC PCS 7 Life Cycle Services
- SINUMERIK Manufacturing Excellence
- SIMATIC Remote Support Services

Advantages at a glance:

- Reduced downtimes for increased productivity
- Optimized maintenance costs due to a tailored scope of services
- Costs that can be calculated and therefore planned
- Service reliability due to guaranteed response times and spare part delivery times
- Customer service personnel will be supported and relieved of additional tasks
- Comprehensive service from a single source, fewer interfaces and greater expertise

Contact information is available in the Internet at:
www.siemens.com/automation/partner

Knowledge Base on DVD

For locations without online connections to the Internet there are excerpts of the free part of the information sources available on DVD (Service & Support Knowledge Base). This DVD contains all the latest product information at the time of production (FAQs, Downloads, Tips and Tricks, Updates) as well as general information on Service & Support.

The DVD also includes a full-text search and our Knowledge Manager for targeted searches for solutions. The DVD will be updated every 4 months.

Just the same as our online offer in the Internet, the Service & Support Knowledge Base on DVD comes complete in 5 languages (German, English, French, Italian, Spanish).

You can order the **Service & Support Knowledge Base** DVD from your Siemens contact.

Order No.: **6ZB5310-0EP30-0BA2**

Automation Value Card

Small card – great support

The Automation Value Card is an integral component of the comprehensive service concept with which Siemens Drive Automation and Drive Technologies will accompany you in each phase of your automation project.

It doesn't matter whether you want just specific services from our Technical Support or want to purchase something on our Online portal, you can always pay with your Automation Value Card. No invoicing, transparent and safe. With your personal card number and associated PIN you can view the state of your account and all transactions at any time.

Services on card. This is how it's done.

Card number and PIN are on the back of the Automation Value Card. When delivered, the PIN is covered by a scratch field, guaranteeing that the full credit is on the card.

By entering the card number and PIN you have full access to the Service & Support services being offered. The charge for the services procured is debited from the credits on your Automation Value Card.

All the services offered are marked in currency-neutral credits, so you can use the Automation Value Card worldwide.

Order your Automation and Value Card easily and comfortably like a product with your sales contact.

Automation Value Card order numbers	
Credits	Order No.
200	**6ES7 997-0BA00-0XA0**
500	**6ES7 997-0BB00-0XA0**
1 000	**6ES7 997-0BC00-0XA0**
10 000	**6ES7 997-0BG00-0XA0**

Detailed information on the services offered is available on our Internet site at:

www.siemens.com/automation/service&support

Service & Support à la Card: Examples

Technical Support	
"Priority"	Priority processing for urgent cases
"24 h"	Availability round the clock
"Extended"	Technical consulting for complex questions
"Mature Products"	Consulting service for products that are not available any more
Support Tools in the Support Shop	
	Tools that can be used directly for configuration, analysis and testing

Overview

Faster and more applicable know-how: Hands-on training from the manufacturer

SITRAIN® – Siemens Training for Industry – provides you with comprehensive support in solving your tasks.

Training by the market leader in automation and plant engineering enables you to make correct decisions with confidence. Especially when it involves the optimum and efficient use of products and plants. You can eliminate deficiencies in existing plants and avoid expensive planning mistakes right from the very start.

First-class know-how which pays off directly: In shorter commissioning times, high-quality end products, faster troubleshooting and reduced downtimes. In other words, higher profits and lower costs.

Achieve more with SITRAIN

- Shorter times for commissioning, maintenance and service
- Optimized production operations
- Reliable engineering and commissioning
- Minimizing plant downtimes
- Flexible plant adaptation to market requirements
- Compliance with quality standards in production
- Increased employee satisfaction and motivation
- Shorter familiarization times following changes in technology and staff

Contact

Visit our Internet site under:

www.siemens.com/sitrain

or let us advise you personally. You can request our latest training catalog from:

SITRAIN Customer Support Germany:

Tel.: +49 (0) 911 / 895 7575

Fax: +49 (0) 911 / 895 7576

E-Mail: info@sitrain.com

SITRAIN highlights

Top trainers

Our trainers have a wealth of practical and didactic experience. Course developers have direct contact to product development, and directly pass on their knowledge to the trainers.

Practical experience

The practical experience of our trainers enables them to teach theory effectively. But since 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 equipment that has been designed both from the methodology and didactic perspectives. You feel absolutely certain when trained in this environment.

Wide variety

With a total of about 300 local attendance courses, we train the complete range of products from Siemens Industry as well as interaction of the products in systems.

Customized training

We are never far away. You can find us at more than 50 locations in Germany, and in 62 countries worldwide. You wish to have individual training instead of one of our 300 courses? Our solution: We can provide you with a program tailored exactly to your personal requirements. Training can be carried out in our Training Centers or at your company.

The right combination: Blended learning

Blended learning is the combination of various training media and sequences. For example, attending a course in a local training center can be optimally supplemented by a teach-yourself program as preparation or follow-up. Spin-off: Lower travel costs and shorter times away from work.

Overview

Product information SINAMICS DCM Cabinet

SINAMICS DC MASTER SIMOREG DC-MASTER

DC technology is still being successfully used in various sectors. However, the design of the converter and motors differs quite significantly from that of AC technology. Further, commissioning and service require special know-how in order to avoid damage and to optimize operating behavior.

We offer training courses for the current (SINAMICS) and the previous (SIMOREG) generation:

- SINAMICS DCM
  Parameter structure and commissioning software correspond to that of the SINAMICS family. The latest technology in the area of DC drives.
- SIMOREG DC-MASTER
  Parameter structure and commissioning software correspond to that of the MASTERDRIVES family. This proven technology has been used in many plants and systems for over 10 years.

SINAMICS DCM Service and commissioning

Description/learning objective

This training course explains how you adapt the parameter settings of the converter to the application and the DC motor. You expand your theoretical knowledge in the form of exercises carried out on special training equipment. After participating in the course, you know the functions of a converter and the interfaces. You are in a position to safely and quickly commission the unit. Through routine fault diagnostics and troubleshooting, you save time and optimize the availability of your plant or system.

Target group

Commissioning engineers, project engineers, service personnel

Preconditions

Basic knowledge of electrical engineering

Content

- Design and function of the SINAMICS DC MASTER converter: Control module CUD, power section, field circuit, interfaces
- Commissioning and parameterizing using the BOP20 and AOP30 operator panels and the STARTER PC program
- Using the memory card: Structure and data backup
- Procedure when commissioning, checking functions
- Optimizing the closed-loop current and speed control, automatic optimization
- Function diagrams: Setpoint channel, inputs and outputs, free function blocks
- Information on Drive Control Chart DCC
- Drive interface to PROFIBUS / PROFINET
- Expanding the system using Terminal Modules and Sensor Modules via DRIVE-CLiQ
- Parallel connection and peer-to-peer coupling
- Operating states, alarms and fault messages
- Service functions: Trace, measuring functions, diagnostics memory
- Practical exercises using AOP30 and STARTER on training equipment

Duration	5 days	*Order code:*	DR-DCM-SI

Overview (continued)

SINAMICS DCM Upgrade for SIMOREG experts

Description/learning objective

They already have good know-how on the previous SIMOREG DC-MASTER unit. This training course explains how you adapt the parameter settings of the SINAMICS DC MASTER to the application and the motor. You expand your theoretical knowledge in the form of exercises carried out on special training equipment. After participating in the course, you know the functions of a converter and the interfaces. You are in a position to safely and quickly commission the unit. Through routine fault diagnostics and troubleshooting, you save time and optimize the availability of your plant or system.

Target group

Commissioning engineers, project engineers, service personnel

Preconditions

Good knowledge about SIMOREG 6RA70

Content

- Design of the SINAMICS DC MASTER converter: Control module CUD, power section, field circuit, interfaces
- Commissioning and parameterizing using the BOP20 and AOP30 operator panels and the STARTER PC program
- Using the memory card: Structure and data backup
- Function diagrams: Setpoint channel, inputs and outputs, free function blocks
- Information on Drive Control Chart DCC
- Drive interface to PROFIBUS / PROFINET
- Expanding the system using Terminal Modules and Sensor Modules via DRIVE-CLiQ
- Parallel connection and peer-to-peer coupling
- Operating states, alarms and fault messages
- Service functions: Trace, measuring functions, diagnostics memory
- Practical exercises using AOP30 and STARTER on training equipment

Duration	3 days	*Order code:*	DR-DCM-U

Commissioning SIMOREG DC-MASTER

Description/learning objective

This training course provides information about how you adapt the parameter settings to a DC motor, document these and identify and resolve faults.

You expand your theoretical knowledge in the form of exercises carried out on special training equipment.

After participating in the course, you know the functions of a converter and the serial interfaces. You are in a position to safely and quickly commission the unit. Through routine fault diagnostics and troubleshooting, you save time and optimize the availability of your plant or system.

Target group

Commissioning engineers, project engineers, service personnel

Preconditions

Basic knowledge of electrical engineering

Content

- Presentation of the concept of the SIMOREG DC-MASTER series of units
- Explanation of the principle of operation and function charts
- Commissioning, parameterization and control loop optimization including function check
- Operating states, troubleshooting, analog and binary inputs and outputs
- Selected practical exercises
- Data transfer, data backup with OP1S, DriveMonitor (SIMOVIS)
- Trace buffer diagnostics
- "Peer-to-peer" and SIMOLINK coupling
- Examples from the area of "free functions"
- Information: Retrofit with SIMOREG CM
- Practical training and troubleshooting

Duration	5 days	*Order code:*	SD-GMP5

Appendix

Subject index

Subject index

Order No. index

Order No. index

AC ..... Alternating Current
AOP30 ..... Advanced Operator Panel
AWG ..... American Wire Gauge
BGV ..... Regulations of the professional association (Berufsgenossenschaftliche Vorschriften)
BICO ..... Binector/Connector Technology
BOP20 ..... Basic Operator Panel
CBE ..... Communication Board
CDS ..... Command Data Set
CM ..... Control Module
CU ..... Control Unit
CUD ..... Control Unit DC
DC ..... Direct Current
DCB ..... Drive Control Block
DCC ..... Drive Control Chart
DCM ..... DC MASTER
DDS ..... Drive Data Set
DIN ..... German Institute for Standardization (Deutsches Institut für Normung e.V.)
DRIVE-CLiQ ..... Drive Component Link with IQ
EMC ..... Electromagnetic Compatibility
EMF ..... Electromotive Force
EN ..... European standard (Europäische Norm)
EPROM ..... Erasable Programmable Read-Only Memory
E-STOP ..... Emergency Stop
ES ..... Engineering System
HTL ..... High-level Transistor Logic
IEC ..... International Electrotechnical Commission
IP ..... International Protection
LCD ..... Liquid Crystal Display
LED ..... Light Emitting Diode
MTBF ..... Mean Time Between Failure
OS ..... Harmonics, Operating System
PC ..... Personal Computer
PCS ..... Process Control System
PDS ..... Power Drive System
PE ..... Protective Earth
PG ..... Programming device
PKW ..... Parameter identifier value (Parameter Kennung Wert)
PTC ..... Temperature Coefficient
PZD ..... Process data (Prozessdaten)
RAM ..... Random Access Memory
SMC30 ..... Sensor Module
SSO ..... Single-Sign-On
TIA ..... Totally Integrated Automation
TIP ..... Totally Integrated Power
TM15, TM31 ..... Terminal Module
TMC ..... Terminal Module Cabinet
TTL ..... Transistor Transistor Logic
UL ..... Underwriters Laboratories Inc.
USS ..... Universal serial interface (Universelle Serielle Schnittstelle)
UPS ..... Uninterruptible Power Supply
VDE ..... Association of Electrical Engineering, Electronics and Information Technology (Germany) (Verband der Elektrotechnik Elektronik Informationstechnik e.V.)

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Catalogs

Industry Automation, Drive Technologies and Low-Voltage Power Distribution

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

Interactive Catalog on DVD	*Catalog*
for Industry Automation, Drive Technologies and Low Voltage Distribution	**CA 01**

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SINAMICS S120 Chassis Format Units and Cabinet Modules SINAMICS S150 Converter Cabinet Units	D 21.3
SINAMICS DCM Converter Units	D 23.1
SINAMICS and Motors for Single-Axis Drives	D 31
Three-phase Induction Motors • H-compact • H-compact PLUS	D 84.1
Asynchronous Motors Standardline	D 86.1
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DC Motors	DA 12
SIMOREG DC MASTER 6RA70 Digital Chassis Converters	DA 21.1
SIMOREG K 6RA22 Analog Chassis Converters	DA 21.2
PDF: *SIMOREG DC MASTER 6RM70 Digital Converter Cabinet Units*	*DA 22*
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MICROMASTER 411/COMBIMASTER 411	DA 51.3
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SIMOVERT MASTERDRIVES Motion Control	DA 65.11
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SIMODRIVE 611 universal and POSMO	DA 65.4
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SINUMERIK, SIMODRIVE and Motors for Machine Tools	NC 60
SINUMERIK, SINAMICS S120 and Motors for Machine Tools	NC 61
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IEC Squirrel-Cage Motors	D 81.1
MOTOX Geared Motors	D 87.1
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FLENDER Standard Couplings	MD 10.1
FLENDER SIG Standard industrial gear unit	MD 30.1

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SIVACON 8PS Busbar Trunking Systems	LV 70
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Motion Control	*Catalog*
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SINUMERIK & SINAMICS Equipment for Machine Tools	NC 61
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SIMOTION, SINAMICS S120 and Motors for Production Machines	PM 21
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PDF: *Process Analytics, Components for the System Integration*	*PA 11*

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KG 0212 140 En
Printed in Germany