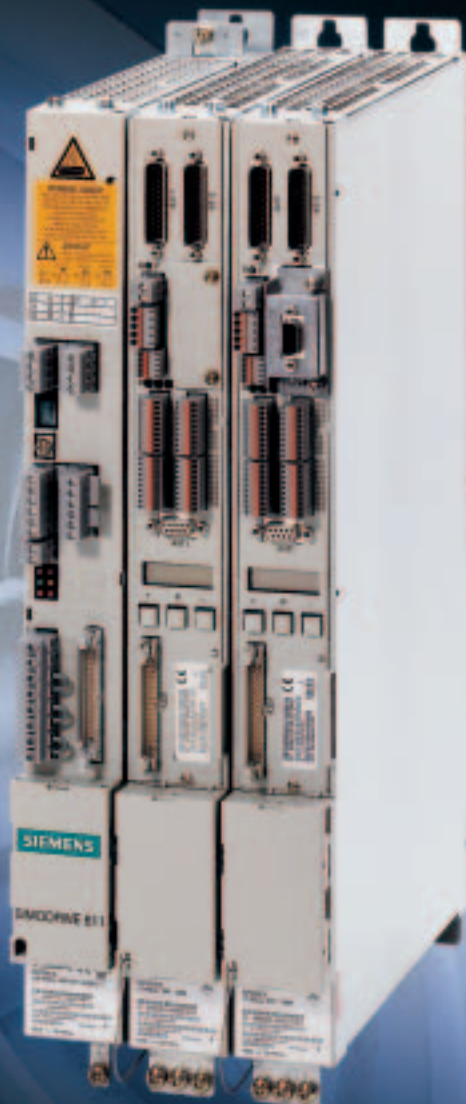


simodrive & POSMO



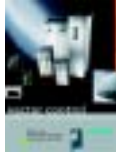
Central and Distributed
Drive Systems
0.075 kW (0.1 HP) to
120 kW (160 HP)



SIEMENS

Related catalogs

SIMOVERT MASTERDRIVES DA 65.10
Vector Control
 0.55 kW (0.75 HP) to 2300 kW (3000 HP)
 Order No.:
 German: E86060-K5165-A101-A3
 English: E86060-K5165-A101-A3-7600



SIMOVERT MASTERDRIVES DA 65.11
Motion Control
 0.55 kW (0.75 HP) to 250 kW (335 HP)
 Order No.:
 German: E86060-K5165-A111-A3
 English: E86060-K5165-A111-A3-7600



SINUMERIK & SIMODRIVE NC 60
 Automation Systems for
 Machine Tools
 Order No.:
 German: E86060-K4460-A101-B1
 English: E86060-K4460-A101-B1-7600



Servo motors DA 65.3
Synchronous and Asynchronous
Servo Motors
 Order No.:
 German: E86060-K5465-A301-A2
 English: E86060-K5465-A301-A2-7600



Catalog CA 01 CA 01
 The Offline Mall of
 Automation and Drives
 Order No.:
 CD-ROM: E86060-D4001-A110-C3



A&D Mall

Internet:
www.siemens.com/automation/mall



CD-ROM for Catalog DA 65.4

On the CD-ROM supplied with Catalog DA 65.4 · 2005, you will find:

- Information on planning and configuration based on the technical documentation; further technical documentation is available at:
www.siemens.com/automation/doconweb
- Dimension drawings of our motors (PDF/DXF format)
- Catalog DA 65.4 in electronic form (PDF format)

Hardware and software requirements

- Intel Pentium 333 MHz or higher
- 128 MB RAM or more
- Screen resolution 1024 x 768 pixels
- 4 x CD-ROM drive
- Windows 98 SE/NT 4.x/2000/XP
- Acrobat Reader
- MS Internet Explorer 5.5 or higher

Start

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

Note

The information on this CD-ROM can be viewed without the need to install any programs. The only exception is for the dimensional drawings, which are provided in DXF format.

Hotline

Please address questions and suggestions to:
motioncontrol.docu@erlf.siemens.de

Trademarks

Any product names may be registered trademarks or product names of Siemens AG or other suppliers, whose use by third parties for their own purposes could violate the rights of the owners.

SIMODRIVE 611 universal and POSMO 0.075 kW (0.1 HP) to 120 kW (160 HP)

Catalog DA 65.4 · 2005

Supersedes:
Catalog DA 65.4 · 2002
General Motion Control Catalog Part 3 · 2001
(North American Catalog)

The products in this catalog are
also included in the electronic catalog CA 01

Contact your local Siemens
representative for further information

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The products and systems described in this catalog are manufactured/distributed under application of a quality management system certified in accordance with EN ISO 9001 (Certificate Registration No. 001258 QM) and EN ISO 14001 (Certificate Registration No. 081342 UM). The certificates are recognized in all IQNet countries.



SIEMENS

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Overview



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Welcome to Automation and Drives

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

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

Discover the world of our technology now. If you need more detailed information, please contact one of your regional Siemens partners.

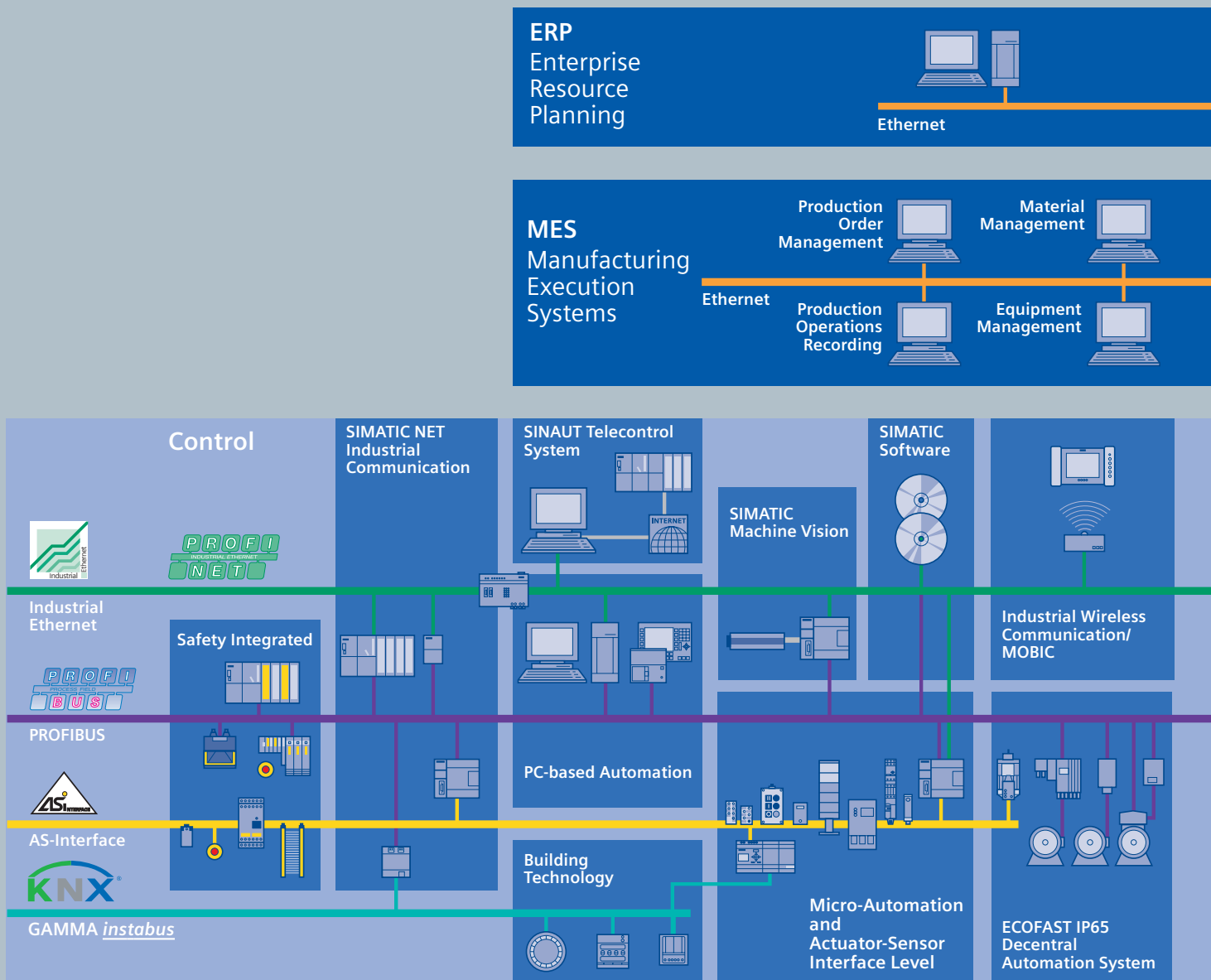
They will be glad to assist you.





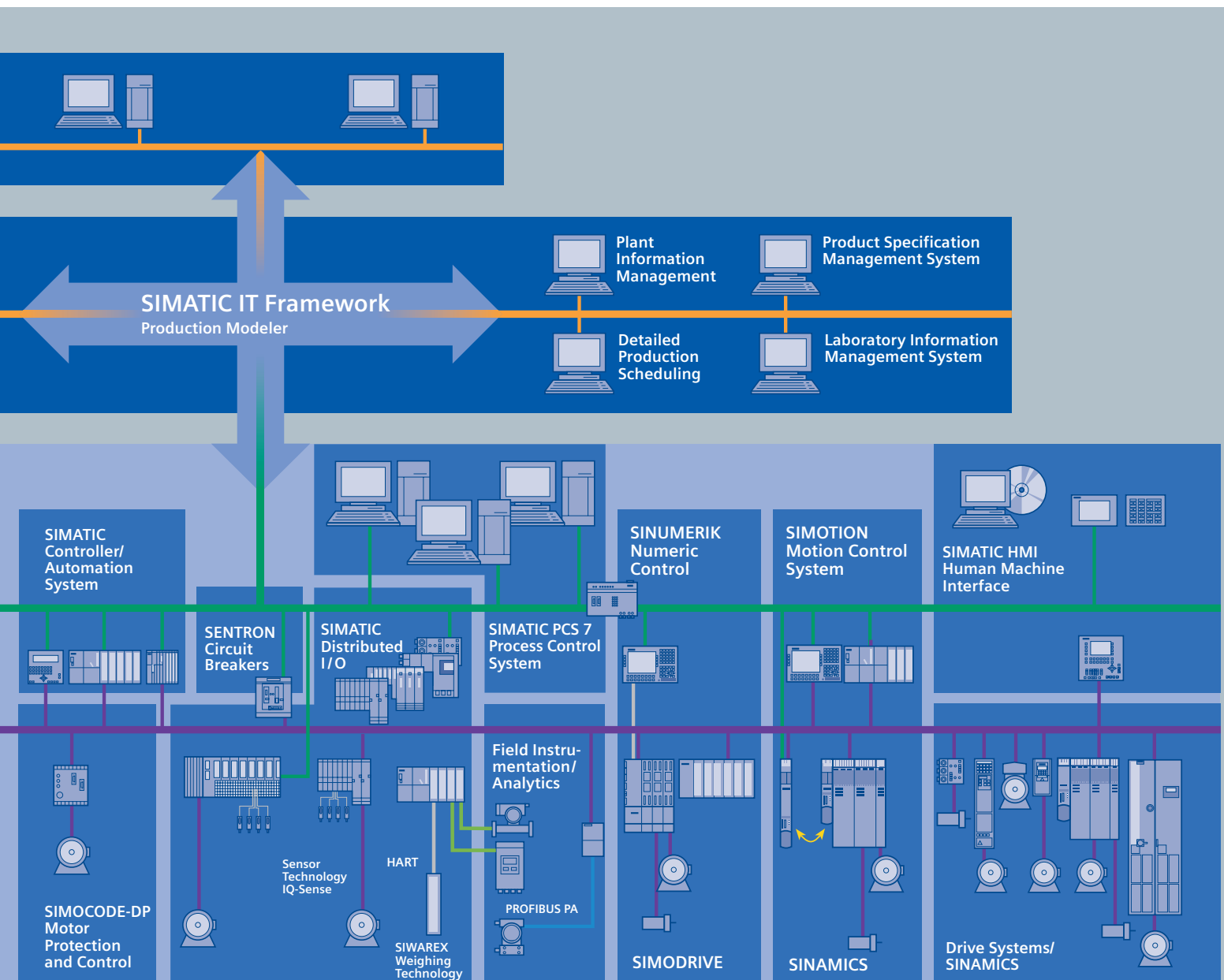
Totally Integrated Automation – innovations for more productivity

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



and production areas to shipping. Thanks to the system-oriented engineering environment, integrated, open communications as well as intelligent diagnostics options, your plant now benefits in every phase of the life cycle.

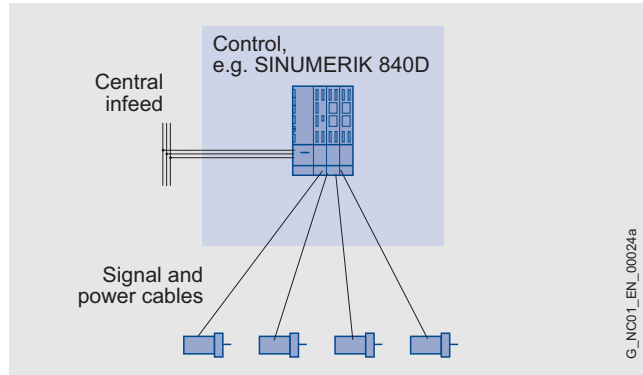
In fact, to this day we are the only company worldwide that can offer a control system based on an integrated platform for both the production and process industry.



Overview

SIMODRIVE for central and distributed drive systems

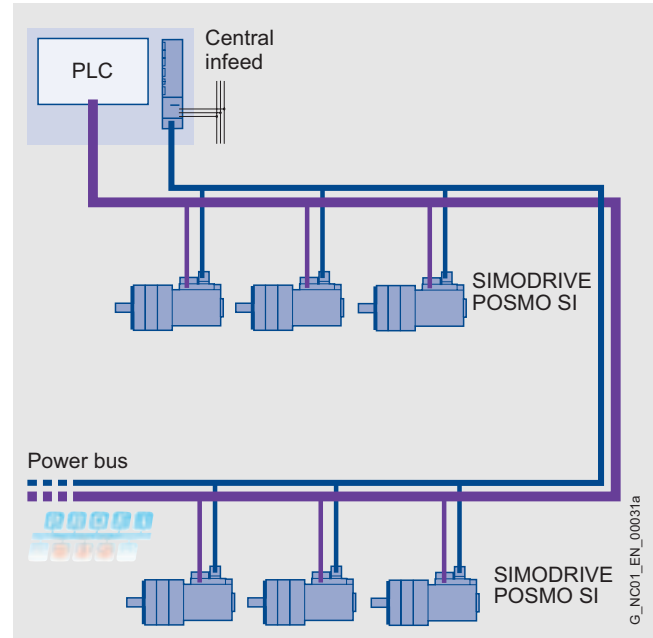
Central drive systems with SIMODRIVE 611



Central drive systems offer a wide performance range based on a modular structure. Various closed-loop control modules make it possible to combine groups of drives to form a higher-level control system. The two-axis modules enable space-saving module configurations.

Such modularity makes virtually any drive configuration possible, as a result allowing integrated configuring for everything from a compact machine to a complex plant.

Distributed drive systems with SIMODRIVE POSMO



Distributed drives take drive technology out of the control cabinet and put it right on the machine. The advantages of this technology result from the type of construction and installation: control cabinet costs are reduced, the control systems make machine installation easier, and installation overhead is reduced thanks to simplified cable routing.

The benefits of distributed drive configurations are most apparent when the machines and plants are large in size.

Notes:

For satisfactory and reliable operation of the drive system, please use only original components of the SIMODRIVE system, and the original Siemens accessories as described in this Catalog and the Planning Guide, in the functional descriptions or user manuals.

The user must observe the configuring instructions.

Combinations that differ from the configuring instructions, also in conjunction with non-Siemens products, require special agreement.

System performance data of the SIMODRIVE converter system

System performance data	SIMODRIVE 611	SIMODRIVE POSMO		
	universal HR	SI	CD	CA
Rated power range - Infeed				
Direct system connection	–	–	–	Yes
Open-loop infeed	5 ... 28 kW (6.5 ... 38 HP)	5 ... 28 kW (6.5 ... 38 HP)	5 ... 28 kW (6.5 ... 38 HP)	5 kW (6.5 HP) (integrated)
Closed-loop infeed	16 ... 120 kW (22 ... 160 HP)	16 ... 120 kW (22 ... 160 HP)	16 ... 120 kW (22 ... 160 HP)	–
Rated current range - Power modules for motor power inverter				
Feed application with motor encoder: Incremental encoder sin/cos 1 V _{pp} and EnDat absolute encoder	3 ... 140 A	Servo drive with inte- grated power section	9 ... 18 A	9 A
Feed application with motor encoder: Resolver	3 ... 140 A	–	–	9 A
Main spindle application, closed-loop controlled with motor encoder	3 ... 200 A	–	9 ... 18 A	9 A
Asynchronous motor application, closed-loop controlled without motor encoder	3 ... 200 A	–	9 ... 18 A	9 A
Rated DC link voltage				
• Open-loop				
at 3-phase AC 400 V -10%	490 V	490 V	490 V	490 V
at 3-phase AC 480 V +6%	680 V	680 V	680 V	–
• Closed-loop				
at 3-phase AC 400 V	600 V	600 V	600 V	–
at 3-phase AC 415 V	625 V	625 V	625 V	–
Motor types				
Synchronous motor as feed drive with motor encoder: Resolver	1FK7/1FT6	–	1FK7/1FT6	1FK7/1FT6
Synchronous motor as feed drive with motor encoder: Incremental encoder sin/cos 1 V _{pp} or EnDat absolute encoder	1FK7/1FT6/ 1FN	1FK7 with basic abso- lute encoder integrated	1FK7/1FT6	1FK7/1FT6
Asynchronous/synchronous motor as main spindle drive	1PH	–	1PH	1PH
Asynchronous low-voltage motors	1LA	–	1LA	1LA

SIMODRIVE 611 universal and POSMO

Overview

Application

Central drive systems with SIMODRIVE 611 universal HR

With a proven hardware platform, SIMODRIVE 611 universal HR has been designed to handle a wide range of applications in the mechanical engineering industry. It can be used to control various motor types, such as synchronous, asynchronous, standard induction or linear motors. Its compact, multi-axis design is well suited for many industries, i.e. printing, packaging, textile, wood, glass, etc.

SIMODRIVE 611 universal HR is supplied for line voltages of 3-phase 380 V to 480 V AC, 50/60 Hz and is available from 1.1 kW (1.5 HP) to 120 kW (160 HP). The modules have a standard design of 480 mm (19 in) high by 288 mm (11.5 in) depth and depending on the power range, the width increases in units of 50 mm (2 in).

Some of the main features of the SIMODRIVE 611 universal HR:

- Configurable for speed/torque control and positioning control
- Suitable for synchronous and asynchronous motors
- Compact design with single-axis and two-axis modules
- Communication with PROFIBUS
- All data in the package is located on a traversable memory submodule.

In addition to classical drive functions such as torque and speed control with output frequencies up to 1400 Hz, SIMODRIVE 611 universal HR offers integral positioning functions.

Up to 64 independent traversing blocks can be stored to perform either absolute or relative position moves allowing it to be characterized by:

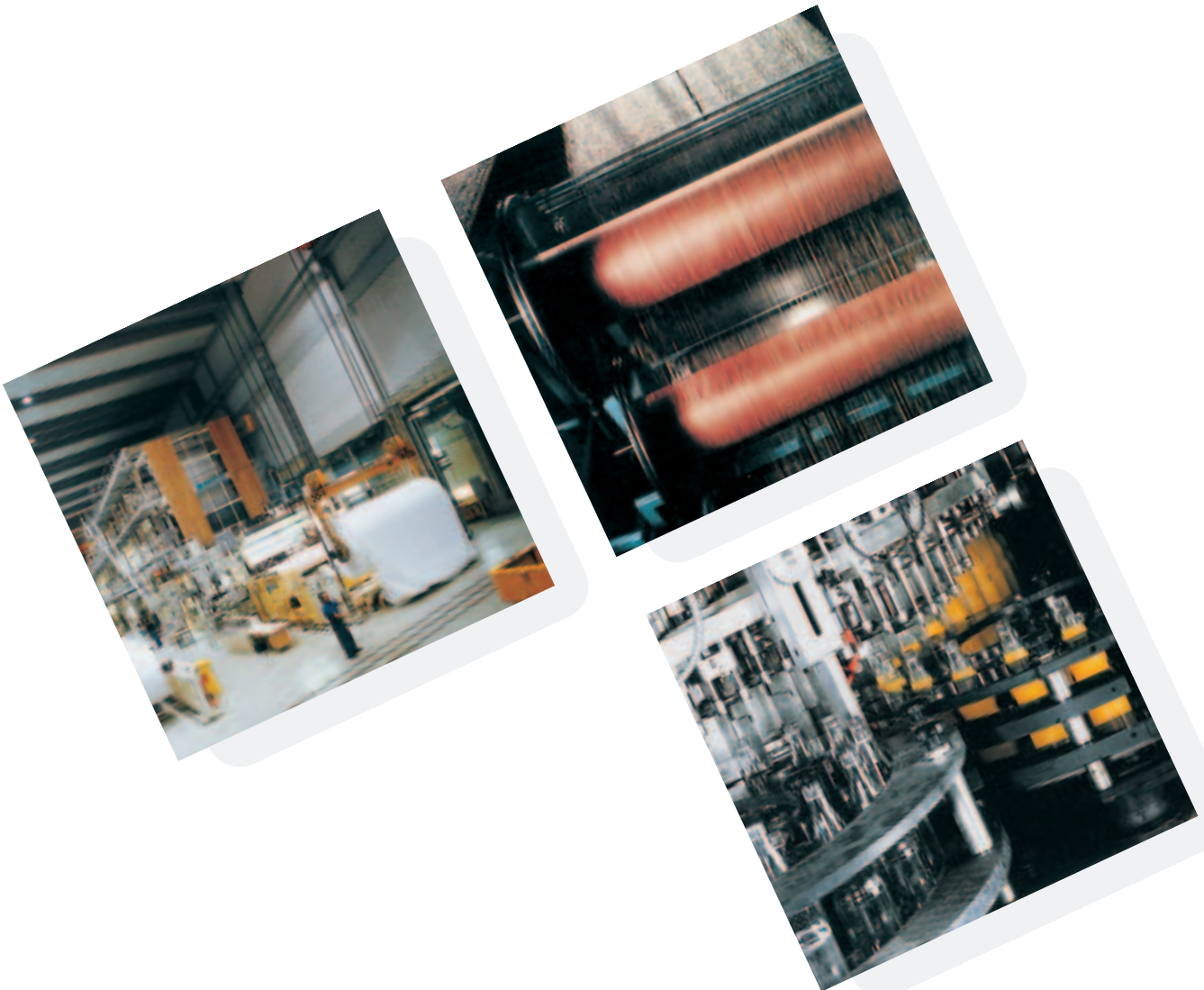
- Extremely high dynamic performance
- Flexible positioning
- High field weakening range
- Ease of use

The range is rounded off by a complete spectrum of system components and accessories.

Customer-specific, integral solutions (automation – converters – motors) are available for the most varied of applications in all industrial sectors.

For the SIMODRIVE 611 universal HR, an easy to use Windows based graphical programming and diagnostic tool is available. Known as SimoCom U, this tool has been specially developed to make start-up of the drive system effortless.

Siemens' worldwide service and the company's sales network enable all our customers to obtain direct access to expert advice and project planning as well as training and service.



Distributed drive systems with SIMODRIVE POSMO

Installation at the machine or integrated in the motor: for distributed solutions, the servo drives of the SIMODRIVE POSMO series designed to a high degree of protection take drive technology out of the control cabinet and put it right on the machine.

Flexibility in machine design, low wiring overheads, rapid installation and start-up, short retooling times, easy maintenance and high availability are obvious advantages for the OEM and machine operator when using SIMODRIVE POSMO drives.

This significantly reduces system costs and project engineering and installation times.

The SIMODRIVE POSMO series, with its consistent distributed design concept, opens up a new level in automation and can be used throughout the mechanical engineering sector, particularly in the fields of packaging, presses, wood, glass, printing, plastics, textiles and machine tools.

SIMODRIVE POSMO CD/CA

SIMODRIVE POSMO CD/CA is the distributed converter system for mounting close to the motor.

Main features:

- Complete functional unit in the IP65 degree of protection, suitable for installation close to the motor.
- The motor-independent construction supports flexible use of different or special motor types, such as servo motors in different designs, asynchronous motors and linear motors.
- Motion control can be stored in the unit in the form of a program.
- Communication via PROFIBUS DP, supply from the power bus.

Typical applications:

- High-performance servo applications such as continuous-path control with an accuracy of up to 1 µm, synchronous operation with a high dynamic response.
- Feed axes on machine tools.

SIMODRIVE POSMO SI

SIMODRIVE POSMO SI is a distributed servo drive system which is a direct node on PROFIBUS DP.

Main features:

- Complete functional unit integrated into the motor.

- Motion control can be stored in the unit in the form of a program.
- Communication via PROFIBUS DP, energy supply from the power bus.

Typical applications:

- Servo axes in handling devices
- Independent positioning axes in machines
- Auxiliary axes in machine tools

The SIMODRIVE POSMO SI servo drive system is a fully functional mechatronic unit that is ideally suited to a wide range of applications in mechanical engineering.

SIMODRIVE POSMO A

SIMODRIVE POSMO A is an intelligent positioning motor as a distributed node on PROFIBUS DP.

Main features:

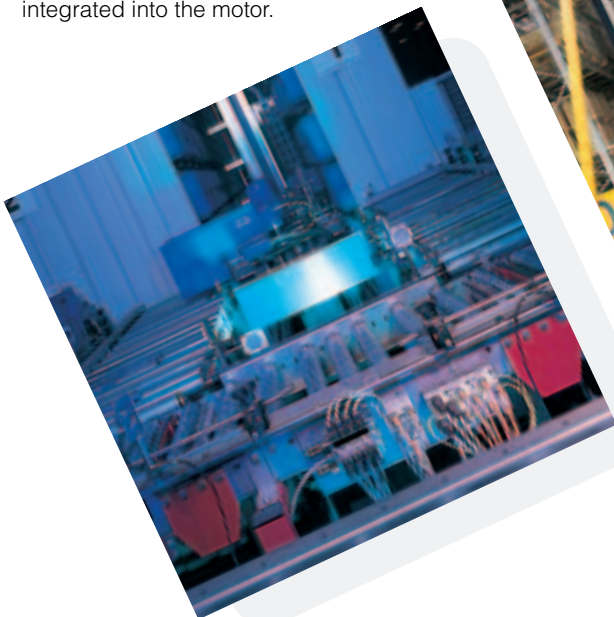
- Power section and complete motion control in the motor
- Link via communication bus and power bus
- PROFIBUS DP standard slave

Typical applications:

- Positioning of formats or stops
- Resetting of process variables, e.g. via motor valves

Areas of application:

- All sectors of mechanical engineering
- Transfer lines
- Medical technology, e.g. traversal of examination tables or X-ray equipment.



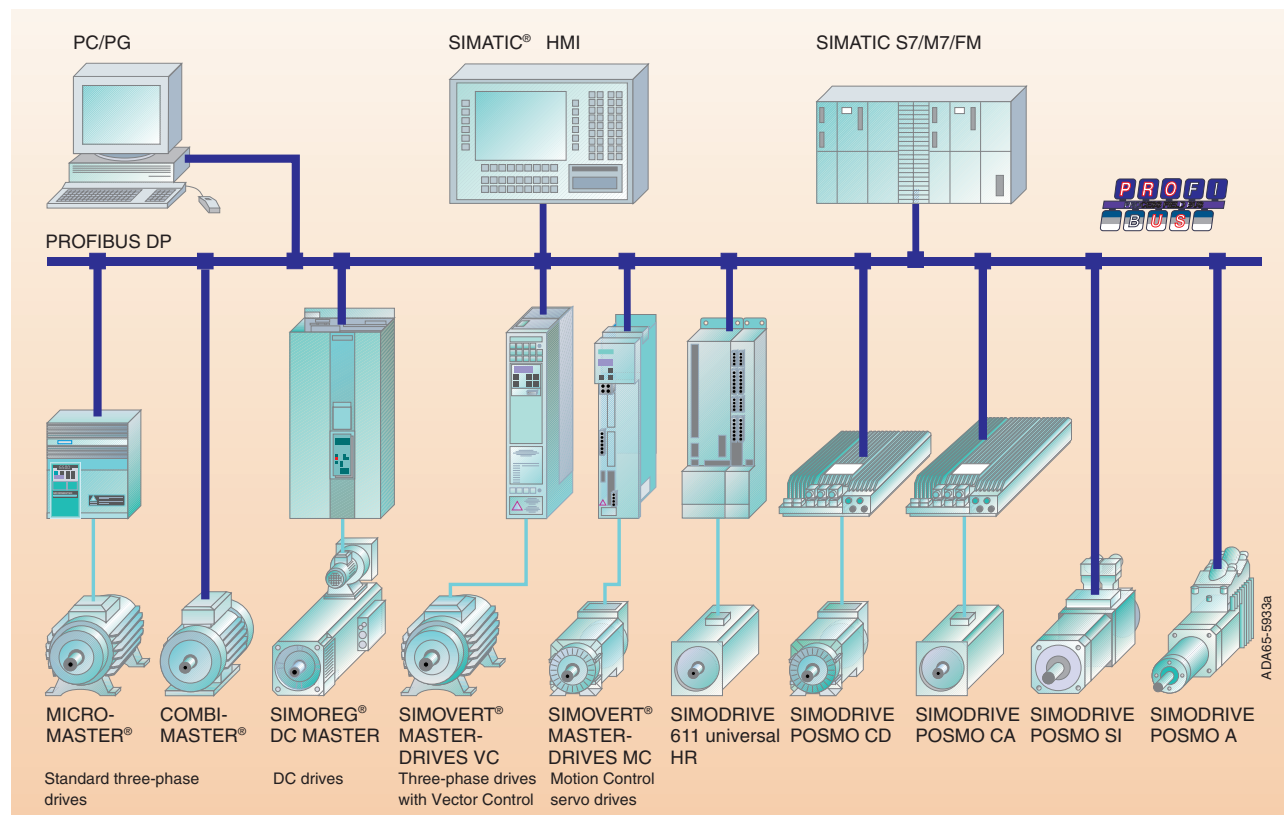
Overview

Optimized integration of the drives
in the world of automation

Totally Integrated Automation

Low engineering costs, high productivity and low life-cycle costs – these are today's requirements for efficient manufacturing. Totally Integrated Automation satisfies these requirements.

Totally Integrated Automation impresses customers on the one hand with its threefold uniformity in configuration/programming, data management and communication and offers on the other hand a modular system that contains all the components required for a modern automation solution. It therefore provides a single, totally integrated system basis: from the field level containing the drives right through to the system management level.



Drive ES – and drives can be seamlessly integrated into the SIMATIC® world.

Drive ES (Engineering System) is an engineering system that gives you all the data pertaining to your drives in a uniform format. For uniform data management, uniform project engineering and uniform communication via PROFIBUS. This makes your life much easier, because there is nothing like it for easy, problem-free, time-saving and economical integration of drive systems into the SIMATIC world.

Drive ES allows you to implement Totally Integrated Automation for your SIMODRIVE drives. Drive ES is easy to use: the software runs under the desktop of the SIMATIC Manager in use throughout the world. The supplementary program Drive ES SIMATIC offers additional advantages.

PROFIBUS DP – Control bus and drive bus in one

PROFIBUS DP is a multi-vendor, open fieldbus standard with a wide field of application in manufacturing and process automation. Multi-vendor capability and openness is guaranteed by the EN 50170 and EN 50254 international standards.

PROFIBUS DP is suitable for high-speed, time-critical applications as well as for complex communication tasks. PROFIBUS DP is the most frequently used communication profile. It is optimized for speed, efficiency and low connection costs and is specially designed for communication between automation systems and distributed I/O.

The new functionality for synchronous operation (closed-loop control and synchronization of drives over the bus) and direct communication (between drives and the I/O) means that a special drive bus is no longer necessary.

For full automation of your machine, you only need one bus: PROFIBUS DP. The following functions can be implemented with PROFIBUS DP:

- Open-loop control
- Operation and monitoring
- Actuators, sensors
- Motion control functions
- Engineering, diagnostics and Teleservice

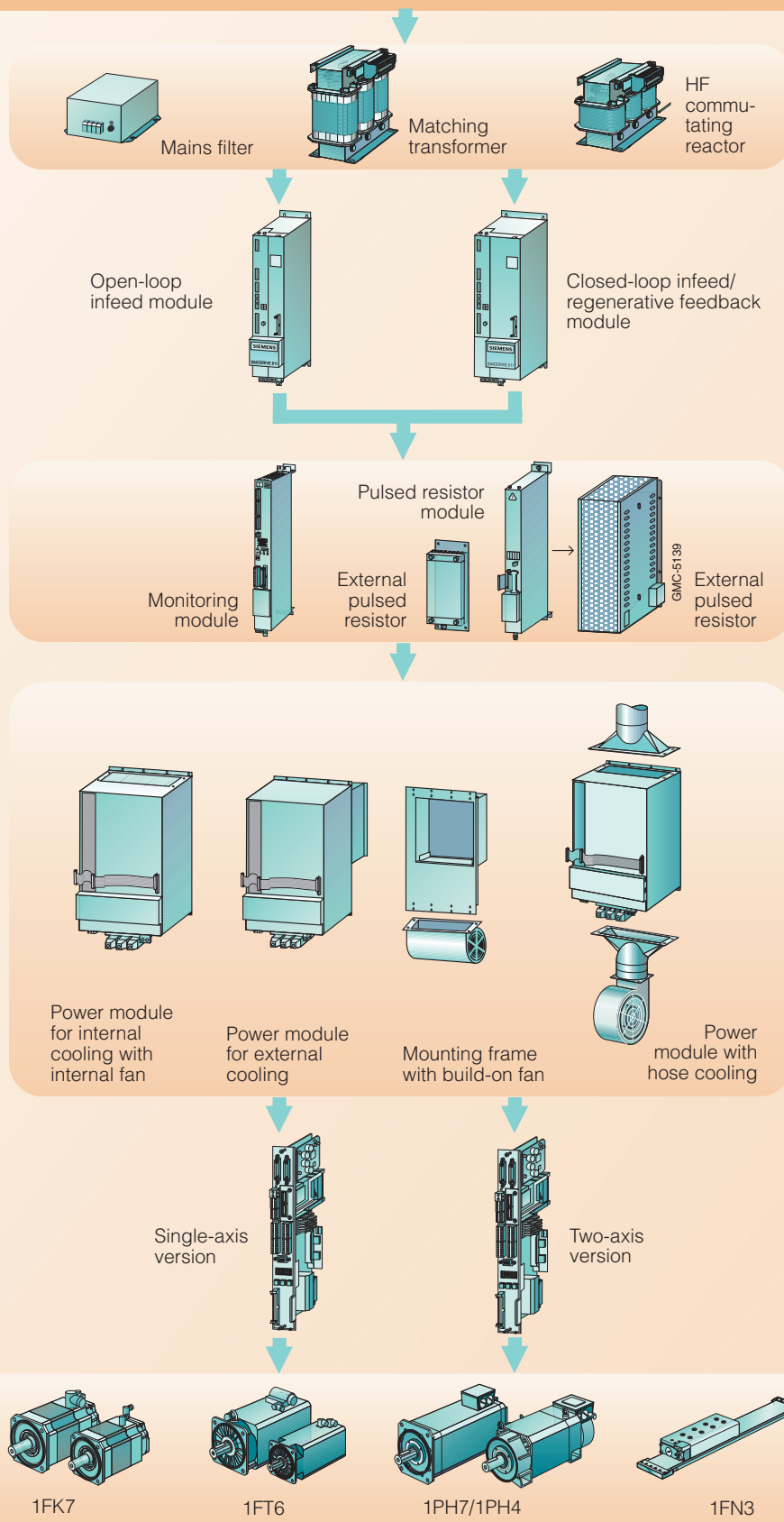
The benefits of PROFIBUS DP for total automation of the machine are clear:
less hardware, less wiring, less installation, lower engineering costs, fewer mistakes with fast commissioning and minimal training costs.

SIMODRIVE 611 universal and POSMO

Overview

Guidelines for SIMODRIVE 611 universal HR

3-phase AC supply



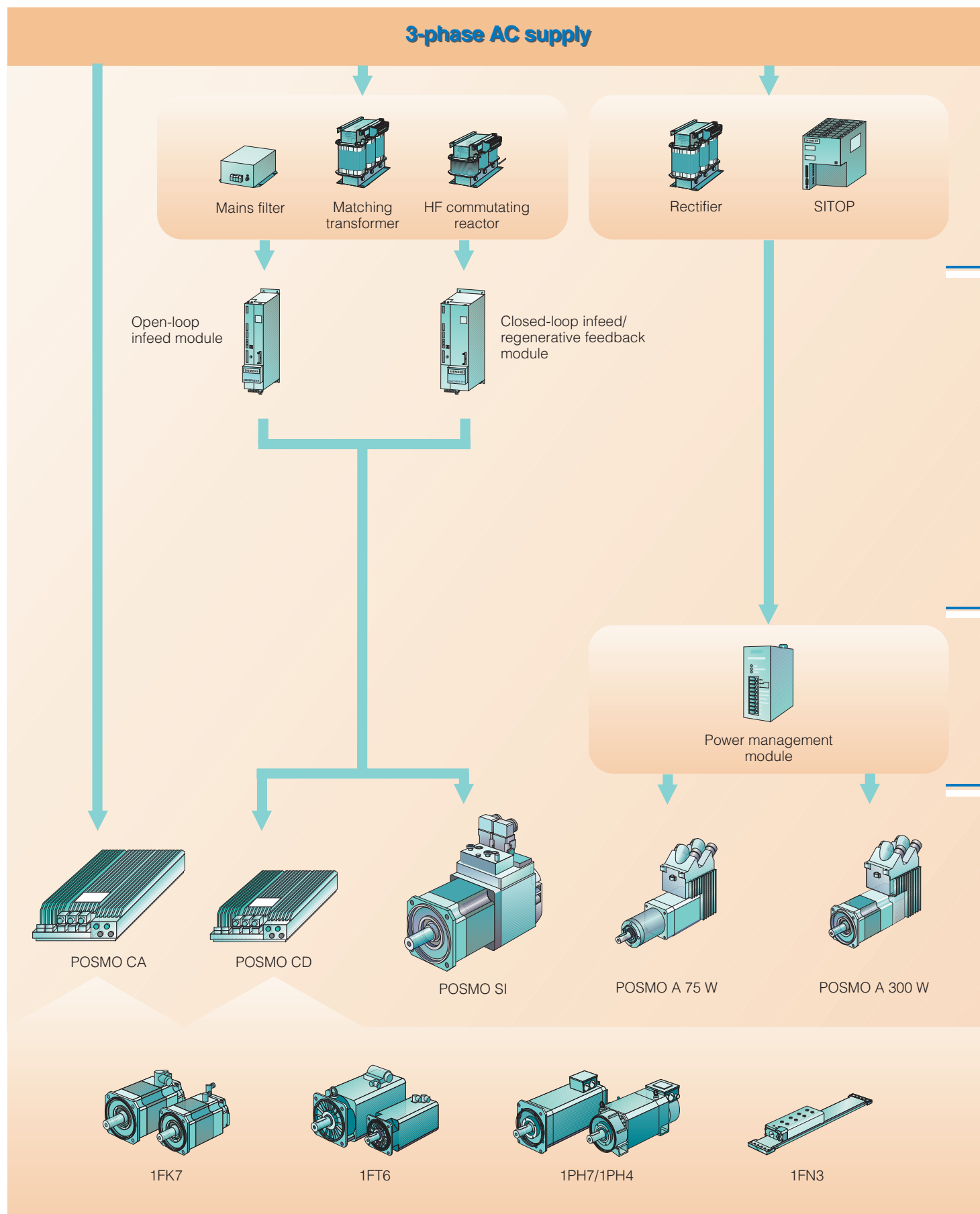
Guidelines for SIMODRIVE 611 universal HR

	Technical data Page	Selection and ordering data Page	Engineering information Page	Dimension drawings
Line-side components				
Mains filter package	–	3/9	8/21	see
HF/HFD commutating reactors	2/8	3/9	8/20	CD Catalog
Mains filter	2/8	3/9	8/21	
Overvoltage limiter module	2/9	3/5	8/22, 8/42	
Matching transformer	2/3	3/8	–	
Infeed modules				
Infeed module				
Infeed/regenerative feedback module	2/5	3/2	8/22, 8/23, 8/32 – 8/34	see CD Catalog
System components				
Monitoring module	2/9	3/5	8/39, 8/40	see
External pulsed resistor	2/8	3/5	8/25, 8/26	CD Catalog
Pulsed resistor module	–	3/5	8/25 – 8/27	
Capacitor module	2/9	3/6	8/28	
Power modules				
Power modules	2/7	3/3	8/24, 8/32 – 8/34, 8/41	see CD Catalog
Power modules with internal cooling	2/7	3/3	8/24, 8/30	
Power modules with external cooling	2/7	3/3	8/30	
Power modules with hose cooling	2/7	3/3	8/31	
Electronic options				
Control units	–	3/4	8/43 – 8/51	–
Cables and connections				
Power and signal cables	7/2	3/10, 3/11, 3/14, 3/15, 3/17, Part 7	8/52, 8/53	–
Motors				
1FK7 synchronous motors	4/25	4/26 – 4/29	4/24	see
1FT6 synchronous motors	4/5	4/6 – 4/23	4/4	CD Catalog
1PH7 asynchronous motors	5/4	5/6 – 5/13	5/5	
1PH4 asynchronous motors	5/14	5/16	5/15	
1FN3 linear motors	4/39	4/40 – 4/43	4/38	

SIMODRIVE 611 universal and POSMO

Overview

Guidelines for SIMODRIVE POSMO



Guidelines for SIMODRIVE POSMO

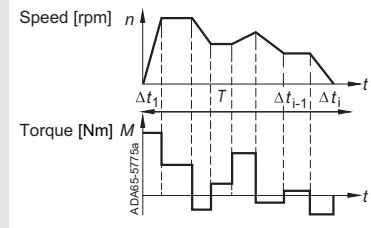
	Technical data Page	Selection and ordering data Page	Engineering information Page	Dimension drawings
Line-side components				
Rectifier unit	2/13	3/21	8/88	see CD Catalog
Mains filter	2/9	3/9	8/21	
Commutating reactor	2/8	3/9	8/20	
SITOP power supply	–	3/19	8/87	
Matching transformer	2/3	3/8	–	
Infeed modules				
Infeed modules, infeed/regenerative feedback modules	2/5	3/2	8/22	see CD Catalog
System components				
Separate variant "extension kit"	–	3/18	–	see CD Catalog
Power Management Module	2/12	3/18	8/89	
Pulsed resistor module	–	3/5	8/25 – 8/27	
External pulsed resistor	2/8	3/5	8/25, 8/26	
SIMODRIVE POSMO				
POSMO CA	2/10	3/12	8/60 – 8/83	see CD Catalog
POSMO CD	2/10	3/12	8/60 – 8/83	
POSMO SI	2/10	3/13	8/60 – 8/83	
POSMO A 75 W	2/11	3/16	8/84 – 8/95	
POSMO A 300 W	2/11	3/17	8/84 – 8/95	
Motors				
1FK7 synchronous motors	4/25	4/26 – 4/29	4/24	see CD Catalog
1FT6 synchronous motors	4/5	4/6 – 4/23	4/4	
1PH7 asynchronous motors	5/4	5/6 – 5/13	5/5	
1PH4 asynchronous motors	5/14	5/16	5/15	
1FN3 linear motors	4/39	4/40 – 4/43	4/38	

SIMODRIVE 611 universal HR selection guidelines

Basic details

Note:

The speed curves and the load torque curve must be known in order to select the correct drive.



Step 1

Determining the degree of protection of the motor:

IP23; IP55; IP64; IP65; IP67

See Part 4 or 5

Step 2

Determining the mains voltage/motor voltage:

380 to 400 V; 460 to 480 V

Step 3

Determining the construction type of the motor:

IM B3 (foot mounted); IM B5 (flange mounted); IM B35 (foot/flange mounted)

See Part 4 or 5

Step 4

Determining the maximum torque $M_{\max}$ from the load torque curve

Step 5

Determining the mean (rms) torque M_{rms}

See Part 8

Step 6

Determining the motor type required:

1FK7; 1FT6; 1PH7; 1PH4; 1FN3

See Part 4 or 5

Step 7

Selection of the motor that meets the following criteria:**Synchronous motor:**

$$n_{\max} \leq n_{\text{rated}}$$

$$M_{\text{rms}} \leq M_{\text{rated}}$$

The load points (n_i , M_i) must lie below $M_{\text{max, perm.}}$ or below the voltage limit curve.

Asynchronous motor:

$$n_{\max} \text{ must not be exceeded; } M_{\max} < 2 \times M_{\text{rated}}$$

$$M_{\text{rms}} \leq M_{\text{rated}}$$

The load points (n_i , M_i) must lie at least 30% below the stalling torque curve.

Step 8

Determining the encoder system required:

Rotary pulse encoder (only asynchronous motors); resolver; encoder; absolute encoder

See Part 6

Step 9

Complete motor order number with all the necessary options:

1FK7; 1FT6; 1PH7; 1PH4; 1FN3

See Part 4 or 5

Motor order number: 1FK7 □□□-□□□□□-□□□□
 1FT6 □□□-□□□□□-□□□□
 1PH7 □□□-□□□□□-□□□□
 1PH4 □□□-□□□□□-**Z + short codes**
 1FN3 □□□-□□□□□-□□□□

Step 10

Determining the length and cross-section of the pre-assembled power cable or determining the coupling required for customer installation:

See Part 7

Power cable order number:

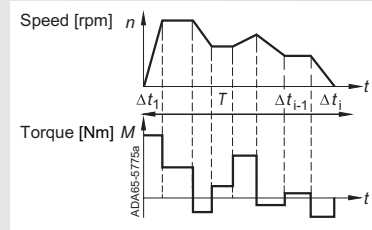
Step 11

SIMODRIVE 611 universal HR selection guidelines



SIMODRIVE POSMO CD/CA selection guidelines

Basic details

**Note:**

The speed curves and the load torque curve must be known in order to select the correct drive.

Step 1

Determining the degree of protection of the motor:

IP23; IP55; IP64; IP65; IP67

See Part 4 or 5

Step 2

Determining the mains voltage/motor voltage:

380 to 400 V; 460 to 480 V

Step 3

Determining the construction type of the motor:

IM B3 (foot mounted); IM B5 (flange mounted); IM B35 (foot/flange mounted)

See Part 4 or 5

Step 4

Determining the maximum torque $M_{\max}$ from the load torque curve

Step 5

Determining the mean (rms) torque M_{rms}

See Part 8

Step 6

Determining the motor type required:

1FK7; 1FT6; 1PH7; 1PH4; 1FN3

See Part 4 or 5

Step 7

Selection of the motor that meets the following criteria:**Synchronous motor:**

$n_{\max} \leq n_{\text{rated}}$
 $M_{\text{rms}} \leq M_{\text{rated}}$
 The load points (n_i , M_i) must lie below $M_{\max, \text{perm.}}$ or below the voltage limit curve.

Asynchronous motor:

$n_{\max}$ must not be exceeded; $M_{\max} < 2 \times M_{\text{rated}}$
 $M_{\text{rms}} \leq M_{\text{rated}}$
 The load points (n_i , M_i) must lie at least 30% below the stalling torque curve.

Step 8

Determining the encoder system required:

- Incremental encoder with 1 V_{pp} sin/cos
- Absolute encoder (Multiturn)

See Part 6

Step 9

Complete motor order number with all the necessary options:

1FK7; 1FT6; 1PH7; 1PH4; 1FN3

See Part 4 or 5

Motor order number: 1FK7 □□-□□□□-□□□□
 1FT6 □□-□□□□-□□□□
 1PH7 □□-□□□□-□□□□
 1PH4 □□-□□□□-**Z** + short codes
 1FN3 □□-□□□□-□□□□

Step 10

Selection of the pre-assembled power cable connected to the motor (length and cross-section)

See Part 7

Step 11

SIMODRIVE POSMO CD/CA selection guidelines

Step
11

Selection of the pre-assembled encoder cable:

See Part 7

Step
12

Selection of the SIMODRIVE POSMO:

POSMO CD 9 A
 POSMO CD 18 A
 POSMO CA 9 A

Order No.

6SN2 703-2AA 0□-0BA1
 6SN2 703-2AA 0□-0CA1
 6SN2 703-3AA 1□-0BA1

Step
13

Repeat steps 1 to 12 for all other axes in the application

Step
14 *)Calculate the DC link power $P_{DC \text{ link}}$

See Part 8

Step
15 *)

Selection of the infeed module in accordance with Step 14
 Caution: due to the power cable, the maximum power per power line
 is 16 kW (22 HP)

See Part 3

Step
16 *)

Selection of the pre-assembled power cables

See Part 7

Step
17

Selection of the PROFIBUS cable
 Selection of the cables for I/O signals

See Part 7

Step
18 *)

Are a pulsed resistor module and a braking resistor necessary?
 (only when using open-loop infeed modules)

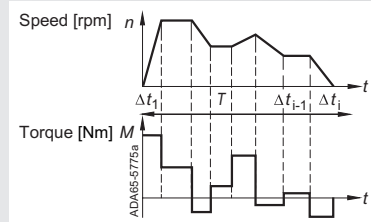
Step
19 *)

Are the following components necessary?
 – HF commutating reactor
 – Mains filter

*) Only for POSMO CD

SIMODRIVE POSMO SI selection guidelines

Basic details

**Note:**

The speed curves and the load torque curve must be known in order to select the correct drive.

Step 1

Determining the degree of protection:

- IP64 (fan IP54)
- IP65 and also DE flange IP67 (fan IP54)

Step 2

Construction type of the motor (flange mounted):

IM B5, IM V1, IM V3

Step 3

Determining the maximum torque $M_{\max}$ from the load torque curve

Step 4

Determining the mean (rms) torque M_{rms}

See Part 8

Step 5

Selection of the POSMO SI that meets the following criteria:

$$n_{\max} \leq 3000 \text{ rpm}$$

$$M_{\text{rms}} \leq M_{\text{rated}}$$

The load points (n_i, M_i) must lie below $M_{\max, \text{perm.}}$ or below the voltage limit curve.

Step 6

Encoder system:

- Absolute encoder

See Part 6

Step 7

Selection of the pre-assembled power cable connected to the infeed module and to the next POSMO (length)

See Part 7

Step 8

Selection of the PROFIBUS cable:

Selection of the cables for I/O signals

See Part 7

Step 9

Repeat steps 1 to 8 for all other axes in the application

Step 10

Calculate the DC link power $P_{\text{DC link}}$

Step 11

Selection of the infeed module in accordance with Step 10

Caution: due to the power cable, the maximum power per power line is 16 kW (22 HP)

See Part 3

Step 12

Are a pulsed resistor module and a braking resistor necessary?

(only when using open-loop infeed modules)

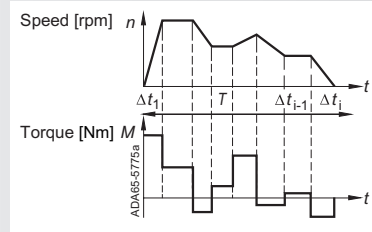
Step 13

Are the following components necessary?

- HF commutating reactor
- Mains filter

SIMODRIVE POSMO A selection guidelines

Basic details

**Note:**

The speed curves and the load torque curve must be known in order to select the correct drive.

Step 1

Determining the maximum torque $M_{\max}$ from the load torque curve

Step 2

Determining the mean (rms) torque M_{rms}

See Part 8

Step 3

Selection of the POSMO A that meets the following criteria:

$$n_{\max} \leq 3000 \text{ rpm}$$

$$M_{\text{rms}} \leq M_{\text{rated}}$$

The load points (n_i, M_i) must lie below $M_{\max, \text{perm.}}$ or below the voltage limit curve.

Step 4

Selection of the pre-assembled power cable connected to the infeed and to the next POSMO (length)

See Part 7

Step 5

Selection of the PROFIBUS cable:
Selection of the cables for I/O signals

See Part 7

Step 6

Repeat steps 1 to 5 for all other axes in the application

Step 7

Calculate the DC link power $P_{\text{DC link}}$

Step 8

Selection of the 24 V/48 V power module in accordance with Step 7

See Part 3

Step 9

Is a power management module necessary?



2/2	SIMODRIVE converter system
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General technical data SIMODRIVE 611 universal HR

EU low-voltage directive 73/23/EEC and RL 93/68/EEC	EN 50178
EU EMC guideline 89/336/EEC	EMC product standard EN 61800-3 for variable-speed drives (also EMC basic standard EN 55011)
EU machine guideline 89/392/EEC	Safety category 3 according to Y54-1
Approvals	CUL
Pollution degree	Pollution degree 2 in accordance with EN 50178 moisture condensation not permissible
Overvoltage category	Category III acc. to DIN VDE 0110, Part 2
Degree of protection	Acc. to EN 60529 IP20 ¹⁾
Shock protection (impact load)	Acceleration 49.05 m/s ² (161 ft/s ²) for 11 ms according to EN 60068-2-27 (IEC 68, Part 2-27)
RI suppression • Standard • Options	Acc. to EN 61800-3 No radio interference suppression Radio interference suppression filter for Class B1 or A1 acc. to EN 55011
Vibration load • Acceleration	Acc. to DIN IEC 68-2-6 9.8 ms ⁻² (32.2 ft/s ²) acc. to EN 60068-2-6 with constant deflection of 0.075 mm (0.003 in) in the frequency range 10 Hz to 58 Hz
Humidity rating to EN 60721-3-3	Class 3K5 condensation and icing excluded. Low air temperature 0 °C (+32 °F).
Cooling type	Forced air cooling with integral fan. Externally cooled by blower or by external duct.
Permissible ambient and coolant temperature • Operation • Storage/transport	0 ... +40 °C (+32 ... +104 °F) ²⁾ –40 ... +70 °C (–40 ... +158 °F)
Installation altitude	≤ 1000 m (3281 ft) above sea level, no power derating
Permissible moisture conditions	Relative humidity ≤ 95% during operation; moisture condensation is not permissible

1) Applies for power modules only when control units are used.

2) With derating, up to +55 °C (+131 °F).

Matching transformers with separate windings for 50/60 Hz supplies

Rated power	kVA	8.2	15.7	47	21	70	104	155
Allocation to infeed module	kW (HP)	5 (6.5) (OI)	10 (13.5) (OI)	28 (38) (OI)/ 36 (49) (I/RF)	16 (22) (I/RF)	55 (75) (I/RF)	80 (109) (I/RF)	120 (160) (I/RF)
Output voltage	V	3 AC 400						
Frequency	Hz	50 ... 60						
Degree of protection according to EN 60529 (IEC 60529)		IP00/IP20/IP23						
Humidity rating in accordance with EN 60721-3-3		Class 3K5 condensation and icing excluded. Low air temperature 0 °C (+32 °F).						
Permissible ambient temperature								
• Operation	°C (°F)	-25 ... +40 (-13 ... +104), up to +55 (+131) with derating						
• Storage/transport	°C (°F)	-25 ... +80 (-13 ... +176)						
Power loss, max.	W	540	710	1210	670	2020	2650	3060
Weight with:								
• Degr. of prot. IP00, approx.	kg (lb)	55 (121.3)	70 (154.4)	200 (441)	120 (264.6)	300 (661.5)	425 (937)	600 (1323)
• Degr. of prot. IP20/IP23, approx.	kg (lb)	65 (143.3)	95 (209.5)	216 (476.3)	131 (289)	364 (802.6)	536 (1182)	688 (1517)
Dimensions (W x H x D) with:								
• Degr. of prot. IP00, approx.	mm (in)	360 x 268 x 320 (14.2 x 10.6 x 12.6)	420 x 262 x 370 (16.5 x 10.3 x 14.6)	480 x 267 x 420 (18.9 x 10.5 x 16.5)	480 x 209 x 420 (18.9 x 8.2 x 16.5)	630 x 330 x 585 (24.8 x 13 x 23)	780 x 350 x 665 (30.7 x 13.8 x 26.2)	780 x 391 x 665 (30.7 x 15.4 x 26.2)
• Degr. of prot. IP20/IP23 ²⁾ , approx.	mm (in)	The dimensions of the housing are listed in the Planning Guide for the SIMODRIVE 611 converter.						
Max. conductor cross-section on secondary side	mm ²	6	16	35	16	70	FL ¹⁾	FL ³⁾
Input voltage 3-phase AC 575/500/480 V ±10%; 50 ... 60 Hz								
Rated input current, max.	A	10.4	20	57.5	25.8	87	127	189
Max. conductor cross-section on primary side	mm ²	6	6	35	16	50	70	FL ¹⁾
Input voltage 3-phase AC 440/415/400 V ±10%; 50 ... 60 Hz								
Rated input current, max.	A	12.6	23.4	69.1	31	103.8	153.6	227.2
Max. conductor cross-section on primary side	mm ²	6	16	35	16	70	70	FL ³⁾
Input voltage 3-phase AC 240/220/200 V ±10%; 50 ... 60 Hz								
Rated input current, max.	A	25.1	46.7	138.3	61.8	208.2	306.6	450
Max. conductor cross-section on primary side	mm ²	6	16	70	35	FL ¹⁾	FL ³⁾	FL ⁴⁾

1) FL = Flat-type terminal for ring terminal end, CU 20 x 3; drilled hole Ø 9 mm (0.35 in).

2) Degree of protection IP20 for 21 kVA and above; with degree of protection IP23, take a power reduction of 10% into account.

3) FL = Flat-type terminal for ring terminal end, CU 25 x 5; drilled hole Ø 11 mm (0.4 in).

4) FL = Flat-type terminal for ring terminal end, CU 30 x 6; drilled hole Ø 11 mm (0.4 in).

SIMODRIVE 611 universal and POSMO

Technical data

SIMODRIVE converter system

Matching transformers in economy circuit for 50/60 Hz (for TN supplies only)

Rated power						
• Autotransformer IP00/IP20	kVA	21	46.5	70.3	104	155
• Autotransformer IP23	kVA	18.9	42	63.3	93.6	140
Allocation to the infeed module	kW (HP)	16 (22) (I/RF)	36 (49) (I/RF)	55 (75) (I/RF)	80 (109) (I/RF)	120 (160) (I/RF)
Output voltage	V	3 AC 400				
Frequency	Hz	50 ... 60				
Vector group		Yna0				
Degree of protection according to EN 60529 (IEC 60529)		IP00/IP20/IP23				
Humidity rating in accordance with EN 60721-3-3		Class 3K5 condensation and icing excluded. Low air temperature 0 °C (+32 °F).				
Permissible ambient temperature						
• Operation	°C (°F)	-25 ... +40 (-13 ... +104), up to +55 (+131) with derating				
• Storage/transport	°C (°F)	-25 ... +80 (-13 ... +176)				

Input voltage 3-phase AC 480/440 V ±10%

Power loss						
• Autotransformer IP00/IP20	W	160 ²⁾	430	550	700	700
• Autotransformer IP23	W	135	370	460	590	600
Max. conductor cross-section on primary/secondary side	mm ²	16	35	70	FL ¹⁾	FL ¹⁾
Weight, approx.						
• Autotransformer IP00/IP20	kg (lb)	29 (64)	52 (114.7)	66 (145.5)	95 (209.5)	135 (297.7)
• Autotransformer IP23	kg (lb)	40 (88.2)	70 (154.4)	85 (187.4)	115 (253.6)	155 (341.8)
Dimensions (L x W x H)						
• Autotransformer IP00/IP20	mm (in)	270 x 192 x 250 (10.6 x 7.6 x 9.8)	370 x 220 x 330 (14.6 x 8.7 x 13)	370 x 240 x 340 (14.6 x 9.4 x 13.4)	420 x 260 x 370 (16.5 x 10.2 x 14.6)	480 x 220 x 420 (18.9 x 8.7 x 16.5)
• Autotransformer IP23	mm (in)	351 x 330 x 395 (13.8 x 13 x 15.6)	460 x 465 x 555 (18.1 x 18.3 x 21.9)	460 x 465 x 555 (18.1 x 18.3 x 21.9)	460 x 465 x 555 (18.1 x 18.3 x 21.9)	565 x 460 x 520 (22.2 x 18.1 x 20.5)

Input voltage 3-phase AC 220 V ±10%

Power loss						
• Autotransformer IP00/IP20	W	550 ²⁾	900 ²⁾	980 ²⁾	1350 ²⁾	1650
• Autotransformer IP23	W	460	760	830	1150	1400
Max. conductor cross-section on primary/secondary side	mm ²	16/16	70/50	95/70	FL ¹⁾	FL ¹⁾
Weight, approx.						
• Autotransformer IP00/IP20	kg (lb)	57 (125.7)	110 (242.6)	155 (341.8)	215 (474.1)	310 (683.6)
• Autotransformer IP23	kg (lb)	75 (165.4)	130 (286.7)	175 (385.9)	275 (606.4)	370 (815.9)
Dimensions (L x W x H)						
• Autotransformer IP00/IP20	mm (in)	370 x 220 x 330 (14.6 x 8.7 x 13)	480 x 230 x 430 (18.9 x 9.1 x 16.9)	480 x 300 x 430 (18.9 x 11.8 x 16.9)	530 x 290 x 520 (20.9 x 11.4 x 20.5)	590 x 320 x 585 (23.2 x 12.6 x 23)
• Autotransformer IP23	mm (in)	460 x 465 x 555 (18.1 x 18.3 x 21.9)	565 x 290 x 520 (22.2 x 11.4 x 20.5)	565 x 460 x 520 (22.2 x 18.1 x 20.5)	900 x 600 x 720 (35.4 x 23.6 x 28.3)	900 x 600 x 720 (35.4 x 23.6 x 28.3)

1) FL = Flat-type terminal, drilled hole Ø 9 mm (0.35 in).

2) Not IP20.

Infeed and infeed/regenerative feedback modules

Internal cooling	6SN1145-	–	1AA0.-0AA1	1AA0.-0CA0	1BA0.-0BA1	1BA0.-0CA1	1BA0.-0DA1	1BB0.-0EA1	1BB0.-0FA1
	6SN1146-	1AB0.-0AB1	–	–	–	–	–	–	–
External cooling ¹⁾	6SN1145-	–	1AA0.-0AA1	–	–	–	–	–	–
	6SN1146-	1AB0.-0AB1	–	1AA0.-0CA0	1BB0.-0BA1	1BB0.-0CA1	1BB0.-0DA1	1BB0.-0EA1	1BB0.-0FA1
Hose cooling ¹⁾	6SN1145-	–	–	–	–	–	1BB0.-0DA1	1BB0.-0EA1	1BB0.-0FA1

Infeed

Infeed type		Open-loop ²⁾	Open-loop ²⁾	Open-loop	Closed-loop	Closed-loop	Closed-loop	Closed-loop ³⁾	Closed-loop ³⁾
Rated output (S1)	kW (HP)	5 (6.5)	10 (13.5)	28 (38)	16 (22)	36 (49)	55 (75)	80 (109)	120 (160)
Infeed power (S6-40)	kW (HP)	6.5 (8.8)	13 (17.5)	36 (49)	21 (28.5)	47 (64)	71 (96.5)	104 (141)	156 (212)
Peak infeed power	kW (HP)	10 (13.6)	25 (34)	50 (68)	35 (47.6)	70 (95.2)	91 (124)	131 (178)	175 (238)

Mains regenerative feedback

Continuous feedback power	kW (HP)	–	–	–	16 (22)	36 (49)	55 (75)	80 (109)	120 (160)
Peak feedback power	kW (HP)	–	–	–	35 (47.6)	70 (95.2)	91 (124)	131 (178)	175 (238)
Continuous/peak performance of integrated pulsed resistor	kW	0.2/10	0.3/25	– ⁴⁾	–	–	–	–	–
DC link capacitance limit	μF	1200	6000	20000	6000	20000	20000	20000	20000
DC link capacitance (limit) utilization	μF	150	440	990	495	990	2145	2145	4290
Charging performance	μF	1050	5560	19010	5505	19010	17855	17855	15710

Supply data

Voltage (output)	V	3 AC 400 –10%/3 AC 415 ±10%/3 AC 480 +6% ^{3) 5)}							
Voltage (electronics)	V	3 AC 400 –10% to 3 AC 480 +6%							
Power supply	V	At DC link with DC 600/625/680 or parallel infeed, AC and DC connection							
Frequency	Hz	50 ... 60 ±10%							
Rated current (at 400 V)	A	9.4	18.2	48.8	27	60.5	92.5	134	202
Peak current	A	25	60	116	59	117.5	153	220	294
Max. conductor cross-section	mm ²	6	16	50	16	50	95	95	150
Output voltage	V	0 ... 490 ... 680 depending on the supply voltage level 0 ... 600/625/680 ⁵⁾							
Module width	mm (in)	50 (2)	100 (3.9)	200 (7.9)	100 (3.9)	200 (7.9)	300 (11.8)	300 (11.8)	300 (11.8)

1) Data valid for use of the specified external fan and fan boxes.

2) Housing is suitable for drive systems with internal and external cooling.

3) The 80/120 kW (109/160 HP) I/RF modules require an external control voltage for internal supply protection of 2 AC 360 ... 457 V at 50 Hz and 2 AC 400 ... 510 V at 60 Hz. For 50 Hz supplies, a matching transformer 4AM4096-0EM50-0AA0 is available for adapting supply voltages of 230 V/380 V ±10% to 415 V (max. 2 contactors).

4) External pulsed resistors can be connected.

5) For supply voltages of 3 AC 400 ... 415 V or 400 ... 480 V, the DC link voltage must be selected on the I/RF module via an internal coding switch.

SIMODRIVE converter system

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Infeed and infeed/regenerative feedback modules (continued)

Internal cooling	6SN1145-	–	1AA0.-0AA1	1AA0.-0CA0	1BA0.-0BA1	1BA0.-0CA1	1BA0.-0DA1	1BB0.-0EA1	1BB0.-0FA1
	6SN1146-	1AB0.-0AB1	–	–	–	–	–	–	–
External cooling ¹⁾	6SN1145-	–	1AA0.-0AA1	–	–	–	–	–	–
	6SN1146-	1AB0.-0AB1	–	1AA0.-0CA0	1BB0.-0BA1	1BB0.-0CA1	1BB0.-0DA1	1BB0.-0EA1	1BB0.-0FA1
Hose cooling ¹⁾	6SN1145-	–	–	–	–	–	1BB0.-0DA1	1BB0.-0EA1	1BB0.-0FA1

Cooling type

Cooling	Self-cooled ²⁾	Universal cooling, internal/external	Internal separate fan	Internal separate fan	Internal separate fan	Internal separate fan ⁵⁾	Built-on fan ³⁾ ⁵⁾	Built-on fan ³⁾ ⁵⁾
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Power loss

Internal cooling	W	270 ⁴⁾	450 ⁴⁾	250 ⁴⁾	320	585	745	1280 ³⁾	1950 ³⁾
External cooling	W	270 ⁴⁾ /–	119/331	90/160	50/270	50/535	115/630	190/1090	290/1660
Hose cooling internal/external	W	–	–	–	–	–	115/630	190/1090	290/1660
Efficiency η		0.985	0.985	0.985	0.97	0.975	0.977	0.977	0.978

Weights

Without integral components	kg (lb)	6.5 (14.3)	9.5 (21)	15.5 (34.2)	10.5 (23.2)	15.5 (34.2)	26 (57.3)	26 (57.3)	29 (64)
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Open-loop infeed modules are available for low ratings. These modules up to 10 kW (13.5 HP) contain the commutating reactors and a pulsed resistor that converts the braking energy of the drive modules into heat. With maximum utilization of the pulsed resistor (> 200 W), a warm air deflection plate must be used to prevent overheating of the modules mounted above.

1) Data valid for use of the specified external fan and fan boxes.

2) Housing is suitable for drive systems with internal and external cooling.

3) Built-on fan 6SN1162-0BA02-0AA2 is required.

4) Including the internal pulsed resistor portion.

5) External cooling = Fan enclosure and built-on fan or hose cooling package is necessary.

Power module in single-axis design

Internal cooling	6SN1123-1AA0.-	-0HA1	-0AA1	-0BA1	-0CA1	-0DA1
External cooling	6SN1124-1AA0.-	-0HA1	-0AA1	-0BA1	-0CA1	-0DA1
Hose cooling	6SN1123-1AA0.-	—	—	—	—	—
Cooling type		Natural cooling	Natural cooling	Forced cooling	Forced cooling	Forced cooling
For operating 1FT6/1FK7/1FN3 motors						
Power loss total/internal/external ²⁾	W	35/14/21	50/19/31	90/35/55	190/65/125	300/30/270
For operating 1PH motors and asynchronous low-voltage motors						
Power loss total/internal/external ²⁾	W	30/12/18	40/16/24	74/29/45	260/89/171	320/32/288
Connectable cross-section, max.	mm ²	6	6	6	6	16
Weight, approx.						
• Internal cooling	kg (lb)	6.5 (14.3)	6.5 (14.3)	6.5 (14.3)	7.5 (16.5)	9.5 (20.9)
• External cooling	kg (lb)	6.5 (14.3)	6.5 (14.3)	6.5 (14.3)	7.5 (16.5)	9.5 (20.9)

Power module in single-axis design (continued)

Internal cooling	6SN1123-1AA0.-	-0EA1	-0FA1	-0LA1	-0JA1	-0KA1
External cooling	6SN1124-1AA0.-	-0EA1	-0FA1	-0LA1	-0JA1	-0KA1
Hose cooling	6SN1123-1AA0.-	—	-0FA1	—	-0JA1	-0KA1
Cooling type		Forced cooling	Forced cooling	Forced cooling	Forced cooling	Forced cooling
For operating 1FT6/1FK7/1FN3 motors						
Power loss total/internal/external	W	645/25/620	730/90/640	460/25/435	1910/170/1130	1910/250/1660
For operating 1PH motors and asynchronous low-voltage motors						
Power loss total/internal/external ²⁾	W	685/30/655	850/100/750	460/19/441	1290/190/1100	2170/325/1845
Connectable cross-section, max.	mm ²	50	95	50	95	150
Weight, approx.						
• Internal cooling	kg (lb)	13 (28.7)	26 (57.3) ¹⁾	13 (28.7)	21 (46.3) ¹⁾	24 (52.9) ¹⁾
• External cooling	kg (lb)	13 (28.7)	26 (57.3) ¹⁾	13 (28.7)	21 (46.3)	24 (52.9)

Power module in two-axis design

Internal cooling	6SN1123-1AB0.-	-0HA0	-0AA0	-0BA0	-0CA0	
External cooling	6SN1124-1AB0.-	-0HA0	-0AA0	-0BA0	-0CA0	
Cooling type		Natural cooling	Forced cooling	Forced cooling	Forced cooling	
For operating 1FT6/1FK7/1FN3 motors						
Power loss total/internal/external ²⁾	W	70/27/43	100/38/62	180/69/111	380/130/250	
For operating 1PH motors and asynchronous low-voltage motors						
Power loss total/internal/external	W	76/28/48	118/42/76	226/74/152	538/184/354	
Connectable cross-section, max.	mm ²	6	6	6	6	
Weight, approx.						
• Internal cooling	kg (lb)	7 (15.4)	7 (15.4)	7 (15.4)	13.5 (29.8)	
• External cooling	kg (lb)	7 (15.4)	7 (15.4)	7 (15.4)	13.5 (29.8)	

Further information

If a power greater than 55 kW (75 HP) has to be transmitted through a power module of 50 mm (2 in), 100 mm (3.9 in) or 150 mm (5.9 in) in width, strengthened DC link rails must be used (see "Supplementary components").

Matching, preassembled power cables are available for connecting the motors (see "MOTION CONNECT Cables and Connections").

1) Without built-on or hose cooling components.

2) Total: Total power loss from the module

Internal: Power losses remaining in the control cabinet.

External: Power losses directly routed to the outside.

The data relate to the corresponding rated pulse frequencies of the inverter.

SIMODRIVE 611 universal and POSMO

Technical data

SIMODRIVE converter system

External pulsed resistor

		External pulsed resistor 0.3/25 kW (0.4/34 HP) (15 Ω)	External pulsed resistor PLUS 1.5/25 kW (2/34 HP) (15 Ω)
Pulsed resistor built-in for:		–	–
Can be used with:		OI module, 28 kW (38 HP)	OI module, 28 kW (38 HP)
P_{rated}	kW (HP)	0.3 (0.4)	1.5 (2)
P_{max}	kW (HP)	25 (34)	25 (34)
E_{max}	kWs	7.5	180
Degree of protection		IP20	IP20
Weight, approx.	kg (lb)	3.4 (7.5)	5.6 (12.3)
Dimensions (W x H x D)	mm (in)	83.5 x 280 x 54.5 (3.3 x 11 x 2.1)	193 x 410 x 240 (7.6 x 16.1 x 9.4)

HF/HFD commutating reactors, supply voltage 3 AC 400/480 V

Allocation to the infeed module	kW (HP)	28 (38) (OI)	16 (22) (I/RF)	36 (49) (I/RF)	55 (75) (I/RF)	80 (109) (I/RF)	120 (160) (I/RF)
Rated AC	A	65	30	67	103	150	225
Power loss	W	70	170	250	350	450	590
Max. conductor cross-section on primary/secondary side	mm ²	50	16	50	70	FL ¹⁾	FL ¹⁾
Weight, approx.	kg (lb)	6 (13.2)	8.5 (18.7)	13 (28.7)	18 (39.7)	40 (88.2)	50 (110.3)
Dimensions (W x H x D), approx.							
• HF commutating reactors	mm (in)	190 x 200 x 100 (7.5 x 7.8 x 3.9)	330 x 125 x 150 (13 x 4.9 x 5.9)	330 x 230 x 150 (13 x 9 x 5.9)	330 x 280 x 150 (13 x 11 x 5.9)	380 x 250 x 170 (15 x 9.8 x 6.7)	380 x 200 x 225 (15 x 7.9 x 8.9)
• HFD commutating reactors	mm (in)	–	–	330 x 243 x 150 (13 x 9.6 x 5.9)	380 x 283 x 170 (15 x 11.1 x 6.7)	380 x 200 x 225 (15 x 7.9 x 8.9)	On request
Supply voltage	V	3 AC 400 -10% to 3 AC 480 +6%					
Frequency	Hz	50/60 ±10%					
Degree of protection according to EN 60529 (IEC 60529)		IP00					
Humidity rating to EN 60721-3-3		Class 3K5 condensation and icing excluded. Low air temperature 0 °C (+32 °F).					
Permissible ambient temperature							
• Operation	°C (°F)	–25 ... +40 (–13 ... +104), up to +55 (+131) with derating					
• Storage/transport	°C (°F)	–25 ... +80 (–13 ... +176)					

1) FL = Flat-type terminal for ring terminal end, Ø 9 mm (0.35 in) hole.

Mains filters

Allocation to the infeed module	kW (HP)	5 (6.5) (OI) ³⁾	10 (13.5) (OI) ³⁾	28 (38) (OI) ³⁾	16 (22) (I/RF)	36 (49) (I/RF)	55 (75) (I/RF)	80 (109) (I/RF)	120 (160) (I/RF)
Rated AC	A	16	25	65	30	67	103	150	225
Power loss	W	20	20	25	70	90	110	150	200
Max. conductor cross-section	mm ²	4	10	50	10	50	50	95	FL ¹⁾
Connection of equipotential bonding (PE)		M6, stud	M6, stud	M10, stud	M5, stud	M8, stud	M8, stud	M8, stud	M10, stud
Weight, approx.	kg (lb)	3.8 (8.4)	5.7 (12.6)	12.5 (27.6)	9 (19.8)	16 (35.3)	19 (41.9)	22 (48.5)	32 (70.6)
Dimensions (W x H x D), approx.	mm (in)	156 x 193 x 81 (6.1 x 7.6 x 3.2)	156 x 281 x 91 (6.1 x 11.1 x 3.6)	171 x 261 x 141 (6.7 x 10.3 x 5.6)	130 x 480 x 149.5 (5.1 x 18.9 x 5.9)	130 x 480 x 244.5 (5.1 x 18.9 x 9.6)	130 x 480 x 279.5 (5.1 x 18.9 x 11)	200 x 480 x 279.5 (7.8 x 18.9 x 11)	300 x 480 x 279.5 (11.8 x 18.9 x 11)
Supply voltage	V	3 AC 400 V ±10% to 3 AC 480 V ±10% (TN supply) ²⁾							
Frequency	Hz	50/60 ±10%							
Degree of protection according to EN 60529 (IEC 60529)		IP20							
Humidity rating to EN 60721-3-3		Class 3K5 condensation and icing excluded. Low air temperature 0 °C (+32 °F).							
Permissible ambient temperature									
• Operation	°C (°F)	0 ... +40 (+32 ... +104); max. +55 (+131) at 0.6 x P _{rated} of the OI or I/RF module							
• Storage/transport	°C (°F)	-25 ... +70 (-13 ... +158)							
Installation altitude	m (ft)	1000 (3281), with derating up to 2000 (6563) above sea level							
Interference suppression to EN 55011		Limit class A for noise faults, for system configuration compatible to the Planning Guide. Limit class B for noise faults on request: E-mail: emv.labor@epcos.com							

Overvoltage limiter module

Maximum energy absorption	J	100
Weight, approx.	kg (lb)	0.3 (0.7)
Dimensions (W x H x D), approx.	mm (in)	70 x 76 x 32.5 (2.8 x 3 x 1.3)
Maximum module depth when plugged in	mm (in)	325 (12.8)

- With the overvoltage module, the infeed module has a maximum module depth of 325 mm (12.8 in) (when plugged in).
- For UL compliance, an overvoltage limiter module must be used.
- In the 5 kW (6.5 HP) OI module an appropriate protective circuit is integrated as standard.

Monitoring module

Rated supply voltage		3 AC 400 V -10% ... 480 V +6%; 50 ... 60 Hz ±10% or DC 490 ... 680 V
Power loss	W	70
Cooling type		Natural cooling
Weight, approx.	kg (lb)	5 (11)
Module width	mm (in)	50 (2)

Capacitor modules

Mounting		distributed		central	
Capacitance of capacitor bank	mF	2.8	4.1	4.1	20
Rated voltage V _{DC}	V	350 ... 750	350 ... 750	350 ... 750	350 ... 750
Storage capacity $w = \frac{1}{2} \times C \times V^2$ at 600 V	Ws	504	738	738	3215
Charging time up to:		like system supply	like system supply	like system supply	2 min
Discharging time down to 10% V _{DC} up to ⁴⁾	min	30	30	30	40
Ambient temperature range	°C (°F)	0 ... +55 (+32 ... +131)	0 ... +55 (+32 ... +131)	0 ... +55 (+32 ... +131)	0 ... +55 (+32 ... +131)
Weight, approx.	kg (lb)	5.3 (11.7)	5.8 (12.8)	7.5 (16.5)	21.5 (47.4)
Dimensions (W x H x D), approx.	mm (in)	100 x 334 x 231 (3.9 x 13.1 x 9.1)	100 x 334 x 231 (3.9 x 13.1 x 9.1)	100 x 480 x 211 (3.9 x 18.9 x 8.3)	300 x 480 x 211 (11.8 x 18.9 x 8.3)

- 1) FL = Flat-type terminal for ring terminal end, Ø 9 mm (0.35 in) hole.
- 2) The permissible supply voltage of the system depends on the infeed module used.

- 3) The mains filters for the OI modules are only suitable for a line voltage up to 415 V +10%.
- 4) In order to shorten the discharging times, it is recommendable to use a pulsed resistor module so that fast discharging can be carried out.

SIMODRIVE 611 universal and POSMO

Technical data

SIMODRIVE POSMO CD/CA

Type		SIMODRIVE POSMO CD		SIMODRIVE POSMO CA
Rated converter current I_{rated}	A	9	18	9
Maximum converter current $I_{max.}$	A	18	36	18
Rated converter power P_{rated}	kW (HP)	5 (6.5)	10 (13.5)	5 (6.5)
Supply voltage	V	DC 600 (400 ... 750)	DC 600 (400 ... 750)	3 AC 400 ... 480 ($\pm 10\%$)
Weight, approx.	kg (lb)	10 (22)	15 (33.1)	15 (33.1)
Motors which can be connected		1FT6, 1FK7, 1FN3, 1PH7, 1PH4		
Degree of protection to IEC 60034-5		IP65		
Cooling		Natural convection		
Ambient temperature	°C (°F)	0 ... +45 (+32 ... +113) (to +55 (+131) with derating 2% per Kelvin)		
Connectable motor measuring system		- Incremental sin/cos 1 V_{pp} - Absolute multi-turn with EnDat		
Direct measuring system		- Incremental sin/cos 1 V_{pp} - Absolute multi-turn with EnDat		
Connection system		- Power connector - PROFIBUS DP with M20 screwed cable gland (copper conductor) or ECOFAST connector - I/O signals with M12 connection system		
Communication		- PROFIBUS DP up to 12 Mbit/s 4 parameterizable I/O terminals (max. 3 inputs, max. 2 outputs)		

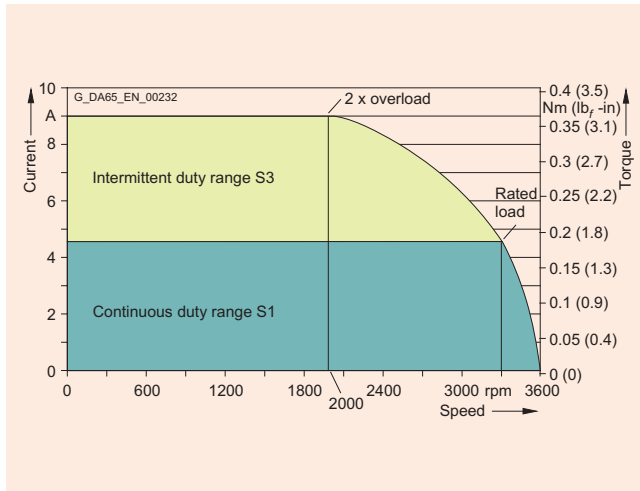
SIMODRIVE POSMO SI

Motor		Permanent magnet excited brushless 1FK6 servo motor				
Rated torque M_{rated} 100K	Nm (lb _f -in)	4 (35.4)	6 (53.1)	6.8 (60.2)	10.5 (92.9)	12 (106.2)
Static torque M_0 100K	Nm (lb _f -in)	6 (53.1)	11 (97.4)	8 (70.8)	16 (141.6)	18 (159.3)
Rotor moment of inertia J (without/with brake)	10 ⁻⁴ kgm ² (lb _f -in-s ²)	8.6/9.5 (0.0076/0.0084)	16.1/17.0 (0.0142/0.015)	15/18 (0.0133/0.0159)	27.3/30.3 (0.0242/0.2682)	55.3/63.2 (0.0489/0.0559)
Rated current I_N 100K	A	3.1	4.7	5.2	7.7	8.4
Motor line current I_0 100K	A	4.3	7.9	5.8	10.4	12.2
Calculated power P_{calc} 100K	kW (HP)	1.9 (2.5)	3.5 (4.7)	2.5 (3.4)	5 (6.5)	5.7 (7.6)
Weight (without/with brake)	kg (lb)	12/12.5 (26.5/27.6)	16.3/16.8 (35.9/37)	17.3/17.8 (38.1/39.2)	21/22.5 (46.3/49.6)	23.9/26.3 (52.7/58)
Type		IM B5 (IM V1, IM V3)				
Degree of protection to IEC 60034-5		IP64 (fan IP54)) option IP65, with DE flange IP67 (fan IP54)				
Cooling		Forced cooling				
Ambient temperature	°C (°F)	0 ... +45 (+32 ... +113) (to +55 (+131) with derating 2% per Kelvin)				
Supply/rated voltage	V	DC 400 ... 700/DC 600				
Rated speed	rpm	3000				
Encoder system		Single abs. encoder (sin/cos 1 V_{pp} ; absolute multiturn with EnDat 32 S/R; traversing range 4096 R)				
Connection system		- Power connector - PROFIBUS DP with M20 screwed cable gland (copper conductor) or ECOFAST connector - I/O signals with M12 connection system				
Shaft end, tolerance N		With fitted key and keyway/smooth shaft				
Holding brake		Option				
Gearbox		Optional with ratio of 5 or 10 (not for 6SN2500) Smooth shaft end is required				
Communication		- Motion Control with PROFIBUS DP up to 12 Mbit/s 4 parameterizable I/O terminals (max. 3 inputs, max. 2 outputs)				
Rotational accuracy, concentricity and linear movement according to DIN 42955 (IEC 60072-1)		Tolerance N (normal)				
Vibration severity in accordance with EN 60034-14 (IEC 60034-14)		Level N (normal)				
Sound pressure level max. acc. to EN ISO 1680		6SN2 46x: 65 dB (A) 6SN2 48x: 70 dB (A) 6SN2 50x: 70 dB (A)				

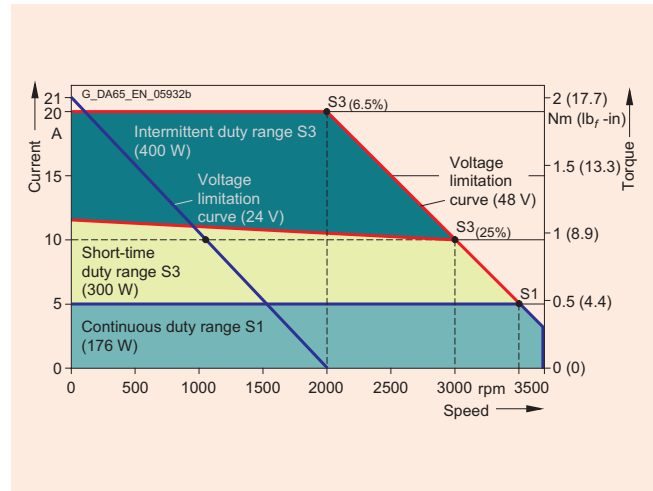
Motor	Permanent magnet excited brushless servo motor (brushless DC: BLDC)	
SIMODRIVE POSMO A	75 W (0.1 HP)	300 W (0.4 HP)
Supply voltage	DC 24 V $\pm 20\%$ Rated power and voltage are reduced if the power supply drops below 24 V.	DC 48 V $\pm 20\%$ At supply voltage < 48 V: • Lower speed • Lower torque
Degree of protection (to IEC 60035-5)	IP54, optional IP65 (SIPLUS) IP40 on the motor axis and the planetary gearing axis. The shaft must not run in an oil bath. Lubricate the axis with grease if applicable.	IP54, IP65
Cooling	Non-ventilated (natural convection)	
Overload • S3-25%, 60 s • Overload monitoring	2 x rated torque for 15 s within 60 s I^2t limitation in the converter	60 s within 4 min
Position encoder (integrated)	Incremental, resolution 816 inc/rev	Incremental, 4096 inc/rev
Rated motor speed	3300 rpm (S1); 2000 rpm (S3)	3600 rpm (S1); 3000 rpm (S3)
Rated motor torque	0.18 Nm (1.6 lb _f -in) (S1), 0.36 Nm (3.2 lb _f -in) (S3)	0.48 Nm (4.2 lb _f -in) (S1), 0.95 Nm (8.4 lb _f -in) (S3)
Rated motor current	4.5 A (S1); 9 A (S3)	5 A (S1); 10 A (S3 _{25%})
Motor efficiency	65%	75%
Motor moment of inertia	600 kgcm ² (0.531 lb _f -in-s ²)	630 kgcm ² (0.558 lb _f -in-s ²) (motor without brake) 670 kgcm ² (0.593 lb _f -in-s ²) (motor with brake)
Permissible ambient temperature (acc. to EN 60721, Part 3-3 Class 3K5) • Operation • Extended operation • Transport and storage	0 ... +45 °C (+32 ... +113 °F) ¹⁾ 0 ... +65 °C (+32 ... +149 °F) (with reduced continuous current) -40 ... +70 °C (-40 ... +158 °F) (acc. to EN 60721, Parts 3-1 and 3-2, Classes 2K4 and 1K4)	-20 ... +45 °C (-4 ... +113 °F) ¹⁾ -20 ... +65 °C (-4 ... +149 °F) (with reduced continuous current)
Installation altitude	1000 m (3282 ft) above sea level 1500 m (4922 ft) Derating factor 0.97 2000 m (6563 ft) Derating factor 0.94 3000 m (9845 ft) Derating factor 0.86 3500 m (11485 ft) Derating factor 0.82 4000 m (13126 ft) Derating factor 0.77	
Vibration load during operation (acc. to IEC 68-2-6, EN 60721, Parts 3-0 and 3-3, Class 3M6)	Frequency range 2 ... 9 Hz with constant excursion = 7 mm (0.3 in) Frequency range 9 ... 200 Hz with const. acceleration = 20 m/s ² (66 ft/s ²)	
Impact load during operation (acc. to EN 60721, Parts 3-0 and 3-3, Class 3M6) • Maximum acceleration • Shock duration	150 m/s ² (492 ft/s ²) 6 ms	
Vibration and shock load during transport	To EN 60721, Part 3-3, Class 2M2 (data apply to components in original packaging)	

1) The extended temperature range for outdoor operation increased from 0 ... +45 °C (+32 ... +113 °F) up to -20 ... +45 °C (-4 ... +113 °F) will be included in the series from February 2005.

Characteristics



Torque/speed characteristic for SIMODRIVE POSMO A 75 W



Torque/speed characteristic for SIMODRIVE POSMO A 300 W

DC Power Management Module (PMM)

For SIMODRIVE POSMO A type	75 W (0.1 HP)	300 W (0.4 HP)
Input voltage	DC 24 V	DC 48 V
Operational voltage range	DC 19.2 ... 28.8 V	DC 38.4 ... 57.6 V
Continuous energy consumption	10 Ws	15 Ws
Peak energy consumption	40 Ws	
Max. permissible continuous current via PMM	25 A at +40 °C (+104 °F) ambient temperature	
Overload monitoring	I^2t limit monitoring to protect the pulsed resistor	
Relay	Monostable with changeover contact	
Maximum relay switching voltage	DC 150 V/AC 125 V	
Maximum number of connectable positioning motors	The maximum permissible number of positioning motors that can be connected to a module is dependent on the load rating, the coincidence factor of the feedback and the feedback energy. ¹⁾	
Operating temperature	0 ... +55 °C (+32 ... +131 °F)	
Transport and storage temperature	-25 ... +85 °C (-13 ... +185 °F)	
Degree of protection to EN 60529 (IEC 60529)	IP20	
Weight, approx.	0.5 kg (1.1 lb)	
Dimensions (W x H x D), approx.	125 mm x 120 mm x 50 mm (4.9 in x 4.7 in x 2 in)	

1) The feedback energy is calculated for a drive as follows:

$$W = \frac{1}{2} \times J \times \omega^2$$

W: Braking energy [Ws = (kgm²/s²)]

J: Mass moment of inertia [kgm²]

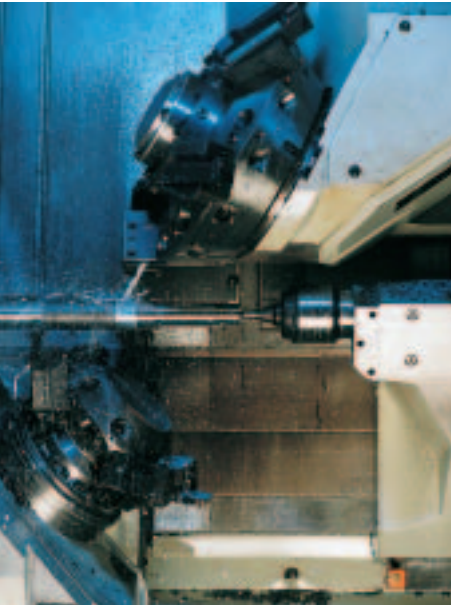
ω : Angular frequency ($2 \times \pi \times n$)/60
[1/s] with n [rpm]

Rectifier for SIMODRIVE POSMO A 300 W

Input voltage	3 AC 480/400 V $\pm$ 10%
Frequency	50 ... 60 Hz
Output voltage	DC 48 V
Output current	25 A
Output capacitance	20,000 μ F/100 V
Residual ripple	< 5%
Insulation class	T 40/B
Degree of protection	IP00
Protective class	I
Applicable specifications	EN 61558; EN 61131-2; EN 50082-2 (interference immunity); EN 50081-1 (emitted interference); acc. to EN 61000-3-2/-3-3 suitable for connection to public supply systems and industrial networks
Installation conditions	
• Mounting position	Upright
• Installation altitude up to	1000 m (3282 ft) above sea level
• Mounting	M6 screw mounting on angle bracket
• Location	Rooms with outdoor climate acc. to DIN 5001
• Ambient temperature	-25 ... +40 °C (-13 ... +104 °F)
• Storage temperature	-25 ... +60 °C (-13 ... +140 °F)
Dimensions (W x H x D), approx.	266 mm x 260 mm x 178 mm (10.5 in x 10.2 in x 7 in)

Selection and ordering data

3



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3/2	Infeed and infeed/regenerative feedback modules
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3/5	Overvoltage limiter module, monitoring module, pulsed resistor module, blanking cover, warm air deflection plate, external pulsed resistors
3/6	Capacitor module, 2-tier configuration, additional components
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SIMODRIVE 611 universal and POSMO

Selection and ordering data

SIMODRIVE converter system

Infeed and infeed/regenerative feedback modules

Open-loop with pulsed resistor	Closed-loop with regenerative feedback	Module width	Infeed module for internal cooling	Infeed module for external cooling ¹⁾	Mounting frame for control cabinet installation ²⁾	Infeed module for hose cooling
OI module	I/RF module					
Rated output (S1)	Rated output (S1)				For external cooling	(hose connection kit required)
kW (HP)	kW (HP)	mm (in)	Order No.	Order No.	Order No.	Order No.
5 (6.5)	–	50 (2)	6SN11 46-1AB00-0BA1	6SN11 46-1AB00-0BA1	6SN11 62-0BA04-0JA0	–
10 (13.5) ⁴⁾	–	100 (3.9)	6SN11 45-1AA01-0AA1	6SN11 45-1AA01-0AA1	6SN11 62-0BA04-0HA1	–
28 (38) ⁴⁾	–	200 (7.9)	6SN11 45-1AA00-0CA0	6SN11 46-1AB00-0CA0	6SN11 62-0BA04-0DA1	–
–	16 (22)	100 (3.9)	6SN11 45-1BA01-0BA1	6SN11 46-1BB01-0BA1	6SN11 62-0BA04-0BA1	–
–	36 (49)	200 (7.9)	6SN11 45-1BA02-0CA1	6SN11 46-1BB02-0CA1	6SN11 62-0BA04-0DA1	–
–	55 (75)	300 (11.8)	6SN11 45-1BA01-0DA1	6SN11 46-1BB00-0DA1	6SN11 62-0BA04-0EA0	6SN11 45-1BB00-0DA1
–	80 (109)	300 (11.8) ³⁾	6SN11 45-1BB00-0EA1	6SN11 46-1BB00-0EA1	6SN11 62-0BA04-0EA0	6SN11 45-1BB00-0EA1
–	120 (160)	300 (11.8) ³⁾	6SN11 45-1BB00-0FA1	6SN11 46-1BB00-0FA1	6SN11 62-0BA04-0EA0	6SN11 45-1BB00-0FA1

1) For external cooling, the fan box is part of the mounting frame package for 300 mm (11.8 in) modules. The associated 6SN1162-0BA02-0AA2 built-on fan must be ordered separately.

2) The mounting frames can be omitted if the required openings for the module heat sinks are made as specified in the Planning Guide in the cabinet's rear panel. The 6SN1162-0BA04-0EA0 mounting must be used with the 300 mm (11.8 in) modules.

3) For internal cooling, the 300 mm (11.8 in) modules require the 6SN1162-0BA02-0AA2 built-on fan.

4) It is recommended that the 100 mm (3.9 in) thermally conductive cover is used.

SIMODRIVE 611 universal and POSMO

Selection and ordering data

SIMODRIVE converter system

Power modules

Internal/external cooling

Module width	Feed drives with motors 1FT6/1FK7/ 1FN3	Main spindle drives with motors 1PH/asynchronous low-voltage motors	Power module for internal cooling	Power module for external cooling	Mounting frame for control cabinet installation ¹⁾ For external cooling
	Rated/peak current	Rated current/ current at S6-40%/peak current			
	$I_{S1}/\hat{I}$	$I_{S1}/I_{S6-40\%}/\hat{I}$			
mm (in)	A	A	Order No.	Order No.	Order No.

Single-axis power modules

50 (2)	3/6	3/3/3	6SN11 23-1AA00-0HA1	6SN11 24-1AA00-0HA1	6SN11 62-0BA04-0AA1
50 (2)	5/10	5/5/8	6SN11 23-1AA00-0AA1	6SN11 24-1AA00-0AA1	6SN11 62-0BA04-0AA1
50 (2)	9/18	8/10/16	6SN11 23-1AA00-0BA1	6SN11 24-1AA00-0BA1	6SN11 62-0BA04-0AA1
50 (2)	18/36	24/32/32	6SN11 23-1AA00-0CA1	6SN11 24-1AA00-0CA1	6SN11 62-0BA04-0FA1
100 (3.9)	28/56	30/40/51	6SN11 23-1AA00-0DA1	6SN11 24-1AA00-0DA1	6SN11 62-0BA04-0BA1
150 (5.9)	42/64	45/60/76	6SN11 23-1AA00-0LA1	6SN11 24-1AA00-0LA1	6SN11 62-0BA04-0CA1
150 (5.9)	56/112	60/80/102	6SN11 23-1AA00-0EA1	6SN11 24-1AA00-0EA1	6SN11 62-0BA04-0CA1
300 (11.8)	70/140	85/110/127	6SN11 23-1AA01-0FA1	6SN11 24-1AA01-0FA1 ²⁾	6SN11 62-0BA04-0EA0
300 (11.8)	100/100	120/150/193	6SN11 23-1AA00-0JA1 ²⁾	6SN11 24-1AA00-0JA1 ²⁾	6SN11 62-0BA04-0EA0
300 (11.8)	140/210	200/250/257	6SN11 23-1AA00-0KA1 ²⁾	6SN11 24-1AA00-0KA1 ²⁾	6SN11 62-0BA04-0EA0

Two-axis power modules

50 (2)	3/6	3/3/3	6SN11 23-1AB00-0HA1	6SN11 24-1AB00-0HA1	6SN11 62-0BA04-0AA1
50 (2)	5/10	5/5/8	6SN11 23-1AB00-0AA1	6SN11 24-1AB00-0AA1	6SN11 62-0BA04-0AA1
50 (2)	9/18	8/10/16	6SN11 23-1AB00-0BA1	6SN11 24-1AB00-0BA1	6SN11 62-0BA04-0AA1
100 (3.9)	18/36	24/32/32	6SN11 23-1AB00-0CA1	6SN11 24-1AB00-0CA1	6SN11 62-0BA04-0GA1

Hose cooling

Module width	Feed drives with motors 1FT6/1FK7/ 1FN3	Main spindle drives with motors 1PH/asynchronous low-voltage motors	Power module for hose cooling	Hose connection kit ³⁾
	Rated/peak current	Rated current/ current at S6-40%/peak current		
	$I_{S1}/\hat{I}$	$I_{S1}/I_{S6-40\%}/\hat{I}$		
mm (in)	A	A	Order No.	Order No.

Single-axis version

300 (11.8)	70/140	85/110/127	6SN11 23-1AA02-0FA1	6SN11 62-0BA03-0AA1
300 (11.8)	100/100	120/150/193	6SN11 23-1AA00-0JA1	6SN11 62-0BA03-0AA1
300 (11.8)	140/210	200/250/257	6SN11 23-1AA00-0KA1	6SN11 62-0BA03-0AA1

1) The mounting frame is not required if the cutouts required for the respective module are made in the cabinet wall in accordance with the SIMODRIVE 611 Planning Guide. A blanking plate (width 50 mm (2 in) can be supplied to cover the prepared opening. The above-mentioned mounting frame must be used for modules of 300 mm (11.8 in) width, see "Supplementary system components".

2) Built-on fan is required, see "Mechanical components".

3) A 2-tier installation is permissible for the 55 kW (75 HP) I/RF module in combination with the 85 A power module. A hose connection kit 6SN11 62-0BA03-0CA1 can be supplied for this purpose, see "Supplementary system components".

SIMODRIVE 611 universal and POSMO

Selection and ordering data

SIMODRIVE converter system

SIMODRIVE 611 universal HR control units

Designation	Order No.
SIMODRIVE 611 universal HR	
• Single-axis version Resolver, speed/torque setpoint	6SN11 18-0NJ01-0AA0
• Single-axis version Resolver, speed/torque setpoint, position- ing	6SN11 18-1NJ01-0AA0
• Two-axis version Resolver, speed/torque setpoint	6SN11 18-0NK01-0AA0
• Two-axis version Resolver, speed/torque setpoint, position- ing	6SN11 18-1NK01-0AA0
• Two-axis version Incremental encoder sin/cos 1 V_{pp} / absolute encoder, velocity, speed/torque setpoint	6SN11 18-0NH01-0AA0
• Two-axis version Incremental encoder sin/cos 1 V_{pp} / absolute encoder, velocity, speed/torque setpoint, position- ing	6SN11 18-1NH01-0AA0
Option module ¹⁾ Terminal expansion 8 digital inputs/8 digital outputs 24 V, max. 480 mA can be param- eterized	6SN11 14-0NA00-0AA0
Option module ¹⁾ PROFIBUS DP Standard slave for up to 2 axes (V1) for cyclic and acyclic data interchange up to 12 Mbit/s	6SN11 14-0NB00-0AA1
Option module ¹⁾ Motion Control with PROFIBUS DP Isochronous standard slave (V1 and V2) for up to 2 axes, for cyclic and acyclic data inter- change up to 12 Mbit/s	6SN11 14-0NB01-0AA0
SimoCom U/611 universal toolbox Parameterizing, start-up and test tool in English, German, French, Italian and Spanish on CD-ROM, all and most recent software ver- sions	6SN11 53-0NX20-0AG0
Start-up box Service aid for start-up complete with switches, analog setpoint source with potentiometers and digital setpoint display	9AK10 14-1AA00

ROBOX-CANopen interface

ROBOX has developed an interface module that can be used to connect the SIMODRIVE 611 universal HR (single or two-axis version), to a CANbus field bus with CANopen protocol.

Properties:

- Each CANopen module will interface the SIMODRIVE 611 universal HR, according to the CANopen profile for "drive and motion control device" (DSP402) and according to the specification for CANopen communication (DS301).
- Depending on the SIMODRIVE configuration, the CANopen interface module 1 or 2 can drive one or two axes; each axis is considered as a slave node of the net.
- The module is housed inside the SIMODRIVE 611 universal HR in the slot reserved for the option module; it is recognized by the SIMODRIVE 611 universal HR as a third-party module.
- Complete SIMODRIVE 611 universal HR parameter handling is available via SDO (Service Data Objects).
- The master and the SIMODRIVE 611 universal HR working frequencies are adapted to the PLL (Phase-Locked Loop) technique.
- The SIMODRIVE 611 universal HR requires software release 04.03 or 05.02.

CANopen profiles handling is as follows:

- "Torque Mode" (allows torque setpoint from CANopen)
- "Velocity Mode" (allows speed setpoint from CANopen).
- "Interpolated Position" and "Homing Mode". An interpolation algorithm allows 1 kHz reference position updating to the drive with a master sampling frequency ranging from 50 Hz to 500 Hz.

Further information

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1) Only one option module can be inserted.

SIMODRIVE 611 universal and POSMO

Selection and ordering data

SIMODRIVE converter system

3

Overvoltage limiter module

Designation	Order No.	Weight, approx. kg (lb)	Dimensions W x H x D mm (in)
Overvoltage limiter module For mains supply modules from 10 kW (13.5 HP) for SIMODRIVE 611	6SN11 11-0AB00-0AA0	0.3 (0.7)	70 x 76 x 32.5 (2.8 x 3 x 1.3)

Monitoring module

Designation	Order No.	Power loss	Rated supply voltage	Weight, approx. kg (lb)	Module width mm (in)
Monitoring module Complete with all termination and connection elements. Suitable for internal and external cooling.	6SN11 12-1AC01-0AA1	70 W	3 AC 400 V –10% ... 480 V +6% 50 Hz ... 60 Hz ±10% or DC 490 V ... 680 V	5 (11)	50 (2)

Pulsed resistor module

Designation	Order No.	Power loss	Rated supply voltage	Continuous rating/peak rating	Weight, approx. kg (lb)	Module width mm (in)
Pulsed resistor module Complete with all termination and connection elements	6SN11 13-1AB01-0BA1	Load dependent 15 W to max. 315 W	DC 600 V/ 625 V/680 V	• With internal pulsed resistor 0.3 kW/25 kW • With external pulsed resistor 1.5 kW/25 kW	5 (11)	50 (2)

Blanking cover

Designation	Order No.	Width mm (in)
Blanking cover For fixing the module and for closing the prepared opening in the case of drive versions with external cooling	6SN11 62-0BA04-0JA0	50 (2)

Warm air deflection plate

Designation	Order No.	Width mm (in)
Warm air deflection plate	6SN11 62-0BA01-0AA0	100 (3.9)

External pulsed resistors

Designation	Order No.	Degree of protection	Weight, approx. kg (lb)	Dimensions W x H x D mm (in)
External pulsed resistor Plus 1.5 kW/25 kW (15 Ω) including 5 m (16.4 ft) connecting cable	6SL31 00-1BE22-5AA0	IP20	5.6 (12.3)	193 x 410 x 240 (7.6 x 16.1 x 9.4)
External pulsed resistor 0.3 kW/25 kW (15 Ω), 28 kW for OI module only, including 3 m (9.8 ft) connecting cable	6SN11 13-1AA00-0DA0	IP20	3.4 (7.5)	83.5 x 280 x 54.5 (3.3 x 11 x 2.1)

SIMODRIVE 611 universal and POSMO

Selection and ordering data

SIMODRIVE converter system

Capacitor module

Designation		Order No.	Dimensions W x H x D mm (in)
Distributed capacitor modules Complete with all connecting and coupling elements	2.8 mF	6SN11 12-1AB00-1AA0	100 x 334 x 231 (3.9 x 13.1 x 9.1)
	4.1 mF	6SN11 12-1AB00-1BA0	100 x 334 x 231 (3.9 x 13.1 x 9.1)
Central capacitor modules Complete with all connection and coupling elements	4.1 mF	6SN11 12-1AB00-0BA0	100 x 480 x 211 (3.9 x 18.9 x 8.3)
	20 mF (with charging circuit)	6SN11 12-1AB00-0CA0	300 x 480 x 211 (11.8 x 18.9 x 8.3)

2-tier configuration

Designation		Order No.
Adapter terminals for DC link connection (for 2-tier configuration)	• Package of 2 double terminals 50 mm ² for module widths of 50 mm (2 in) to 200 mm (7.9 in)	6SN11 61-1AA01-0BA0
	• Package of 2 double terminals 95 mm ² for module widths of 300 mm (11.8 in)	6SN11 61-1AA01-0AA0
Device bus cable (for 2-tier configuration) with SIMODRIVE 611	Length: 1.5 m (4.9 ft)	6SN11 61-1AA00-0AA1

Additional components

Designation		Order No.	Grid pattern mm (in)
Shield connection	Packing unit: 10 units The shield contacting clips for the electronics cables can be mounted on the threaded bushes on the power and infeed modules above the control units.	6SN11 62-0FA00-0AA1	
	The plug-in terminals on the front panel of the modules can be coded by freely pluggable male coding elements on the pin side and corresponding female coding elements on the plug side (socket). The male and female coding elements are necessary only if the connectors are to be individually coded. The function of the plug-in terminals is not restricted if coding elements are not used.		
	Female coding elements for plug side (socket)	Quantity: 100 6FC9 348-7BA	5 (0.2)
	Male coding elements for pin side	Quantity: 100 6FC9 348-7BB	5 (0.2)
SVE signal amplifier electronics in IP65 housing		6SN11 15-0AA12-0AA0	
Interference suppressor filter for 24 V SSI encoder		6SN11 61-1DA00-0AA0	
Reinforced DC link busbars for 50 mm (2 in)/100 mm (3.9 in)/ 150 mm (5.9 in) module	Quantity: 10	6SN11 61-1AA02-6AA0	
Universal empty casing 50 mm (2 in) wide		6SN11 62-1AA00-0AA0	
Terminator for drive bus		6FX2 003-0DA00	
Adhesives: SIMODRIVE 611 warning labels	French/English, Spanish/English, Italian/English, Swedish/English, Finnish/English, Danish/English, Dutch/English, Portuguese/English, Greek/English, traditional Chinese/English, Korean/English, Japanese/English, Czech/English, Russian/English, Polish/English, Turkish/English	Quantity: 50 6SN11 62-8YY00-0AA0	
Device bus cable for adapting module configurations Length: 400 mm (15.7 in)		6SN11 61-1AA00-0BA0	
Device bus cable for 2-tier device configurations Length: 1.5 m (4.9 ft)		6SN11 61-1AA00-0AA1	

SIMODRIVE 611 universal and POSMO

Selection and ordering data

SIMODRIVE converter system

Mechanical components

Designation		Order No.	
Hose cooling packages ¹⁾	• Package 1 for single module comprising: 2 x module connection flange 2000 mm (78.7 in) hose 1 x cabinet connection flange 1 x radial fan with cabinet connection flange Supply voltage: 3 AC 360 ... 457 V, 47.5 ... 62.5 Hz Supply current: 1 ... 1.2 A	6SN11 62-0BA03-0AA1	Important: A 2-tier installation is permissible for the 55 kW (75 HP) I/RF module in combination with the 85 A power module. A hose connection kit 6SN11 62-0BA03-0CA1 can be supplied for this purpose.
	• Package 2 for 2-tier configuration of I/RF 55 kW (75 HP) and 85 A power module comprising: 4 x module connection flange 2000 mm (78.7 in) hose 1 x cabinet connection flange 1 x radial fan as in package 1	6SN11 62-0BA03-0CA1	

Designation		Order No.	Degree of protection	Supply voltage	Supply current
Built-on fan	Radial blower for internal and external cooling	6SN11 62-0BA02-0AA2	IP44	3 AC 360 ... 510 V, 45 ... 65 Hz	0.2 ... 0.3 A



Important:
A built-on fan 6SN11 62-0BA02-0AA2 is required for several 300 mm (11.8 in) modules for internal cooling (see power and infeed modules). In the case of external cooling, the fan box is part of the scope of supply of the mounting frame for the 300 mm (11.8 in) module width. The required 6SN11 62-0BA02-0AA2 built-on fan must be ordered separately.

Designation		Order No.	Module width mm (in)
Shield terminal plate	For 5 kW (6.5 HP) OI module, monitoring module and pulsed resistor module	6SN11 62-0EB00-0AA0	50 (2)
	For 10 kW (13.5 HP) OI module	6SN11 62-0EB00-0BA0	100 (3.9)
	For 28 kW (38 HP) OI module, I/RF module and power modules with:		
		• Internal cooling	
		6SN11 62-0EA00-0AA0	50 (2)
		6SN11 62-0EA00-0BA0	100 (3.9)
		6SN11 62-0EA00-0CA0	150 (5.9)
		6SN11 62-0EA00-0JA0	200 (7.8)
		6SN11 62-0EA00-0DA0	300 (11.8)
	• External cooling		
		6SN11 62-0EB00-0AA0	50 (2)
		6SN11 62-0EB00-0BA0	100 (3.9)
		6SN11 62-0EB00-0CA0	150 (5.9)
		6SN11 62-0EB00-0JA0	200 (7.8)
		6SN11 62-0EB00-0DA0	300 (11.8)
	For modules with hose cooling or internal cooling with built-on fan	6SN11 62-0EA00-0KA0	300 (11.8)

1) For replacement filter mats for AFF0 filter type, see <http://www.pfannenberger.com>.

SIMODRIVE 611 universal and POSMO

Selection and ordering data

SIMODRIVE converter system

Mains supply interfaces for voltage matching

Designation	Order No.
Matching transformers with separate windings for 50/60 Hz supplies	
• Input voltage 3 AC 575/500/480 V ±10%	
- 8.2 kVA ¹⁾	4AU36 95-0SB0-0CN2
- 15.7 kVA ¹⁾	4AU39 95-0SA3-0CN2
- 21 kVA	4BU43 95-0SA7-0C
- 47 kVA	4BU47 95-0SC3-0C
- 70 kVA	4BU55 95-0SA4-0C
- 104 kVA	4BU58 95-0SA6-0C
- 155 kVA	4BU60 95-0SA6-0C
• Input voltage 3 AC 440/415/400 V ±10%	
- 8.2 kVA ¹⁾	4AU36 95-0SB1-0CN2
- 15.7 kVA ¹⁾	4AU39 95-0SA4-0CN2
- 21 kVA	4BU43 95-0SA8-0C
- 47 kVA	4BU47 95-0SC4-0C
- 70 kVA	4BU55 95-0SA5-0C
- 104 kVA	4BU58 95-0SA7-0C
- 155 kVA	4BU60 95-0SA7-0C
• Input voltage 3 AC 240/220/200 V ±10%	
- 8.2 kVA ¹⁾	4AU36 95-0SB2-0CN2
- 15.7 kVA ¹⁾	4AU39 95-0SA5-0CN2
- 21 kVA	4BU43 95-0SB0-0C
- 47 kVA	4BU47 95-0SC5-0C
- 70 kVA	4BU55 95-0SA6-0C
- 104 kVA	4BU58 95-0SA8-0C
- 155 kVA	4BU60 95-0SA8-0C
• Degree of protection:	
- IP00	0
- IP20	8
- IP23 ²⁾	2

Designation	Order No.
Matching transformers in economy circuit for 50/60 Hz supplies	
• Input voltage 3 AC 480/440 V ±10%	
<u>Degree of protection IP00</u>	
- 21 kVA	4AP27 96-0EL40-2XA0
- 46.5 kVA	4AU36 96-0ER20-2XA0
- 70.3 kVA	4AU36 96-2NA00-2XA0
- 104 kVA	4AU39 96-0EQ80-2XA0
- 155 kVA	4BU43 95-0CB50-8B
<u>Degree of protection IP20</u>	
- 155 kVA	4BU43 95-0CB58-8B
<u>IP23 degree of protection</u>	
- 18.9 kVA	4AP27 96-0EL40-2XC0
- 42 kVA	4AU36 96-0ER20-2XC0
- 63.6 kVA	4AU36 96-2NA00-2XC0
- 93.6 kVA	4AU39 96-0EQ80-2XC0
- 140 kVA	4BU43 95-0CB52-8B
• Input voltage 3 AC 220 V ±10%	
<u>Degree of protection IP00</u>	
- 21 kVA	4AU36 96-0ER30-2XA0
- 46.5 kVA	4BU43 95-0CB60-8B
- 70.3 kVA	4BU45 95-0BD00-8B
- 104 kVA	4BU52 95-0AE40-8B
- 155 kVA	4BU54 95-1AA10-8B
<u>Degree of protection IP20</u>	
- 46.5 kVA	4BU43 95-0CB68-8B
- 70.3 kVA	4BU45 95-0BD08-8B
- 104 kVA	4BU52 95-0AE48-8B
- 155 kVA	4BU54 95-1AA18-8B
<u>IP23 degree of protection</u>	
- 18.9 kVA	4AU36 96-0ER30-2XC0
- 42 kVA	4BU43 95-0CB62-8B
- 63.3 kVA	4BU45 95-0BD02-8B
- 93.6 kVA	4BU52 95-0AE42-8B
- 140 kVA	4BU54 95-1AA12-8B

1) Not IP20 degree of protection.

2) 10% derating is required.

SIMODRIVE 611 universal and POSMO

Selection and ordering data

SIMODRIVE converter system

Supply components · HF/HFD commutating reactor, supply voltage 3 AC 400 ... 480 V

Allocation to infeed module	Order No.	Rated AC	Power loss	Max. conductor cross-section, primary/secondary side	Weight, approx.	Dimensions (W x H x D) approx.
kW (HP)		A	W	mm ²	kg (lb)	mm (in)
HF commutating reactor						
28 (38) (OI)	6SN11 11-1AA00-0CA0	65	70	50	6 (13.2)	190 x 200 x 100 (7.5 x 7.9 x 3.9)
16 (22) (I/RF)	6SN11 11-0AA00-0BA1	30	170	16	8.5 (18.7)	330 x 125 x 150 (13 x 4.9 x 5.9)
36 (49) (I/RF)	6SN11 11-0AA00-0CA1	67	250	50	13 (28.7)	330 x 230 x 150 (13 x 9.1 x 5.9)
55 (75) (I/RF)	6SN11 11-0AA00-0DA1	103	350	70	18 (39.7)	330 x 280 x 150 (13 x 11 x 5.9)
80 (109) (I/RF)	6SN11 11-0AA00-1EA0	150	450	FL ¹⁾	40 (88.2)	380 x 250 x 170 (15 x 9.8 x 6.7)
120 (160) (I/RF)	6SN11 11-0AA00-1FA0	225	590	FL ¹⁾	50 (110.3)	380 x 290 x 170 (15 x 11.4 x 6.7)
HFD commutating reactor						
36 (49) (I/RF)	6SL3 000-0DE23-6AA0	67	250	50	13 (28.7)	330 x 243 x 150 (13 x 9.6 x 5.9)
55 (75) (I/RF)	6SL3 000-0DE25-5AA0	103	350	70	18 (39.7)	380 x 283 x 170 (15 x 11.1 x 6.7)
80 (109) (I/RF)	6SL3 000-0DE28-0AA0	150	450	FL ¹⁾	40 (88.2)	380 x 200 x 170 (15 x 7.9 x 6.7)
120 (160) (I/RF)	6SL3 000-0DE31-2AA0	225	590	FL ¹⁾	50 (110.3)	490 x 240 x 170 (19.3 x 9.4 x 6.7)
HFD resistor						
IP51 degree of protection; connection cable 5 m (16.4 ft); for mounting on top of control cabinet						
0.8 (1.1)	6SL3 100-1BE21-3AA0		800		5 (11)	270 x 75 x 555 (10.6 x 3 x 21.9)

Supply components · Mains filters

Allocation to infeed module	Order No.	Rated AC	Supply voltage up to ... V ±10%	Power loss	Max. conductor cross-section, primary/secondary side	Connection of equipotential bonding (PE)	Weight, approx.	Dimensions (W x H x D) approx.
kW (HP)		A		W	mm ²		kg (lb)	mm (in)
5 (6.5) (OI)	6SN11 11-0AA01-1BA0	16	415	20	4	M6, bolt	3.8 (8.4)	156 x 193 x 81 (6.1 x 7.6 x 3.2)
10 (13.5) (OI)	6SN11 11-0AA01-1AA0	25	415	20	10	M6, bolt	5.7 (12.6)	156 x 281 x 91 (6.1 x 11.1 x 3.6)
28 (38) (OI)	6SN11 11-0AA01-1CA0	65	415	25	50	M10, bolt	12.5 (27.6)	171 x 261 x 141 (6.7 x 10.3 x 5.6)
16 (22) (I/RF)	6SL3 000-0BE21-6AA0	30	480	70	10	M5, bolt	9 (19.8)	130 x 480 x 149.5 (5.1 x 18.9 x 5.9)
36 (49) (I/RF)	6SL3 000-0BE23-6AA0	67	480	90	50	M8, bolt	16 (35.3)	130 x 480 x 244.5 (5.1 x 18.9 x 9.6)
55 (75) (I/RF)	6SL3 000-0BE25-5AA0	103	480	110	50	M8, bolt	19 (41.9)	130 x 480 x 279.5 (5.1 x 18.9 x 11)
80 (109) (I/RF)	6SL3 000-0BE28-0AA0	150	480	150	95	M8, bolt	22 (48.5)	200 x 480 x 279.5 (7.9 x 18.9 x 11)
120 (160) (I/RF)	6SL3 000-0BE31-2AA0	225	480	200	FL ¹⁾	M10, bolt	32 (70.6)	300 x 480 x 279.5 (11.8 x 18.9 x 11)

Accessories

Adapter sets are available for very compact installation. They enable mains filters and line reactors to be installed compactly one above the other in the control cabinet.

Module power output	Order No.
kW (HP)	Adapter set
16 (21.5)	6SL3 060-1FE21-6AA0
36 (48)	6SN1 162-0GA00-0CA0

1) FL = Flat-type terminal, drilled hole Ø 9 mm (0.35 in).

SIMODRIVE 611 universal and POSMO

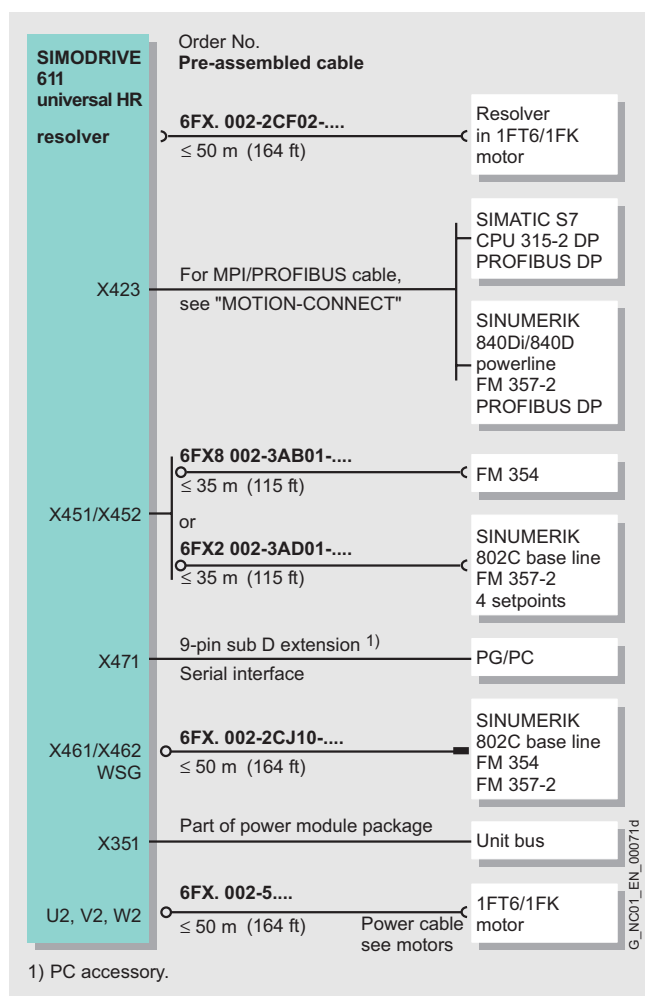
Selection and ordering data

SIMODRIVE converter system

Supply components · Mains filter package

Allocation to infeed module kW (HP)	Order No.	Comprising mains filter	Line reactor
HF mains filter package			
16 (22) (I/RF)	6SL3 000-0FE21-6AA0	6SL3 000-0BE21-6AA0	6SN11 11-0AA00-0BA1
36 (49) (I/RF)	6SL3 000-0FE23-6AA0	6SL3 000-0BE23-6AA0	6SN11 11-0AA00-0CA1
55 (75) (I/RF)	6SL3 000-0FE25-5AA0	6SL3 000-0BE25-5AA0	6SN11 11-0AA00-0DA1
80 (109) (I/RF)	6SL3 000-0FE28-0AA0	6SL3 000-0BE28-0AA0	6SN11 11-0AA00-1EA0
120 (160) (I/RF)	6SL3 000-0FE31-2AA0	6SL3 000-0BE31-2AA0	6SN11 11-0AA00-1FA0
HFD mains filter package			
36 (49) (I/RF)	6SL3 000-0FE23-6BA0	6SL3 000-0BE23-6AA0	6SL3 000-0DE23-6AA0
55 (75) (I/RF)	6SL3 000-0FE25-5BA0	6SL3 000-0BE25-5AA0	6SL3 000-0DE25-5AA0
80 (109) (I/RF)	6SL3 000-0FE28-0BA0	6SL3 000-0BE28-0AA0	6SL3 000-0DE28-0AA0
120 (160) (I/RF)	6SL3 000-0FE31-2BA0	6SL3 000-0BE31-2AA0	6SL3 000-0DE31-2AA0

Connection overview for SIMODRIVE 611 universal HR



Shield connection plates or the shield connection are required to attach the power cable shields as well as the electronics cables, e.g. incremental shaft-angle encoder.

Power and signal cables can be extended or prefabricated within the maximum permissible length. In such cases, the possible configuration should be selected from those shown in "MOTION-CONNECT Cables and Connectors".

If more than one additional intermediate connector is used in a signal cable, the maximum permissible cable length is reduced by 2 m (6.6 ft) for each connector.

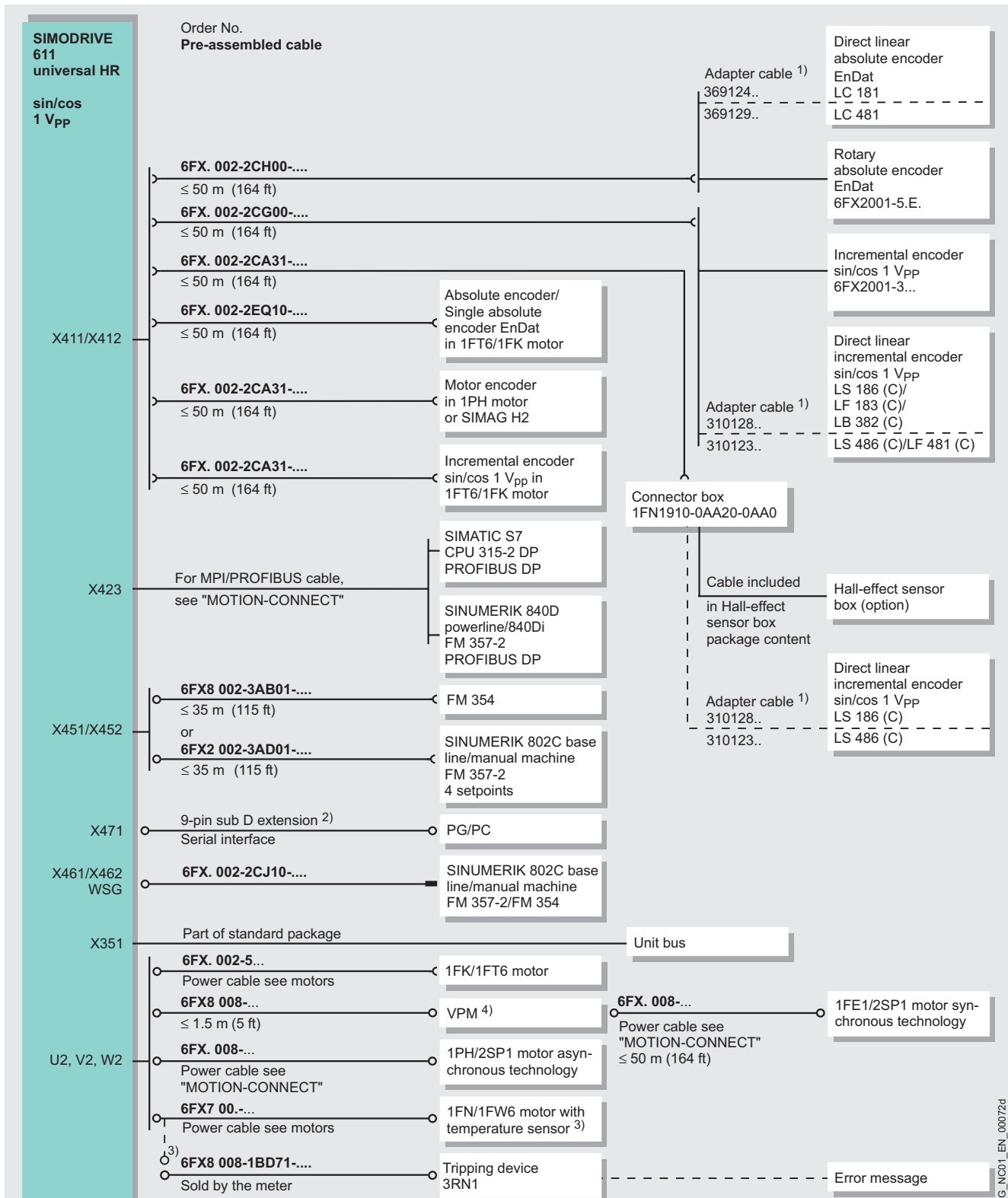
Connection overview for SIMODRIVE 611 universal HR, resolver

SIMODRIVE 611 universal and POSMO

Selection and ordering data

SIMODRIVE converter system

Connection overview for SIMODRIVE 611 universal HR (continued)



1) Cable can be ordered from the manufacturer of the linear scale.

2) PC accessory.

3) The cables for the temperature sensor are run in the power cable 6FX700-... and must be coupled out before the converter. The customer must make the connection.

4) Voltage Protection Module VPM is required for 1FE1/2SP1 motors (synchronous technology).

Connection overview for SIMODRIVE 611 universal HR, absolute encoder/basic absolute encoder EnDat and incremental encoder sin/cos 1 V_{pp}

SIMODRIVE 611 universal and POSMO

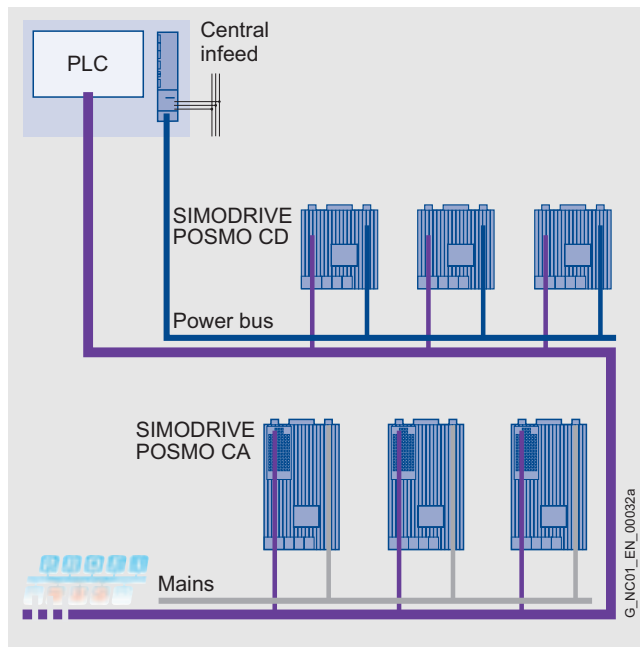
Selection and ordering data

SIMODRIVE POSMO CD/CA, SI

SIMODRIVE POSMO CD, SIMODRIVE POSMO CA

PROFIBUS DP

PROFIBUS DP makes high-speed data interchange possible with the higher-level master, such as a SIMATIC S7. Synchronized motion control with PROFIBUS DP V2 enables the interpolating operation of the SIMODRIVE POSMO CD/CA with a higher-level control such as a SINUMERIK 802D/SINUMERIK 840Di.



Distributed drive technology, structure with SIMODRIVE POSMO CD/CA

Variants	Supply data			Rated converter current	Distributed converter SIMODRIVE POSMO CD/CA natural convection Order No.	Maximum-converter current	Rated converter power	Converter output voltage	Weight, approx.
	V_{Supply}	Current consumption	Power consumption	I_{rated} (AC)		I_{max} (AC)	P_{rated} (AC)	V_{out}	m
	V	A	kW	A		A	kW (HP)	V	kg (lb)
SIMODRIVE POSMO CD	DC 600	8.7	5.2	9	6SN2 703-2A 0 0 -0BA1	18	5 (6.5)	3 AC 0 ... 430	10 (22)
	DC 600	17.2	10.3	18	6SN2 703-2A 0 0 -0CA1	36	10 (13.5)	3 AC 0 ... 430	15 (33)
SIMODRIVE POSMO CA ¹⁾	3 AC 400 ... 480 (±10%)	10.5	5.6	9	6SN2 703-3A 1 1 -0BA1	18	5 (6.5)	3 AC 0 ... 380/460 (±10%)	15 (33)

Power connector PROFIBUS DP

- with connector M20

- with ECOFAST connector

A

B

Standard

0

With direct measuring system

3

M12 connector, EMC filter

Designation	Order No.
M12 connector for I/O signals	6SN2 414-2RX00-0AA0
EMC filter with varistor for 24 V DC, 10 A (for 24 V cables in PROFIBUS, e.g. for standby electronics supply)	6SN2 414-2TX00-0AA1

¹⁾ For TT/IT systems, it is necessary to use an isolating transformer for basic insulation; the neutral point (connecting group yn) on the secondary side of the transformer has to be connected to the enclosure of the SIMODRIVE POSMO CD/CA.

SIMODRIVE 611 universal and POSMO

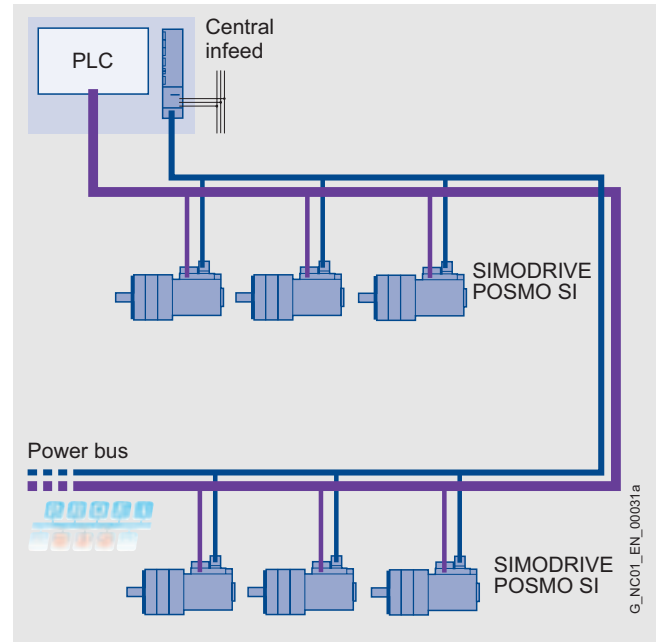
Selection and ordering data

SIMODRIVE POSMO CD/CA, SI

SIMODRIVE POSMO SI

PROFIBUS DP

PROFIBUS DP makes high-speed data interchange possible with the higher-level master, such as a SIMATIC S7. Synchronized motion control with PROFIBUS DP V2 enables the interpolating operation of the SIMODRIVE POSMO SI with a higher-level control such as a SINUMERIK 802D/SINUMERIK 840Di.



Distributed drive technology, structure with SIMODRIVE POSMO SI

Rated speed	Static torque		Rated torque	Distributed servo drive SIMODRIVE POSMO SI Forced ventilation	Rotor moment of inertia (without/with brake)	Weight (without/with brake)	Supply data			
n_{rated}	M_0 (60) at $\Delta T = 60$ K	M_0 (100) at $\Delta T = 100$ K	M_{rated} (100) at $\Delta T = 100$ K				Power consumption at 600 V DC supply		Current consumption at 600 V DC	
rpm	Nm (lb _f -in)	Nm (lb _f -in)	Nm (lb _f -in)		J 10 ⁻⁴ kgm ² (lb _f -in-s ²)	m kg (lb)	for M_{rated} (60)	for M_{rated} (100)	for M_{rated} (60)	for M_{rated} (100)
3000	5 (44.3)	6.0 (53.1)	4.0 (35.4)	6SN2 460-2CF 0- G ■	8.6/9.5 (0.0076/0.0084)	12.0/12.5 (26.5/27.6)	1.2	1.6	2.0	2.7
	9.1 (80.5)	11.0 (97.4)	6.0 (53.1)	6SN2 463-2CF 0- G ■	16.1/17.0 (0.0142/0.0150)	16.3/16.8 (35.9/37)	1.4	2.3	2.4	3.9
	6.6 (58.4)	8.0 (70.8)	6.8 (60.2)	6SN2 480-2CF 0- G ■	15.0/18.0 (0.0133/0.0159)	17.3/17.8 (38.1/39.2)	1.4	2.7	2.4	4.5
	13.3 (117.7)	16.0 (141.8)	10.5 (92.9)	6SN2 483-2CF 0- G ■	27.3/30.3 (0.0242/0.0268)	21.0/22.5 (46.3/49.6)	1.6	4.0	2.6	6.6
	15 (132.8)	18.0 (159.3)	12 (106.2)	6SN2 500-2CF 0- G ■	55.3/63.2 (0.0489/0.0559)	23.9/26.3 (52.7/58)	2.0	4.4	3.3	7.3

- Gearbox (only with plain shaft extension and IP64)

without

0

$i = 5$

1

$i = 10$ (not 6SN2500)

2

- Power connector PROFIBUS DP

with connector M20

0

with ECOFAST connector

1

- Shaft extension

with fitted key and keyway

A

with fitted key and keyway with holding brake

B

Plain

G

Plain with holding brake

H

- Degree of protection

IP64

0

IP65 and additional IP67 DE flange

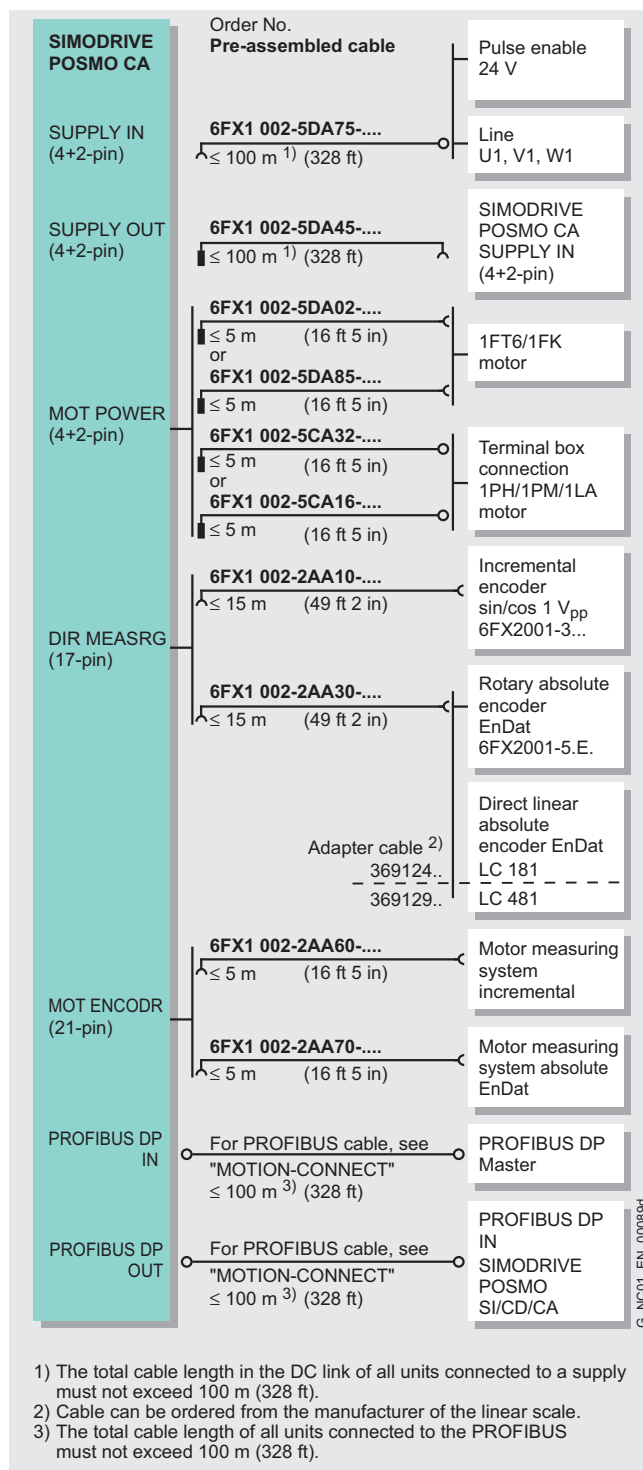
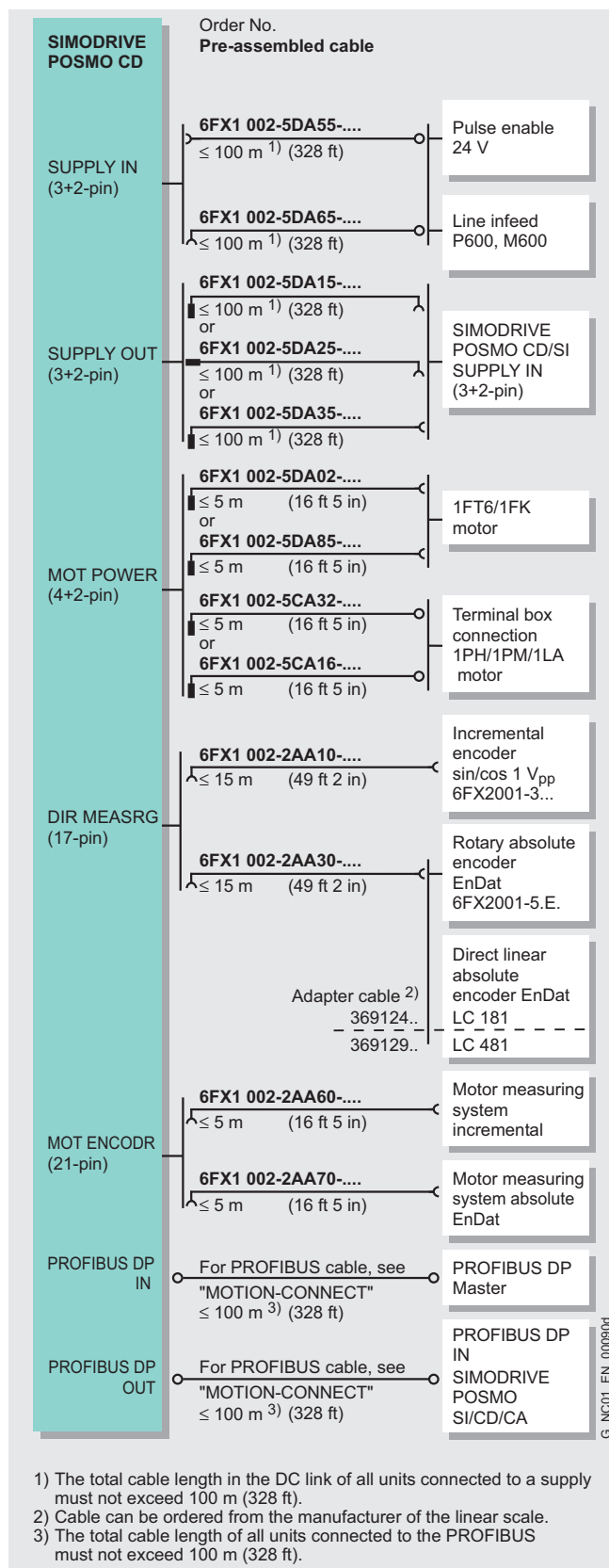
2

SIMODRIVE 611 universal and POSMO

Selection and ordering data

SIMODRIVE POSMO CD/CA, SI

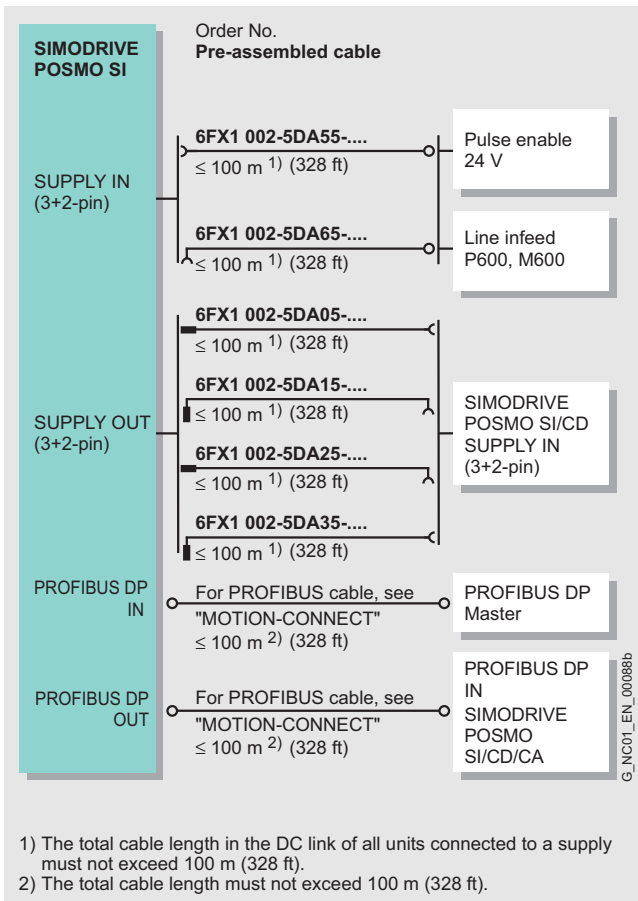
Connection overview for SIMODRIVE POSMO CD and CA



Connection overview for SIMODRIVE POSMO CA

Connection overview for SIMODRIVE POSMO CD

Connection overview for SIMODRIVE POSMO SI



Connection overview for SIMODRIVE POSMO SI

SIMODRIVE 611 universal and POSMO

Selection and ordering data

SIMODRIVE POSMO A positioning motor

SIMODRIVE POSMO A 75 W (0.1 HP)

Available torque at continuous operation	Speed	SIMODRIVE POSMO A 75 Watt Intelligent positioning motor	Gearbox type	Stage number	Ratio	Gearbox efficiency	Continuous gearbox torque ¹⁾	Gearbox overload torque ²⁾	Moment of inertia motor and gearbox, related to gearbox output	Weight, approx.
M_{S1}		Order No.					M_{S1}	$M_{S3-25\%}$	without brake	
Nm (lb _f -in)	rpm						Nm (lb _f -in)	Nm (lb _f -in)	10 ⁻³ kgm ² (lb _f -in-s ²)	kg (lb)

SIMODRIVE POSMO A 75 W, IP54 degree of protection

0.18 (1.6)	3300	6SN21 32-0AA11-1BA1	Without gearbox, plain shaft				–	0.36 (3.2)	0.060 ³⁾ (0.00053) ³⁾	3.1 (6.8)
0.7 (6.2)	733	6SN21 32-1BC11-1BA1	Planetary gearbox play 1°	1	4.5	0.85	1.2 (10.6)	1.4 (12.4)	1.23323 (0.01091)	3.5 (7.7)
1.2 (10.6)	413	6SN21 32-1BF11-1BA1		1	8	0.85	1.2 (10.6)	2.4 (21.2)	3.8976 (0.03449)	3.5 (7.7)
2.6 (23)	163	6SN21 32-1CK11-1BA1	Planetary gearbox play 1°	2	20.25	0.72	8.0 (70.8)	5.2 (46)	24.9728 (0.22100)	3.7 (8.2)
4.7 (41.6)	92	6SN21 32-1CR11-1BA1		2	36	0.72	8.0 (70.8)	9.3 (82.3)	78.9264 (0.69850)	3.7 (8.2)
6.5 (57.5)	66	6SN21 32-1CU11-1BA1		2	50	0.72	8.0 (70.8)	13.0 (115.1)	152.250 (1.34741)	3.7 (8.2)
13.9 (123)	26	6SN21 32-1DE11-1BA1	Planetary gearbox play 1.5°	3	126.56	0.61	24 (212.4)	27.8 (246.1)	975.5002 (8.63318)	3.9 (8.6)
17.8 (157.5)	20	6SN21 32-1DH11-1BA1		3	162	0.61	24 (212.4)	35.6 (315.1)	1598.2596 (14.14460)	3.6 (7.9)
0.6 (5.3)	660	6SN21 32-5KD11-1BA1	Worm gearbox play <1°	–	5	0.70	2.0 (17.7)	1.3 (11.5)	1.5375 (0.01361)	3.5 (7.7)
2.2 (19.5)	138	6SN21 32-5KM11-1BA1		–	24	0.50	3.5 (31)	4.3 (38.1)	35.424 (0.31350)	3.5 (7.7)
3.4 (30.1)	44	6SN21 32-5KW11-1BA1		–	75	0.25	4.0 (35.4)	6.8 (60.2)	345.9375 (3.06155)	3.5 (7.7)

SIMODRIVE POSMO A 75 W, SiPLUS, IP65 degree of protection

0.18 (1.6)	3300	6AG11 32-0AA11-5BA0	Without gearbox, plain shaft				–	0.36 (3.2)	0.060 ³⁾ (0.00053) ³⁾	3.1 (6.8)
0.7 (6.2)	733	6AG11 32-1BC11-5BA0	Planetary gearbox play 1°	1	4.5	0.85	1.2 (10.6)	1.4 (12.4)	1.23323 (0.01091)	3.5 (7.7)
1.2 (10.6)	413	6AG11 32-1BF11-5BA0		1	8	0.85	1.2 (10.6)	2.4 (21.2)	3.8976 (0.03449)	3.5 (7.7)
2.6 (23)	163	6AG11 32-1CK11-5BA0	Planetary gearbox play 1°	2	20.25	0.72	8.0 (70.8)	5.2 (46)	24.9728 (0.22100)	3.7 (8.2)
4.7 (41.6)	92	6AG11 32-1CR11-5BA0		2	36	0.72	8.0 (70.8)	9.3 (82.3)	78.9264 (0.69850)	3.7 (8.2)
6.5 (57.5)	66	6AG11 32-1CU11-5BA0		2	50	0.72	8.0 (70.8)	13.0 (115.1)	152.250 (1.34741)	3.7 (8.2)
13.9 (123)	26	6AG11 32-1DE11-5BA0	Planetary gearbox play 1.5°	3	126.56	0.61	24 (212.4)	27.8 (246.1)	975.5002 (8.63318)	3.9 (8.6)
17.8 (157.5)	20	6AG11 32-1DH11-5BA0		3	162	0.61	24 (212.4)	35.6 (315.1)	1598.2596 (14.14460)	3.6 (7.9)
0.6 (5.3)	660	6AG11 32-5KD11-5BA0	Worm gearbox play <1°	–	5	0.70	2.0 (17.7)	1.3 (11.5)	1.5375 (0.01361)	3.5 (7.7)
2.2 (19.5)	138	6AG11 32-5KM11-5BA0		–	24	0.50	3.5 (31)	4.3 (38.1)	35.424 (0.31350)	3.5 (7.7)
3.4 (30.1)	44	6AG11 32-5KW11-5BA0		–	75	0.25	4.0 (35.4)	6.8 (60.2)	345.9375 (3.06155)	3.5 (7.7)

1) Permissible short-term gear torque, e.g.: overloading by a factor of 2 on starting.

2) S3-25%: ON period 15 s, operation 1 min, i.e. 15 s traversing, 45 s pause.

3) Moment of inertia motor, related to motor output.

SIMODRIVE 611 universal and POSMO

Selection and ordering data

SIMODRIVE POSMO A positioning motor

SIMODRIVE POSMO A 300 W (0.4 HP)

Available torque at continuous operation M_{S1}	Speed	SIMODRIVE POSMO A 300 Watt Intelligent positioning motor Order No.	Planetary gearbox (replaceable)	Stage number	Ratio	Gearbox efficiency	Permissible continuous gearbox torque M_{S1}	Max. available overload torque ¹⁾			Moment of inertia motor and gearbox, related to gearbox output without/ with motor brake 10^{-3} kgm ² (lb _f -in-s ²)	Weight, approx. without/ with brake kg (lb)
Nm (lb _f -in)	rpm						Nm (lb _f -in)	Nm (lb _f -in)	Nm (lb _f -in)			
0.48 (4.2)	3500	6SN21 55-0AA -1BA1	Without gearbox, shaft with fitted key				–	0.95 (8.4)	1.9 (16.8)		0.058 ²⁾ /0.065 ²⁾ (0.00051/0.00058)	3.9/4.0 (8.6/8.8)
		6SN21 55-1AA -1BA1	Without gearbox, plain shaft				–					
1.7 (15)	875	6SN21 55-2BD -1BA1	Play 0.25°	1	4	0.90	26 (230.1)	3.4 (30.1)	6.8 (60.2)		1.424/1.536 (0.0126/0.0136)	5.1/5.2 (11.2/11.5)
3.0 (26.6)	500	6SN21 55-2BF -1BA1		1	7	0.90	26 (230.1)	6.0 (53.1)	12.0 (106.2)		4.268/4.611 (0.0378/0.0408)	5.1/5.2 (11.2/11.5)
4.9 (43.4)	292	6SN21 55-2CH -1BA1	Play 0.33°	2	12	0.85	36 (318.6)	9.7 (85.8)	19.4 (171.7)		13.018/14.026 (0.1152/0.1241)	5.4/5.5 (11.9/12.1)
8.2 (72.6)	175	6SN21 55-2CK -1BA1		2	20	0.85	42 (371.7)	16.2 (143.4)	32.3 (285.9)		35.48/38.28 (0.3140/0.3388)	5.4/5.5 (11.9/12.1)
14.3 (126.6)	100	6SN21 55-2CM -1BA1		2	35	0.85	44 (389.4)	28.3 (250.5)	55.0 (486.8)		107.065/115.640 (0.9475/1.0234)	5.4/5.5 (11.9/12.1)
20.0 (177)	71	6SN21 55-2CP -1BA1		2	49	0.85	44 (389.4)	39.6 (350.5)	55.0 (486.8)		209.847/226.654 (1.8571/2.0059)	5.4/5.5 (11.9/12.1)
46.1 (408)	29	6SN21 55-2DU 1 -1BA1	Play 0.42°	3	120	0.80	100 (885)	91.2 (807.1)	125 (1106.3)		1856.16/1956.96 (16.427/17.319)	8.2/8.3 (18.1/18.3)

Degree of protection IP54

1

Degree of protection IP65

2

without holding brake

0

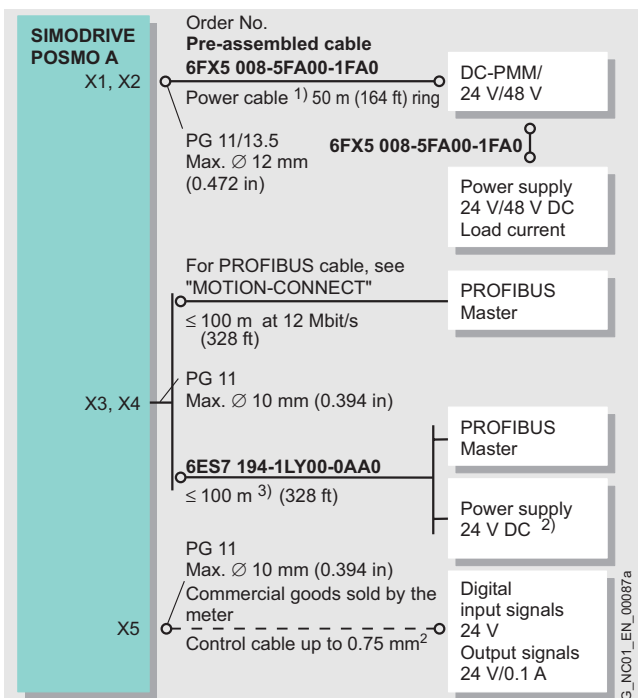
with holding brake

1

1) S3-6.25%: ON period 15 s, operation 4 min;
S3-25%: ON time 60 s, operation 4 min.

2) Moment of inertia motor, related to motor output.

Connection overview for SIMODRIVE POSMO A



1) Length depends on permissible voltage drop at max. operating current.

2) Required when electronics have separate power supply.

3) The total cable length in the DC link of all units connected to a supply must not exceed 100 m (328 ft).

SIMODRIVE 611 universal and POSMO

Selection and ordering data

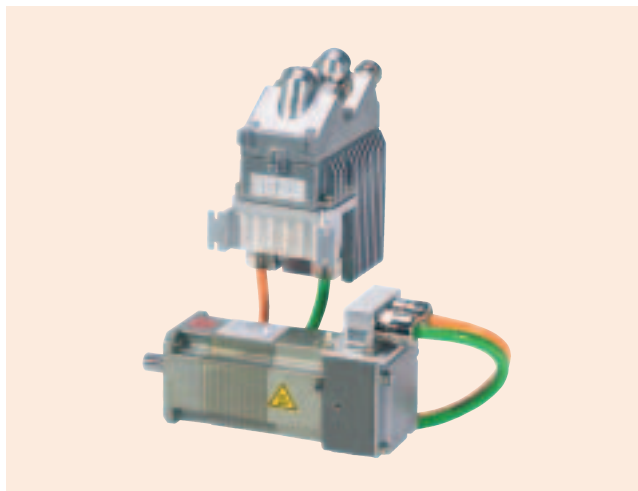
SIMODRIVE POSMO A positioning motor

Separate variant extension set for SIMODRIVE POSMO A 300 W (0.4 HP)

When space is at a premium, it is possible to separate the motor from the drive unit. The separate variant extension kit for POSMO A 300 W enables the drive unit to be installed at a distance.

The power and signal cables will be supplied preassembled as the separate variant extension kit (available soon).

Designation	Length	Order No.
Extension set	1 m (3.3 ft)	6FX8 002-6AA00-1AB0
Outgoing direction, drive end	3 m (9.8 ft)	6FX8 002-6AA00-1AD0
	5 m (16.4 ft)	6FX8 002-6AA00-1AF0
Outgoing direction, non-drive end	1 m (3.3 ft)	6FX8 002-6AA10-1AB0
	3 m (9.8 ft)	6FX8 002-6AA10-1AD0
	5 m (16.4 ft)	6FX8 002-6AA10-1AF0



POSMO A 300 W, power section separate from the drive unit

DC PMM Power Management Module 24V/48 V

For operating SIMODRIVE POSMO A on regulated power supplies with an output voltage of 24 V DC or 48 V DC, e.g. SITOP power.

The DC PMM/24 V/48 V is required when one or more SIMODRIVE POSMO A units feed back so much energy through simultaneous braking that it results in an impermissible voltage overshoot on the infeed side (e.g. due to high coincidence factor).

The module is installed between the load power supply and the first SIMODRIVE POSMO A, and converts the recovered energy into heat.

Function

- Feedback protection for the load power supply
In case of overvoltage, the PMM recognizes the braking operation of the positioning motor and converts the recovered energy from the motor into heat via an internal pulsed resistor.
- An integrated I^2t monitoring protects the pulsed resistor from thermal overload and destruction.
- Diagnostics message/display
 - Contact assemblies (changeover contact) on the PMM serve as signaling or monitoring contacts for the operating states "Ready" and "Fault"
 - The operating states are displayed via LED.



Power Management Module

Designation	Order No.
DC Power Management Module DC PMM/24 V (10 Ws)	9AL2 137-1AA00-1AA0
DC Power Management Module DC PMM/48 V (15 Ws)	9AL2 137-1BA00-1AA0
DC Power Management Module Extension (PMME) for POSMO A 300 W for additional reduction of the feedback energy DC PMME/48 V (30 Ws)	9AL2 137-2BA00-1AA0

SIMODRIVE 611 universal and POSMO

Selection and ordering data

Power supplies SITOP power

SITOP power

The SITOP range of 24 V power supplies has been optimized for industrial applications and operates on the switched-mode principle. Due to the precisely regulated output voltage, the devices are even suitable for the connection of sensitive sensors. Different versions are available depending on the output current and field of application. To protect against longer power failures, the 15 A and 40 A DC UPS modules are available with external battery backup.

Benefits

- Precise output voltage
- Low residual ripple
- Large input voltage range
- High utilization factor
- Easy assembly

- Integrated electronic short-circuit protection
- Secure electric isolation (SELV compliant with 60950)
- Compliance with national and international standards, e.g. EMC compliant with EN 50081-1/-2 and EN 50082-1/-2; UL/cUL Approval
- No silicone release

More information

Additional information is available on the Internet at



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

	Design	Input Rated voltage $V_{e \text{ rated}}$	Output Rated voltage $V_{a \text{ rated}}$	Rated current $I_{a \text{ rated}}$	Order No.
	24 V DC/2 A; 5 A; 10 A; 20 A single-phase  				
	2 A	120 V/230 V AC (93 ... 132 V/ 187 ... 264 V AC)	24 V DC $\pm 3\%$	2 A	6EP1 331-2BA00
	5 A	120 V/230 V AC (93 ... 132 V/ 187 ... 264 V AC)	24 V DC $\pm 3\%$	5 A	6EP1 333-2BA00
	10 A	120 V/230 V AC (85 ... 132 V/ 187 ... 264 V AC)	24 V DC $\pm 3\%$	10 A	6EP1 334-2BA00
	20 A	120 V/230 V AC (93 ... 132 V/ 187 ... 264 V AC)	24 V DC $\pm 3\%$	20 A	6EP1 336-2BA00
	24 V DC/5 A; 10 A single-phase, flat design  				
	5 A	120 V/230 V AC (85 ... 132 V/ 170 ... 264 V AC)	24 V DC $\pm 1\%$	5 A	6EP1 333-1AL12
	10 A	120 V/230 V AC (85 ... 132 V/ 170 ... 264 V AC)	24 V DC $\pm 1\%$	10 A	6EP1 334-1AL12
	24 V DC/20 A 2-phase   for industrial power systems in Canada and USA				
	20 A	400 ... 600 V AC (420 ... 682 V AC)	24 V DC $\pm 3\%$	20 A	6EP1 536-2AA00

SIMODRIVE 611 universal and POSMO

Selection and ordering data

Power supplies SITOP power

SITOP power (continued)

Modular power supply units with additional modules

The modular concept is based on basic power supply units in compact design with outputs from 24 V/5 A ... 24 V/40 A, with

- Standard rail mounting
- 5 A and 10 A units with single-phase and 2-phase connection (L1 and N, L1 and L2)
- Adjustable output voltage up to 28.8 V
- 3 x LED status display
- Selectable short-circuit response, constant current or disconnection with saving
- Switchover for parallel operation
- 20 A and 40 A units with single-phase or 3-phase connection

Power supply units

- Radio interference level Class B
- Input current harmonics limitation acc. to EN 61000-3-2

Two add-on modules offer supplementary functions.

The signaling module can be snapped onto the side of the basic unit; complete with isolated signaling contacts "Output voltage OK" and "Ready"; with signal input for remote On/Off switching of basic unit.

The backup module bridges line interruptions in the ms range. 100 ms at 40 A, 800 ms at 5 A, up to 3 s at minimal load current; standard rail mounting at any location in the control cabinet.

Power supply units and add-on modules

- Ambient temperature 0 ... +60 °C (+32 ... +140 °F)

	Design	Input Rated voltage V_e rated	Output Rated voltage V_a rated	Rated current I_a rated	Order No.
24 V power supply					
	5 A	120/230 ... 500 V AC (85 ... 132 V/ 176 ... 550 V AC)	24 V DC ±3%	5 A	6EP1 333-3BA00
	10 A	120/230 ... 500 V AC (85 ... 132 V/ 176 ... 550 V AC)	24 V DC ±3%	10 A	6EP1 334-3BA00
	20 A	120/230 V AC (85 ... 132 V/ 176 ... 264 V AC)	24 V DC ±3%	20 A	6EP1 336-3BA00
	20 A	3-phase AC 400 ... 500 V (320 ... 550 V AC)	24 V DC ±3%	20 A	6EP1 436-3BA00
	40 A	120/230 V AC (85 ... 132 V/ 176 ... 264 V AC)	24 V DC ±3%	40 A	6EP1 337-3BA00
	40 A	3-phase AC 400 ... 500 V (320 ... 550 V AC)	24 V DC ±3%	40 A	6EP1 437-3BA00
48 V power supply					
	20 A	3-phase AC 400 ... 500 V (320 ... 550 V AC) wide-range input	48 V DC ±3%	20 A	6EP1 457-3BA00
Add-on modules					
	Signaling module				6EP1 961-3BA10
	Backup module	24 V DC	24 V DC	40 A	6EP1 961-3BA00

SIMODRIVE 611 universal and POSMO

Selection and ordering data

Power supplies SITOP power

SITOP power (continued)

By combining the DC UPS module with at least one battery module and a SITOP power supply, long power failures can be bridged without any interruption of supply.

DC UPS modules

- Radio interference level Class B
- Ambient temperature 0 ... +60 °C (+32 ... +140 °F)

Battery modules

- 2.5 Ah: -40 ... +60 °C (-40 ... +140 °F)
- 3.2 ... 12 Ah: +5 ... +40 °C (+41 ... +104 °F)

	Design	Input Rated voltage $V_{e \text{ rated}}$	Output Rated voltage $V_{a \text{ rated}}$	Rated current $I_{a \text{ rated}}$	Order No.
	DC UPS modules DC 24 V (UL cUL)				
	15 A	24 V DC (22 ... 27.5 V DC)	24 V DC (mains operation: 22 ... 27.5 V, battery operation: 27.0 ... 18.5 V)	15 A	6EP1 931-2EC01
	15 A	24 V DC with RS 232 interface	24 V DC (mains operation: 22 ... 27.5 V, battery operation: 27.0 ... 18.5 V)	15 A	6EP1 931-2EC11
	40 A	24 V DC (23.5 ... 26 V DC)	24 V DC (mains operation: 23.5 ... 26 V, battery operation: 27.3 ... 18.5 V)	40 A	6EP1 931-2FC01

	Design	Charging voltage at +25 °C (+77 °F) V_{charge}	Output Rated voltage $V_{a \text{ rated}}$	Order No.
	Battery modules 15 A for DC UPS modules			
	2.5 Ah/ high-temperature rechargeable bat- tery	27.7 V DC	24 V DC (end of charge: 27.7 V, exhaustive discharge protection: 18.5 V)	6EP1 935-6MD31
	3.2 Ah	27.0 V DC	24 V DC (end of charge: 27.0 V, exhaustive discharge protection: 18.5 V)	6EP1 935-6MD11
	Battery modules 15 A and 40 A for DC UPS modules			
	7 Ah	27.0 V DC	24 V DC (end of charge: 27.0 V, exhaustive discharge protection: 18.5 V)	6EP1 935-6ME21
	12 Ah	27.0 V DC	24 V DC (end of charge: 27.0 V, exhaustive discharge protection: 18.5 V)	6EP1 935-6MF01

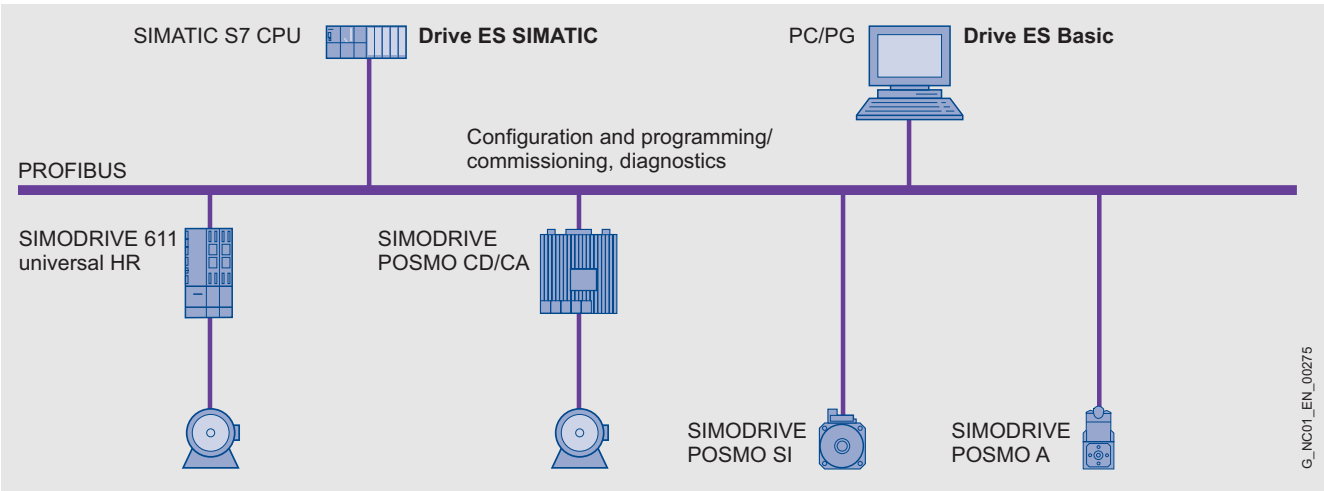
	Input voltage 3 AC V	Frequency Hz	Output Output voltage DC V	Output current DC A	Order No.
	Rectifier unit				
	480/400 +6%/-10%	50 ... 60	48	25	4AV35 96-0EG30-0C

SIMODRIVE 611 universal and POSMO

Selection and ordering data

Software

Engineering package Drive ES



Integration of SIMODRIVE 611 universal and SIMODRIVE POSMO in SIMATIC S7 with Drive ES

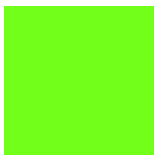
Designation	Order No.
Drive ES Basic V 5.3 ¹⁾ Configuration software for the integration of drives into Totally Integrated Automation Requirements: STEP 7 V 5.1 and higher, SP 3 on CD-ROM Languages: English, German, French, Italian, Spanish with electronic documentation	
• Single license	6SW1 700-5JA00-3AA0
• Copy license, 60 units	6SW1 700-5JA00-3AA1
• Update service for single-user license	6SW1 700-0JA00-0AB2
• Update service for multi-user license	6SW1 700-0JA00-1AB2
• Upgrade from V 5.x to V 5.3	6SW1 700-5JA00-3AA4

Designation	Order No.
Drive ES SIMATIC V 5.3 Function block library for SIMATIC for parameterizing communication with the drives Requirements: STEP 7 V 5.1 and higher, SP 3 on CD-ROM Languages: English, German, French, Italian, Spanish with electronic documentation	
• Single license including 1 runtime license	6SW1 700-5JC00-3AA0
• Runtime license ²⁾	6SW1 700-5JC00-1AC0
• Update service for single-user license	6SW1 700-0JC00-0AB2
• Upgrade from V 5.x to V 5.3	6SW1 700-5JC00-3AA4

1) Drive ES Basic can also be installed stand-alone without STEP 7.

2) Product license only (without software and documentation).

Synchronous motors



4/2	Introduction
4/3	1FT6 motors
4/4	Core type, natural cooling
4/6	Standard type, natural cooling
4/16	Standard type, forced ventilation
4/20	Standard type, water cooling
4/22	1FK7 motors
4/24	Compact core type, natural cooling
4/26	High Dynamic core type, natural cooling
4/28	Gearboxes
4/28	Planetary gearboxes for 1FT6 motors
4/31	Planetary gearboxes for 1FK7 motors
4/34	Cycloid gearbox for 1FT6/1FK7 motors
4/36	1FN linear motors
4/38	1FN3 standard type, water cooling
4/42	Hall sensor box
4/42	Connector box
4/43	Measuring systems
4/43	Liquid cooling
4/44	Selection guide
4/44	Type
4/44	Degree of protection

Note:

For products approved for Canada and USA, see "Appendix".

Synchronous motors

Servo motors for SIMODRIVE 611

Introduction

Overview

	1FT6	1FK7 CT Compact 1FK7 HD High Dynamic	1FN3 linear motors
Speed	1500 ... 6000 rpm	3000 ... 6000 rpm	58 ... 836 m/min (190.3 ... 2743.3 ft/min) ¹⁾
Standstill torque M_0	0.4 ... 175 Nm (3.5 ... 1548.8 lb _f -in)	0.85 ... 48 Nm (7.5 ... 424.8 lb _f -in) (1FK7 CT) 1.3 ... 22 Nm (11.5 ... 194.7 lb _f -in) (1FK7 HD)	–
Rated force F_{rated}	–	–	200 ... 8100 N (45 ... 1821 lb _f)
Overload capability up to max.	4 x M_0	3 x M_0	2.75 x F_{rated}
Encoder system	• Incremental encoder sin/cos 1 V_{pp} • Absolute encoder with EnDat interface • Resolver		Linear scale (enclosed or open) • Incremental encoder sin/cos 1 V_{pp} • Absolute encoder with EnDat interface
Sound pressure level EN ISO 1680	55 ... 74 dB (A)		–
Degree of protection EN 60034-5 (IEC 60034-5)	IP64 ... IP68	IP64, IP65, additional drive end flange IP67	IP65
Cooling	Natural cooling Forced ventilation Water cooling	Natural cooling	Water cooling
Insulation of the stator winding EN 60034-1 (IEC 60034-1)	Temperature class F for a winding temperature of $\Delta T = 100$ K at an ambient temperature of +40 °C (+104 °F) For water cooling max. inlet temperature +30 °C (+86 °F)	–	Temperature class H for a coolant temperature of +120 °C (+248 °F) Inlet temperature of coolant max. +35 °C (+95 °F)
Holding brake	Built-on (option)		–
Type of motor	Permanent magnet excited synchronous motor, 3-phase		Permanent magnet excited synchronous linear motor, 3-phase
Paint finish	Anthracite	Unpainted, anthracite (option)	Unpainted
Mounted gearing	Planetary gearbox	Planetary gearbox	–
Planetary gearbox	$i = 4 ... 10$ (1-speed) $i = 16 ... 50$ (2-speed)	$i = 5, i = 10$ (1-speed)	–

Application

There are many fields of application for the 1FT6/1FK7/1FN3 motors. In the case of machine tools, these motors are known as feed motors and are used as such.

For production machines, such as printing, packaging and textile machines, the motors are designated as synchronous servo-motors. In this description, the motors are generally designated as synchronous motors due to their principle of operation.

Core types can be supplied for certain motor types. These core types have several advantages over the standard types: shorter delivery time and faster spare parts supply. For this reason, core types should be used for configuration wherever possible.

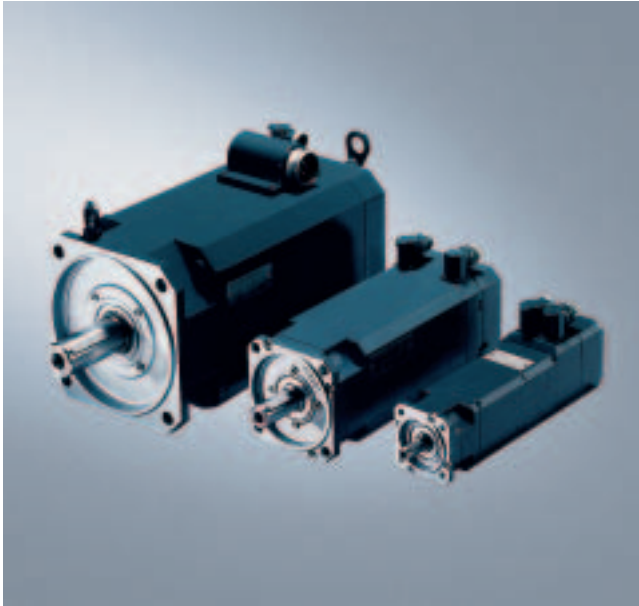
1) Observe maximum speed of measuring system.

Synchronous motors

Servo motors for SIMODRIVE 611

1FT6 motors

Overview



1FT6 motors are permanent magnet excited synchronous motors with compact dimensions.

1FT6 motors with built-in encoders are suitable for use with the SIMODRIVE 611 digital/universal HR converter system.

The fully digital control system of the SIMODRIVE 611 converter and the encoder technology of the 1FT6 motors fulfill the highest demands in terms of dynamic performance, speed setting range, and rotational and positioning accuracy.

The motors are primarily designed for operation without external cooling, and the heat is dissipated through the motor surface. The heat generated in the stator winding and stator core can be directly dissipated via the good thermal coupling to the motor enclosure. The concept of brushless, permanent magnet excited synchronous motors shows its special merits here.

Benefits

- Short non-productive times thanks to high dynamic performance
- Power and signal connections for use in severely contaminated areas
- Easy installation thanks to reduced cabling overhead
- High resistance to lateral force

Application

- Machines with high requirements in terms of dynamic performance and precision
- Packaging machinery
- Shelf access equipment
- Woodworking
- Handling equipment
- Printing machines

Technical data

1FT6 motors

Type of motor	Permanent magnet excited synchronous motor
Magnet material	Rare-earth magnet material
Insulation of the stator winding to EN 60034-1 (IEC 60034-1)	Temperature class F for a winding temperature of $\Delta T = 100 \text{ K}$ at an ambient temperature of $+40 \text{ °C}$ ($+104 \text{ °F}$). For water cooling max. inlet temperature $+30 \text{ °C}$ ($+86 \text{ °F}$)
Type according to EN 60034-7 (IEC 60034-7)	IM B5 (IM V1, IM V3) IM B14 (IM V18, IM V19)
Degree of protection according to EN 60034-5 (IEC 60034-5)	IP64 standard type, IP65 core type
Cooling	Natural cooling, forced ventilation, water cooling
Temperature monitoring	KTY 84 temperature sensor in stator winding
Paint finish	Anthracite
2nd rating plate	Enclosed separately
Shaft extension on the drive end to DIN 748-3 (IEC 60072-1)	Plain shaft
Rotational accuracy, concentricity and linear movement in accordance with DIN 42955 (IEC 60072-1)	Tolerance N (normal)
Vibration severity to EN 60034-14 (IEC 60034-14)	Grade N (normal)
Max. sound pressure level to EN ISO 1680	Natural cooling/water cooling 1FT602... – 1FT604.: 55 dB (A) 1FT606... – 1FT610.: 65 dB (A) 1FT613... : 70 dB (A) Forced ventilation: 1FT608... – 1FT610.: 70 dB (A) 1FT613... : 74 dB (A)
Built-in encoder systems	• Incremental encoder sin/cos 1 V_{pp}, 2048 pulses/revolution • Absolute encoder, multiturn, 2048 pulses/revolution with 1FT603 to 1FT613, 512 pulses/revolution with 1FT602 and traversing range 4096 revolutions with EnDat interface • Multipole resolver²⁾ (number of poles corresponds to number of pole pairs of the motor) • Resolver 2-pole
Connection	Connectors for signals and power
Options	• Shaft extension on the drive extension with fitted key and key-way (half-key balancing) • Built-in holding brake • Degree of protection IP67, IP68 M5 sealing air connection present (except with forced ventilation) • Planetary gearboxes, built-on (requirement: plain shaft end and vibration severity grade N)

1) Supply voltage of the SIMODRIVE 611 converter system

3 AC 400 V $\pm 10\%$ (i. e. $V_{DC \text{ link}} \leq 600 \text{ V}$)	3 AC 480 V $+6\%, -10\%$ (i. e. $V_{DC \text{ link}} = 680 \text{ V}$)
--	--

Utilization of the 1FT6 motors up to $\Delta T = 100 \text{ K}$.	Utilization of the 1FT6 motors up to $\Delta T = 100 \text{ K}$.
---	---

2) With SIMODRIVE 611 universal HR, the maximum operating frequency of 432 Hz must be complied with.

Synchronous motors

Servo motors for SIMODRIVE 611

1FT6 motors - core type with natural cooling

Selection and ordering data

Rated speed	Shaft height	Rated output	Standstill torque	Rated torque ¹⁾	Rated current	1FT6 synchronous motors Natural cooling	Pole pair No.	Rotor moment of inertia (without brake)	Weight (without brake)
n_{rated}		P_{rated} at $\Delta T=100\text{ K}$	M_0 at $\Delta T=100\text{ K}$	M_{rated} at $\Delta T=100\text{ K}$	I_{rated} at $\Delta T=100\text{ K}$	Order No. Core type		J	m
rpm		kW (HP)	Nm (lb _f -in)	Nm (lb _f -in)	A			10 ⁻⁴ kgm ² (lb _f -in-s ²)	kg (lb)
2000	100	4.8 (6.43)	27 (239)	23 (203.6)	11	1FT6 102-1AC7 1 - ■ ■ ■ ■ 1	4	99 (0.0876)	27.5 (60.6)
		8.0 (10.72)	50 (442.6)	38 (336.3)	17.6	1FT6 105-1AC7 1 - ■ ■ ■ ■ 1	4	168 (0.1487)	39.5 (87.1)
3000	48	1.4 (1.88)	5 (44.3)	4.3 (38.1)	2.9	1FT6 044-1AF7 1 - ■ ■ ■ ■ 1	2	5.1 (0.0045)	8.3 (18.3)
	63	1.5 (2.01)	6 (53.1)	4.7 (41.6)	3.4	1FT6 062-1AF7 1 - ■ ■ ■ ■ 1	3	8.5 (0.0752)	9.5 (20.9)
		2.2 (2.95)	9.5 (84.1)	7 (62)	4.9	1FT6 064-1AF7 1 - ■ ■ ■ ■ 1	3	13 (0.0115)	12.5 (27.6)
	80	3.2 (4.29)	13 (115.1)	10.3 (91.2)	8.7	1FT6 082-1AF7 1 - ■ ■ ■ ■ 1	4	30 (0.0266)	15 (33.1)
		4.6 (6.17)	20 (177)	14.7 (130.1)	11	1FT6 084-1AF7 1 - ■ ■ ■ ■ 1	4	48 (0.0425)	20.5 (45.2)
		5.8 (7.77)	27 (239)	18.5 (163.7)	13	1FT6 086-1AF7 1 - ■ ■ ■ ■ 1	4	66.5 (0.0589)	25.5 (56.2)
4500	63	1.7 (2.28)	6 (53.1)	3.6 (31.9)	3.9	1FT6 062-1AH7 1 - ■ ■ ■ ■ 1	3	8.5 (0.0752)	9.5 (20.9)
		2.3 (3.08)	9.5 (84.1)	4.8 (42.5)	5.5	1FT6 064-1AH7 1 - ■ ■ ■ ■ 1	3	13 (0.0115)	12.5 (27.6)
	80	4.9 (6.57)	20 (177)	10.5 (92.9)	12.5	1FT6 084-1AH7 1 - ■ ■ ■ ■ 1	4	48 (0.0425)	20.5 (45.2)
6000	36	0.88 (1.18)	2 (17.7)	1.4 (12.4)	2.1	1FT6 034-1AK7 1 - ■ ■ ■ ■ 1	2	1.1 (0.001)	4.4 (9.7)
	80	4.1 (5.5)	20 (177)	6.5 (57.5)	9.2	1FT6 084-1AK7 1 - ■ ■ ■ ■ 1	4	48 (0.0425)	20.5 (45.2)
• Connector outlet direction:		Transverse - right (not for 1FT603/1FT604/1FT606) Transverse - left (not for 1FT603/1FT604/1FT606) Axially NDE Axially DE				1 2 3 4			
• Encoder systems:		Incremental encoder sin/cos 1 V _{pp} 2048 pulses/revolution Absolute encoder EnDat 2048 pulses/revolution ¹⁾				A E			
• Plain shaft/radial eccentricity tolerance N:		Without holding brake With holding brake				G H			

Synchronous motors

Servo motors for SIMODRIVE 611

1FT6 motors - core type with natural cooling

Selection and ordering data

Motor type (continued)	Standstill current	Calculated power $P_{\text{calc}} [\text{kW}] = \frac{M_0 \times n_{\text{rated}}}{9550}$	SIMODRIVE 611 power module Required rated current		Power cable, completely screened Motor connection (with brake connection) through power supply connector		
	I_0 at M_0 at $\Delta T = 100 \text{ K}$ A	P_{calc} for M_0 at $\Delta T = 100 \text{ K}$ kW (HP)	I_{rated} at M_0 at $\Delta T = 100 \text{ K}$ A	Order No.	Power supply connector Size	Motor cable cross- section ²⁾ mm ²	Order No. Prefabricated cable
1FT6 102-1AC7...	12.1	5.7 (7.64)	18	For ordering data. see "Power Modules" in Section 3	1.5	4 x 1.5	6FX ■ ■ 02 -5 ■ A21-....
1FT6 105-1AC7...	21.4	10.5 (14.08)	28		1.5	4 x 4	-5 ■ A41-....
1FT6 044-1AF7...	3	1.6 (2.14)	3		1	4 x 1.5	6FX ■ ■ 02 -5 ■ A01-....
1FT6 062-1AF7...	4.1	1.9 (2.55)	5		1	4 x 1.5	6FX ■ ■ 02 -5 ■ A01-....
1FT6 064-1AF7...	6.1	3.0 (4.02)	9		1	4 x 1.5	-5 ■ A01-....
1FT6 082-1AF7...	9.6	4.1 (5.5)	18		1.5	4 x 1.5	6FX ■ ■ 02 -5 ■ A21-....
1FT6 084-1AF7...	13.2	6.3 (8.45)	18		1.5	4 x 1.5	-5 ■ A21-....
1FT6 086-1AF7...	16.4	8.5 (11.39)	18		1.5	4 x 2.5	-5 ■ A31-....
1FT6 062-1AH7...	5.7	2.8 (3.75)	9		1	4 x 1.5	6FX ■ ■ 02 -5 ■ A01-....
1FT6 064-1AH7...	9	4.5 (6.03)	9		1	4 x 1.5	-5 ■ A01-....
1FT6 084-1AH7...	19.8	9.4 (12.6)	18		1.5	4 x 4	6FX ■ ■ 02 -5 ■ A41-....
1FT6 086-1AH7...	23.3	12.7 (17.02)	28		1.5	4 x 4	-5 ■ A41-....
1FT6 034-1AK7...	2.6	1.3 (1.74)	3		1	4 x 1.5	6FX ■ ■ 02 -5 ■ A01-....
1FT6 084-1AK7...	24.1	12.6 (16.89)	28		1.5	4 x 4	6FX ■ ■ 02 -5 ■ A41-....

Design of the power cable:

- MOTION-CONNECT 800
- MOTION-CONNECT 700 (only with brake cores)
- MOTION-CONNECT 500
- MOTION-CONNECT 500 PLUS (only up to cross-section of 6 mm²)

8 0
7 0
5 0
5 1

- Without brake cores
- With brake cores

C
D

For length code as well as power and signal cables, see "MOTION-CONNECT cables and connections".

1) If the absolute encoder is used, M_{rated} is reduced by 10%.

2) The current carrying capacity of the power cables corresponds to IEC 60204-1 for type of routing C under continuous operating conditions with an ambient air temperature of +40 °C (+104 °F), designed for I_0 (100 K), PVC/PUR-insulated cable.

Synchronous motors

Servo motors for SIMODRIVE 611

1FT6 motors - standard type with natural cooling

Selection and ordering data

Rated speed	Shaft height	Rated power	Standstill torque	Rated torque ¹⁾	Rated current	1FT6 synchronous motors Natural cooling	Pole pair No.	Rotor moment of inertia (without brake)	Weight (without brake)
n_{rated}		P_{rated} at $\Delta T=100\text{ K}$	M_0 at $\Delta T=100\text{ K}$	M_{rated} at $\Delta T=100\text{ K}$	I_{rated} at $\Delta T=100\text{ K}$	Order No. Standard type		J	m
rpm		kW (HP)	Nm (lb _f -in)	Nm (lb _f -in)	A			10 ⁻⁴ kgm ² (lb _f -in-s ²)	kg (lb)
1500	100	3.8 (5.09)	27 (239)	24.5 (216.8)	8.4	1FT6 102-8AB7 - ■ ■ ■ ■ ■	4	99 (0.0876)	27.5 (60.6)
		6.4 (8.58)	50 (442.6)	41 (362.9)	14.5	1FT6 105-8AB7 - ■ ■ ■ ■ ■	4	168 (0.1487)	39.5 (87.1)
		9.6 (12.87)	70 (619.6)	61 (539.9)	20.5	1FT6 108-8AB7 - ■ ■ ■ ■ ■	4	260 (0.2301)	55.5 (122.4)
	132	9.7 (13)	75 (663.8)	62 (548.8)	19	1FT6 132-6AB7 1 - ■ ■ ■ ■ ■	3	430 (0.3806)	85 (187.4)
		11.8 (15.82)	95 (840.8)	75 (663.8)	24	1FT6 134-6AB7 1 - ■ ■ ■ ■ ■	3	547 (0.4841)	100 (220.5)
		13.8 (18.5)	115 (1017.9)	88 (778.9)	27	1FT6 136-6AB7 1 - ■ ■ ■ ■ ■	3	664 (0.5876)	117 (258)
• Type of construction:			IM B5 IM B14 ²⁾ (not for 1FT613)			1 2			
• Connector outlet direction:			Transverse - right Transverse - left Axially NDE (not for 1FT613) Axially DE			1 2 3 4			
• Encoder systems:			Incremental encoder sin/cos 1 V _{pp} 2048 pulses/revolution Absolute encoder EnDat 2048 pulses/revolution ¹⁾ Multipole resolver ³⁾ Resolver 2-pole			A E S T			
• Shaft extension:			• Radial eccentricity tolerance:			• Holding brake:			
With fitted key and keyway			N			without		A	
With fitted key and keyway			N			with		B	
With fitted key and keyway			R			without		D	
With fitted key and keyway			R			with		E	
Plain shaft			N			without		G	
Plain shaft			N			with		H	
Plain shaft			R			without		K	
Plain shaft			R			with		L	
• Vibration severity grade:			• Degree of protection:					0	
N			IP64					1	
N			IP65					2	
N			IP67					6	
N			IP68						
R			IP64					3	
R			IP65					4	
R			IP67					5	
R			IP68					7	

To select the degree of protection and type, see "Selection guide".

Synchronous motors

Servo motors for SIMODRIVE 611

1FT6 motors - standard type
with natural cooling

Selection and ordering data

Motor type (continued)	Standstill current	Calculated power $P_{\text{calc}} [\text{kW}] = \frac{M_0 \times n_{\text{rated}}}{9550}$	SIMODRIVE 611 power module Required rated current		Power cable, completely screened Motor connection (with brake connection) through power supply connector		
	I_0 at M_0 at $\Delta T = 100 \text{ K}$ A	P_{calc} for M_0 at $\Delta T = 100 \text{ K}$ kW (HP)	I_{rated} at M_0 at $\Delta T = 100 \text{ K}$ A	Order No.	Power supply connector Size	Motor cable cross- section ⁴⁾ mm ²	Order No. Prefabricated cable
1FT6 102-8AB7...	8.7	4.2 (5.63)	9	For ordering data, see "Power Modules" in Section 3	1.5	4 x 1.5	6FX ■ ■ 02 -5 ■ A21-....
1FT6 105-8AB7...	16	7.9 (10.59)	18		1.5	4 x 2.5	■ -5 ■ A31-....
1FT6 108-8AB7...	22.3	11.0 (14.75)	28		1.5	4 x 4	■ -5 ■ A41-....
1FT6 132-6AB7...	21.6	11.8 (15.82)	28		1.5	4 x 4	6FX ■ ■ 02 -5 ■ A41-....
1FT6 134-6AB7...	27	14.9 (19.97)	28		1.5	4 x 4	■ -5 ■ A41-....
1FT6 136-6AB7...	34	18.1 (24.26)	56		1.5	4 x 10	■ -5 ■ A61-....

Design of the power cable:

- MOTION-CONNECT 800
- MOTION-CONNECT 700 (only with brake cores)
- MOTION-CONNECT 500
- MOTION-CONNECT 500 PLUS (only up to cross-section of 6 mm²)

8 0
7 0
5 0
5 1

- Without brake cores
- With brake cores

C
D

For length code as well as power and signal cables, see "MOTION-CONNECT cables and connections".

1) If the absolute encoder is used, M_{rated} is reduced by 10%.
2) The same flange as for IM B5 type, but with metric threaded insert in the 4 fixing holes.

3) With SIMODRIVE 611 universal HR, the maximum operating frequency of 432 Hz must be complied with.
4) The current carrying capacity of the power cables corresponds to IEC 60204-1 for type of routing C under continuous operating conditions with an ambient air temperature of +40 °C (+104 °F), designed for I_0 (100 K), PVC/PUR-insulated cable.

Synchronous motors

Servo motors for SIMODRIVE 611

1FT6 motors - standard type with natural cooling

Selection and ordering data

Rated speed	Shaft height	Rated power	Standstill torque	Rated torque ¹⁾	Rated current	1FT6 synchronous motors Natural cooling	Pole pair No.	Rotor moment of inertia (without brake)	Weight (without brake)
n_{rated}		P_{rated} at $\Delta T=100\text{ K}$	M_0 at $\Delta T=100\text{ K}$	M_{rated} at $\Delta T=100\text{ K}$	I_{rated} at $\Delta T=100\text{ K}$	Order No. Standard type		J	m
rpm		kW (HP)	Nm (lb _f -in)	Nm (lb _f -in)	A			10^{-4} kgm^2 (lb _f -in-s ²)	kg (lb)
2000	63	0.8 (1.07)	4 (35.4)	3.7 (32.7)	1.9	1FT6 061-6AC7 ■ - ■ ■ ■ ■ 1	3	6 (0.0053)	8 (17.6)
		1.1 (1.47)	6 (53.1)	5.2 (46)	2.6	1FT6 062-6AC7 ■ - ■ ■ ■ ■ 1	3	8.5 (0.0075)	9.5 (20.9)
		1.7 (2.28)	9.5 (84.1)	8 (70.8)	3.8	1FT6 064-6AC7 ■ - ■ ■ ■ ■ 1	3	13 (0.0115)	12.5 (27.6)
	80	1.6 (2.14)	8 (70.8)	7.5 (66.4)	4.1	1FT6 081-8AC7 ■ - ■ ■ ■ ■ 1	4	21 (0.0186)	12.5 (27.6)
		2.4 (3.22)	13 (115.1)	11.4 (101)	6.6	1FT6 082-8AC7 ■ - ■ ■ ■ ■ 1	4	30 (0.0266)	15 (33.1)
		3.5 (4.69)	20 (177)	16.9 (149.6)	8.3	1FT6 084-8AC7 ■ - ■ ■ ■ ■ 1	4	48 (0.0425)	20.5 (45.2)
		4.7 (6.3)	27 (239)	22.5 (199)	10.9	1FT6 086-8AC7 ■ - ■ ■ ■ ■ 1	4	66.5 (0.0589)	25.5 (56.2)
	100	4.8 (6.43)	27 (239)	23 (203.6)	11	1FT6 102-8AC7 ■ - ■ ■ ■ ■ 1	4	99 (0.0876)	27.5 (60.6)
		8.0 (10.72)	50 (442.5)	38 (336.3)	17.6	1FT6 105-8AC7 ■ - ■ ■ ■ ■ 1	4	168 (0.1478)	39.5 (87.1)
		11.5 (15.42)	70 (620)	55 (486.8)	24.5	1FT6 108-8AC7 ■ - ■ ■ ■ ■ 1	4	260 (0.2301)	55.5 (122.4)
	132	11.5 (15.42)	75 (663.8)	55 (486.8)	23	1FT6 132-6AC7 1 - ■ ■ ■ ■ 1	3	430 (0.3806)	85 (187.5)
		13.6 (18.23)	95 (840.8)	65 (575.3)	27	1FT6 134-6AC7 1 - ■ ■ ■ ■ 1	3	547 (0.4841)	100 (220.5)
		15.5 (20.78)	115 (1018)	74 (655)	30	1FT6 136-6AC7 1 - ■ ■ ■ ■ 1	3	664 (0.5876)	117 (258)

• Type of construction:		IM B5 IM B14 ²⁾ (not for 1FT613)	1 2			
• Connector outlet direction:		Transverse - right (not for 1FT606) Transverse - left (not for 1FT606) Axially NDE (not for 1FT613) Axially DE	1 2 3 4			
• Encoder systems:		Incremental encoder sin/cos 1 V _{pp} 2048 pulses/revolution Absolute encoder EnDat 2048 pulses/revolution ¹⁾ Multipole resolver ³⁾ Resolver 2-pole	A E S T			
• Shaft extension:		With fitted key and keyway With fitted key and keyway With fitted key and keyway With fitted key and keyway Plain shaft Plain shaft Plain shaft Plain shaft		A B D E G H K L		
• Radial eccentricity tolerance:		N N R R N N R R				
• Holding brake:		without with without with without with without with				
• Vibration severity grade:		N N N N R R R R				
• Degree of protection:		IP64 IP65 IP67 IP68 IP64 IP65 IP67 IP68	0 1 2 6 3 4 5 7			

To select the degree of protection and type, see "Selection guide".

Synchronous motors

Servo motors for SIMODRIVE 611

1FT6 motors - standard type
with natural cooling

Selection and ordering data

Motor type (continued)	Standstill current	Calculated power $P_{calc} [kW] = \frac{M_0 \times n_{rated}}{9550}$	SIMODRIVE 611 power module Required rated current		Power cable, completely screened Motor connection (with brake connection) through power supply connector		
	I_0 at M_0 at $\Delta T = 100 \text{ K}$ A	P_{calc} for M_0 at $\Delta T = 100 \text{ K}$ kW (HP)	I_{rated} at M_0 at $\Delta T = 100 \text{ K}$ A	Order No.	Power supply connector Size	Motor cable cross- section ⁴⁾ mm ²	Order No. Prefabricated cable
1FT6 061-6AC7...	1.9	0.84 (1.13)	3	For ordering data, see "Power Modules" in Section 3	1	4 x 1.5	6FX ■ ■ 02 -5 ■ A01-....
1FT6 062-6AC7...	2.7	1.3 (1.74)	3		1	4 x 1.5	-5 ■ A01-....
1FT6 064-6AC7...	4.2	2.0 (2.68)	5		1	4 x 1.5	-5 ■ A01-....
1FT6 081-8AC7...	3.9	1.7 (2.28)	5		1.5	4 x 1.5	6FX ■ ■ 02 -5 ■ A21-....
1FT6 082-8AC7...	6.6	2.7 (3.62)	9		1.5	4 x 1.5	-5 ■ A21-....
1FT6 084-8AC7...	8.8	4.2 (5.63)	9		1.5	4 x 1.5	-5 ■ A21-....
1FT6 086-8AC7...	11.3	5.7 (7.64)	18		1.5	4 x 1.5	-5 ■ A21-....
1FT6 102-8AC7...	12.1	5.7 (7.64)	18		1.5	4 x 1.5	6FX ■ ■ 02 -5 ■ A21-....
1FT6 105-8AC7...	21.4	10.5 (14.07)	28		1.5	4 x 4	-5 ■ A41-....
1FT6 108-8AC7...	29	14.7 (19.71)	28 ⁵⁾		1.5	4 x 6	-5 ■ A51-....
1FT6 132-6AC7...	29	15.7 (21.05)	28 ⁵⁾		1.5	4 x 6	6FX ■ ■ 02 -5 ■ A51-....
1FT6 134-6AC7...	36	19.9 (26.68)	56		1.5	4 x 10	-5 ■ A61-....
1FT6 136-6AC7...	42	24.1 (22.31)	56		3	4 x 10	-5 ■ A13-....

Design of the power cable:

- MOTION-CONNECT 800
- MOTION-CONNECT 700 (only with brake cores)
- MOTION-CONNECT 500
- MOTION-CONNECT 500 PLUS (only up to cross-section of 6 mm²)

8 0
7 0
5 0
5 1

- Without brake cores
- With brake cores

C
D

For length code as well as power and signal cables, see "MOTION-CONNECT cables and connections".

- 1) If the absolute encoder is used, M_{rated} is reduced by 10%.
- 2) The same flange as for IM B5 type, but with metric threaded insert in the 4 fixing holes.
- 3) With SIMODRIVE 611 universal HR, the maximum operating frequency of 432 Hz must be complied with.
- 4) The current carrying capacity of the power cables corresponds to IEC 60204-1 for type of routing C under continuous operating conditions with an ambient air temperature of +40 °C (+104 °F), designed for I_0 (100 K), PVC/PUR-insulated cable.

- 5) With the specified power module, the motor cannot be fully utilized after $\Delta T = 100 \text{ K}$ winding overheating. If a larger power module is used, it must be checked that the specified power cable can be connected to the larger power module.

Synchronous motors

Servo motors for SIMODRIVE 611

1FT6 motors - standard type with natural cooling

Selection and ordering data

Rated speed	Shaft height	Rated power	Standstill torque	Rated torque ¹⁾	Rated current	1FT6 synchronous motors Natural cooling	Pole pair No.	Rotor moment of inertia (without brake)	Weight (without brake)
n_{rated}		P_{rated} at $\Delta T=100$ K	M_0 at $\Delta T=100$ K	M_{rated} at $\Delta T=100$ K	I_{rated} at $\Delta T=100$ K	Order No. Standard type		J	m
rpm		kW (HP)	Nm (lb _f -in)	Nm (lb _f -in)	A			10 ⁻⁴ kgm ² (lb _f -in-s ²)	kg (lb)
3000	48	0.7 (0.99)	2.6 (23)	2.15 (19)	1.7	1FT6 041-4AF7 1 - ■ ■ ■ ■ ■	2	2.9 (0.0025)	6.6 (14.6)
		1.4 (1.88)	5 (44.3)	4.3 (38.1)	2.9	1FT6 044-4AF7 1 - ■ ■ ■ ■ ■	2	5.1 (0.0045)	8.3 (18.3)
	63	1.1 (1.47)	4 (35.4)	3.5 (31)	2.6	1FT6 061-6AF7 ■ - ■ ■ ■ ■ ■	3	6 (0.0053)	8 (17.6)
		1.5 (2.01)	6 (53.1)	4.7 (41.6)	3.4	1FT6 062-6AF7 ■ - ■ ■ ■ ■ ■	3	8.5 (0.0075)	9.5 (20.9)
		2.2 (2.95)	9.5 (84.1)	7 (62)	4.9	1FT6 064-6AF7 ■ - ■ ■ ■ ■ ■	3	13 (0.0115)	12.5 (27.6)
	80	2.2 (2.95)	8 (70.8)	6.9 (61.1)	5.6	1FT6 081-8AF7 ■ - ■ ■ ■ ■ ■	4	21 (0.0186)	12.5 (27.6)
		3.2 (4.29)	13 (115.1)	10.3 (91.2)	8.7	1FT6 082-8AF7 ■ - ■ ■ ■ ■ ■	4	30 (0.0266)	15 (33.1)
		4.6 (6.17)	20 (177)	14.7 (130.1)	11	1FT6 084-8AF7 ■ - ■ ■ ■ ■ ■	4	48 (0.0425)	20.5 (45.2)
		5.8 (7.77)	27 (239)	18.5 (163.7)	13	1FT6 086-8AF7 ■ - ■ ■ ■ ■ ■	4	66.5 (0.0589)	25.5 (56.2)
	100	6.1 (8.18)	27 (239)	19.5 (172.6)	13.2	1FT6 102-8AF7 ■ - ■ ■ ■ ■ ■	4	99 (0.0876)	27.5 (60.6)
		9.7 (13)	50 (442.6)	31 (274.4)	22.5	1FT6 105-8AF7 ■ - ■ ■ ■ ■ ■	4	168 (0.1487)	39.5 (87.1)
		11.6 (15.55)	70 (619.6)	37 (327.5)	25	1FT6 108-8AF7 ■ - ■ ■ ■ ■ ■	4	260 (0.2301)	55.5 (122.4)
	132	11.3 (15.15)	75 (663.8)	36 (318.6)	23	1FT6 132-6AF7 1 - ■ ■ ■ ■ ■	3	430 (0.3806)	85 (187.4)

• Type of construction:		IM B5 IM B14 ²⁾ (not for 1FT604, 1FT613)	1 2
• Connector outlet direction:		Transverse - right (not for 1FT604, 1FT606) Transverse - left (not for 1FT604, 1FT606) Axially NDE (not for 1FT613) Axially DE	1 2 3 4
• Encoder systems:		Incremental encoder sin/cos 1 V _{pp} 2048 pulses/revolution Absolute encoder EnDat 2048 pulses/revolution ¹⁾ Multipole resolver ³⁾ Resolver 2-pole	A E S T
• Shaft extension:		With fitted key and keyway With fitted key and keyway With fitted key and keyway With fitted key and keyway Plain shaft Plain shaft Plain shaft Plain shaft	A B D E G H K L
• Radial eccentricity tolerance:		N N R R N N R R	
• Holding brake:		without with without with without with without with	
• Vibration severity grade:		N N N N R R R R	
• Degree of protection:		IP64 IP65 IP67 IP68 IP64 IP65 IP67 IP68	0 1 2 6 3 4 5 7

To select the degree of protection and type, see "Selection guide".

Synchronous motors

Servo motors for SIMODRIVE 611

1FT6 motors - standard type
with natural cooling

Selection and ordering data

Motor type (continued)	Standstill current	Calculated power $P_{\text{calc}} [\text{kW}] = \frac{M_0 \times n_{\text{rated}}}{9550}$	SIMODRIVE 611 power module Required rated current		Power cable, completely screened Motor connection (with brake connection) through power supply connector		
	I_0 at M_0 at $\Delta T = 100 \text{ K}$ A	P_{calc} for M_0 at $\Delta T = 100 \text{ K}$ kW (HP)	I_{rated} at M_0 at $\Delta T = 100 \text{ K}$ A	Order No.	Power supply connector Size	Motor cable cross- section ⁴⁾ mm ²	Order No. Prefabricated cable
1FT6 041-4AF7 ...	1.9	0.8 (1.07)	3	For ordering data, see "Power Modules" in Section 3	1	4 x 1.5	6FX ■ ■ 02 -5 ■ A01-....
1FT6 044-4AF7 ...	3	1.6 (2.14)	3		1	4 x 1.5	■ -5 ■ A01-....
1FT6 061-6AF7 ...	2.7	1.3 (1.74)	3		1	4 x 1.5	6FX ■ ■ 02 -5 ■ A01-....
1FT6 062-6AF7 ...	4.1	1.9 (2.55)	5		1	4 x 1.5	■ -5 ■ A01-....
1FT6 064-6AF7 ...	6.1	3.0 (4.02)	9		1	4 x 1.5	■ -5 ■ A01-....
1FT6 081-8AF7 ...	5.8	2.5 (3.35)	9		1.5	4 x 1.5	6FX ■ ■ 02 -5 ■ A21-....
1FT6 082-8AF7 ...	9.6	4.1 (5.5)	18		1.5	4 x 1.5	■ -5 ■ A21-....
1FT6 084-8AF7 ...	13.2	6.3 (8.45)	18		1.5	4 x 1.5	■ -5 ■ A21-....
1FT6 086-8AF7 ...	16.4	8.5 (11.39)	18		1.5	4 x 2.5	■ -5 ■ A31-....
1FT6 102-8AF7 ...	16.9	8.5 (11.39)	18		1.5	4 x 2.5	6FX ■ ■ 02 -5 ■ A31-....
1FT6 105-8AF7 ...	32	15.7 (21.05)	56		1.5	4 x 6	■ -5 ■ A51-....
1FT6 108-8AF7 ...	41	22.0 (29.49)	56		3	4 x 10	■ -5 ■ A13-....
1FT6 132-6AF7 ...	43	23.6 (31.64)	56		3	4 x 10	6FX ■ ■ 02 -5 ■ A13-....

Design of the power cable:

- MOTION-CONNECT 800
- MOTION-CONNECT 700 (only with brake cores)
- MOTION-CONNECT 500
- MOTION-CONNECT 500 PLUS (only up to cross-section of 6 mm²)

8 0
7 0
5 0
5 1

- Without brake cores
- With brake cores

C
D

For length code as well as power and signal cables, see "MOTION-CONNECT cables and connections".

1) If the absolute encoder is used, M_{rated} is reduced by 10%.
2) The same flange as for IM B5 type, but with metric threaded insert in the 4 fixing holes.

3) With SIMODRIVE 611 universal HR, the maximum operating frequency of 432 Hz must be complied with.
4) The current carrying capacity of the power cables corresponds to IEC 60204-1 for type of routing C under continuous operating conditions with an ambient air temperature of +40 °C (+104 °F), designed for I_0 (100 K), PVC/PUR-insulated cable.

Synchronous motors

Servo motors for SIMODRIVE 611

1FT6 motors - standard type with natural cooling

Selection and ordering data

Rated speed	Shaft height	Rated power	Standstill torque	Rated torque ¹⁾	Rated current	1FT6 synchronous motors Natural cooling	Pole pair No.	Rotor moment of inertia (without brake)	Weight (without brake)
n_{rated}		P_{rated} at $\Delta T=100$ K	M_0 at $\Delta T=100$ K	M_{rated} at $\Delta T=100$ K	I_{rated} at $\Delta T=100$ K	Order No. Standard type		J	m
rpm		kW (HP)	Nm (lb _f -in)	Nm (lb _f -in)	A			10 ⁻⁴ kgm ² (lb _f -in-s ²)	kg (lb)
4500	63	1.4 (1.88)	4 (35.4)	2.9 (25.7)	3.4	1FT6 061-6AH7 ■ - ■ ■ ■ ■ ■	3	6 (0.0053)	8 (17.6)
		1.7 (2.28)	6 (53.1)	3.6 (31.9)	3.9	1FT6 062-6AH7 ■ - ■ ■ ■ ■ ■	3	8.5 (0.0075)	9.5 (20.9)
		2.3 (3.08)	9.5 (84.1)	4.8 (42.5)	5.5	1FT6 064-6AH7 ■ - ■ ■ ■ ■ ■	3	13 (0.0115)	12.5 (27.6)
	80	2.7 (3.62)	8 (70.8)	5.8 (51.3)	7.3	1FT6 081-8AH7 ■ - ■ ■ ■ ■ ■	4	21 (0.0186)	12.5 (27.6)
		4 (5.36)	13 (115.1)	8.5 (75.2)	11	1FT6 082-8AH7 ■ - ■ ■ ■ ■ ■	4	30 (0.0266)	15 (33.1)
		4.9 (6.57)	20 (177)	10.5 (92.9)	12.5	1FT6 084-8AH7 ■ - ■ ■ ■ ■ ■	4	48 (0.0425)	20.5 (45.2)
		5.7 (7.64)	27 (239)	12 (106.2)	12.6	1FT6 086-8AH7 ■ - ■ ■ ■ ■ ■	4	66.5 (0.0589)	25.5 (56.2)
	100	5.7 (7.64)	27 (239)	12 (106.2)	12	1FT6 102-8AH7 ■ - ■ ■ ■ ■ ■	4	99 (0.0876)	27.5 (60.6)
• Type of construction:		IM B5 IM B14 ²⁾				1 2			
• Connector outlet direction:		Transverse - right (not for 1FT606) Transverse - left (not for 1FT606) Axially NDE Axially DE				1 2 3 4			
• Encoder systems:		Incremental encoder sin/cos 1 V _{pp} 2048 pulses/revolution Absolute encoder EnDat 2048 pulses/revolution ¹⁾ Multipole resolver ³⁾ Resolver 2-pole				A E S T			
• Shaft extension:		• Radial eccentricity tolerance:							
With fitted key and keyway		N							
With fitted key and keyway		N							
With fitted key and keyway		R							
With fitted key and keyway		R							
Plain shaft		N							
Plain shaft		N							
Plain shaft		R							
Plain shaft		R							
• Holding brake:		without with without with without with without with							
• Vibration severity grade:		• Degree of protection:							
N		IP64							
N		IP65							
N		IP67							
N		IP68							
R		IP64							
R		IP65							
R		IP67							
R		IP68							

To select the degree of protection and type, see "Selection guide".

Synchronous motors

Servo motors for SIMODRIVE 611

1FT6 motors - standard type
with natural cooling

Selection and ordering data

Motor type (continued)	Standstill current	Calculated power P_{calc} [kW] = $M_0 \times n_{\text{rated}}/9550$	SIMODRIVE 611 power module Required rated current		Power cable, completely screened Motor connection (with brake connection) through power supply connector		
	I_0 at M_0 at $\Delta T=100$ K	P_{calc} for M_0 at $\Delta T=100$ K	I_{rated} at M_0 at $\Delta T=100$ K	Order No.	Power supply connector	Motor cable cross- section ⁴⁾	Order No. Prefabricated cable
	A	kW (HP)	A		Size	mm ²	
1FT6 061-6AH7...	4	1.9 (2.55)	5	For ordering data, see "Power Modules" in Section 3	1	4 x 1.5	6FX ■ ■ 02 -5 ■ A01-....
1FT6 062-6AH7...	5.7	2.8 (3.75)	9		1	4 x 1.5	-5 ■ A01-....
1FT6 064-6AH7...	9	4.5 (6.03)	9		1	4 x 1.5	-5 ■ A01-....
1FT6 081-8AH7...	8.6	3.8 (5.09)	9		1.5	4 x 1.5	6FX ■ ■ 02 -5 ■ A21-....
1FT6 082-8AH7...	14.8	6.1 (8.18)	18		1.5	4 x 1.5	-5 ■ A21-....
1FT6 084-8AH7...	19.8	9.4 (12.6)	18 ⁵⁾		1.5	4 x 4	-5 ■ A41-....
1FT6 086-8AH7...	23.3	12.7 (17.02)	28		1.5	4 x 4	-5 ■ A41-....
1FT6 102-8AH7...	24.1	12.7 (17.02)	28		1.5	4 x 4	6FX ■ ■ 02 -5 ■ A41-....
Design of the power cable:							
• MOTION-CONNECT 800							8 0
• MOTION-CONNECT 700 (<u>only</u> with brake cores)							7 0
• MOTION-CONNECT 500							5 0
• MOTION-CONNECT 500 PLUS (<u>only</u> up to cross-section of 6 mm ²)							5 1
• Without brake cores							C
• With brake cores							D

For length code as well as power and signal cables, see "MOTION-CONNECT cables and connections".

- 1) If the absolute encoder is used, M_{rated} is reduced by 10%.
- 2) The same flange as for IM B5 type, but with metric threaded insert in the 4 fixing holes.
- 3) With SIMODRIVE 611 universal HR, the maximum operating frequency of 432 Hz must be complied with.
- 4) The current carrying capacity of the power cables corresponds to IEC 60204-1 for type of routing C under continuous operating conditions with an ambient air temperature of +40 °C (+104 °F), designed for I_0 (100 K), PVC/PUR-insulated cable.

- 5) With the specified power module, the motor cannot be fully utilized after $\Delta T = 100$ K winding overheating. If a larger power module is used, it must be checked that the specified power cable can be connected to the larger power module.

Synchronous motors

Servo motors for SIMODRIVE 611

1FT6 motors - standard type with natural cooling

Selection and ordering data

Rated speed	Shaft height	Rated power	Standstill torque	Rated torque ¹⁾	Rated current	1FT6 synchronous motors Natural cooling	Pole pair No.	Rotor moment of inertia (without brake)	Weight (without brake)
n_{rated}		P_{rated} at $\Delta T=100$ K	M_0 at $\Delta T=100$ K	M_{rated} at $\Delta T=100$ K	I_{rated} at $\Delta T=100$ K	Order No. Standard type		J	m
rpm		kW (HP)	Nm (lb _f -in)	Nm (lb _f -in)	A			10 ⁻⁴ kgm ² (lb _f -in-s ²)	kg (lb)
6000	28	0.19 (0.25)	0.4 (3.5)	0.3 (2.7)	1.1	1FT6 021-6AK7 1 - ■ ■ ■ ■ ■	3	0.21 (0.0002)	1.2 (2.6)
		0.31 (0.42)	0.8 (7.1)	0.5 (4.4)	0.9	1FT6 024-6AK7 1 - ■ ■ ■ ■ ■	3	0.34 (0.0003)	2.1 (4.6)
	36	0.47 (0.63)	1 (8.8)	0.75 (6.6)	1.2	1FT6 031-4AK7 1 - ■ ■ ■ ■ ■	2	0.65 (0.0006)	3.1 (6.8)
		0.88 (1.18)	2 (17.7)	1.4 (12.4)	2.1	1FT6 034-4AK7 1 - ■ ■ ■ ■ ■	2	1.1 (0.0010)	4.4 (9.7)
	48	1.1 (1.47)	2.6 (23)	1.7 (15)	2.4	1FT6 041-4AK7 1 - ■ ■ ■ ■ ■	2	2.9 (0.0025)	6.6 (14.6)
		1.9 (2.55)	5 (44.3)	3 (26.6)	4.1	1FT6 044-4AK7 1 - ■ ■ ■ ■ ■	2	5.1 (0.0045)	8.3 (18.3)
	63	1.3 (1.74)	4 (35.4)	2.1 (18.6)	3.1	1FT6 061-6AK7 ■ - ■ ■ ■ ■ ■	3	6 (0.0053)	8 (17.6)
		1.3 (1.74)	6 (53.1)	2.1 (18.6)	3.2	1FT6 062-6AK7 ■ - ■ ■ ■ ■ ■	3	8.5 (0.0075)	9.5 (20.9)
		1.3 (1.74)	9.5 (84.1)	2.1 (18.6)	3.5	1FT6 064-6AK7 ■ - ■ ■ ■ ■ ■	3	13 (0.0115)	12.5 (27.6)
	80	2.9 (3.89)	8 (70.8)	4.6 (40.7)	7.7	1FT6 081-8AK7 ■ - ■ ■ ■ ■ ■	4	21 (0.0186)	12.5 (27.6)
		3.5 (4.69)	13 (115.1)	5.5 (48.7)	9.1	1FT6 082-8AK7 ■ - ■ ■ ■ ■ ■	4	30 (0.0266)	15 (33.1)
		4.1 (5.55)	20 (177)	6.5 (57.5)	9.2	1FT6 084-8AK7 ■ - ■ ■ ■ ■ ■	4	48 (0.0425)	20.5 (45.2)
• Type of construction:			IM B5 IM B14 ²⁾ (not for 1FT602, 1FT603, 1FT604)			1 2			
• Connector outlet direction:			Transverse - right (not for 1FT603, 1FT604, 1FT606) Transverse - left (not for 1FT603, 1FT604, 1FT606) Axially NDE Axially DE			1 2 3 4			
• Encoder systems:			Incremental encoder sin/cos 1 V _{pp} 2048 pulses/revolution Absolute encoder EnDat 2048 pulses/revolution ¹⁾³⁾ Absolute encoder EnDat 512 pulses/revolution ¹⁾⁴⁾ Multipole resolver ⁵⁾ Resolver 2-pole			A E H S T			
• Shaft extension:			• Radial eccentricity tolerance:		• Holding brake:		A B D E G H K L		
With fitted key and keyway			N		without				
With fitted key and keyway			N		with				
With fitted key and keyway			R		without				
With fitted key and keyway			R		with				
Plain shaft			N		without				
Plain shaft			N		with				
Plain shaft			R		without				
Plain shaft			R		with				
• Vibration severity grade:			• Degree of protection:			0 1 2 6 3 4 5 7			
N			IP64						
N ³⁾			IP65 ³⁾						
N			IP67						
N ³⁾			IP68 ³⁾						
R			IP64						
R ³⁾			IP65 ³⁾						
R			IP67						
R ³⁾			IP68 ³⁾						

To select the degree of protection and type, see "Selection guide".

Synchronous motors

Servo motors for SIMODRIVE 611

1FT6 motors - standard type
with natural cooling

Selection and ordering data

Motor type (continued)	Standstill current	Calculated power $P_{\text{calc}} [\text{kW}] = \frac{M_0 \times n_{\text{rated}}}{9550}$	SIMODRIVE 611 power module Required rated current		Power cable, completely screened Motor connection (with brake connection) through power supply connector		
	I_0 at M_0 at $\Delta T = 100 \text{ K}$ A	P_{calc} for M_0 at $\Delta T = 100 \text{ K}$ kW (HP)	I_{rated} at M_0 at $\Delta T = 100 \text{ K}$ A	Order No.	Power supply connector Size	Motor cable cross- section ⁶⁾ mm ²	Order No. Prefabricated cable
1FT6 021-6AK7...	1.25	0.3 (0.4)	3	For ordering data, see "Power Modules" in Section 3	1	4 x 1.5	6FX ■ ■ 02 -5 ■ A01-....
1FT6 024-6AK7...	1.25	0.5 (0.67)	3		1	4 x 1.5	-5 ■ A01-....
1FT6 031-4AK7...	1.4	0.6 (0.8)	3		1	4 x 1.5	6FX ■ ■ 02 -5 ■ A01-....
1FT6 034-4AK7...	2.6	1.3 (1.74)	3		1	4 x 1.5	-5 ■ A01-....
1FT6 041-4AK7...	3	1.6 (2.14)	3		1	4 x 1.5	6FX ■ ■ 02 -5 ■ A01-....
1FT6 044-4AK7...	5.9	3.1 (4.16)	9		1	4 x 1.5	-5 ■ A01-....
1FT6 061-6AK7...	5	2.5 (3.35)	5		1	4 x 1.5	6FX ■ ■ 02 -5 ■ A01-....
1FT6 062-6AK7...	7.6	3.8 (5.09)	9		1	4 x 1.5	-5 ■ A01-....
1FT6 064-6AK7...	12	4.0 (5.36)	18		1	4 x 1.5	-5 ■ A01-....
1FT6 081-8AK7...	11.1	5.0 (6.7)	18		1.5	4 x 1.5	6FX ■ ■ 02 -5 ■ A21-....
1FT6 082-8AK7...	17.3	8.2 (10.99)	18		1.5	4 x 2.5	-5 ■ A31-....
1FT6 084-8AK7...	24.1	12.6 (16.89)	28		1.5	4 x 4	-5 ■ A41-....

Design of the power cable:

- MOTION-CONNECT 800
- MOTION-CONNECT 700 (only with brake cores)
- MOTION-CONNECT 500
- MOTION-CONNECT 500 PLUS (only up to cross-section of 6 mm²)

8 0
7 0
5 0
5 1

- Without brake cores
- With brake cores

C
D

For length code as well as power and signal cables, see "MOTION-CONNECT cables and connections".

- 1) If the absolute encoder is used, M_{rated} is reduced by 10%.
- 2) The same flange as for IM B5 type, but with metric threaded insert in the 4 fixing holes.
- 3) Not possible on the 1FT602.
- 4) Only possible for 1FT602.

- 5) With SIMODRIVE 611 universal HR, the maximum operating frequency of 432 Hz must be complied with.
- 6) The current carrying capacity of the power cables corresponds to IEC 60204-1 for type of routing C under continuous operating conditions with an ambient air temperature of +40 °C (+104 °F), designed for I_0 (100 K), PVC/PUR-insulated cable.

Synchronous motors

Servo motors for SIMODRIVE 611

1FT6 motors - standard type with forced ventilation

Selection and ordering data

Rated speed	Shaft height	Rated power	Standstill torque	Rated torque ¹⁾	Rated current	1FT6 synchronous motors Forced ventilation ²⁾	Pole pair No.	Rotor moment of inertia (without brake)	Weight (without brake)
n_{rated}		P_{rated} at $\Delta T=100$ K	M_0 at $\Delta T=100$ K	M_{rated} at $\Delta T=100$ K	I_{rated} at $\Delta T=100$ K	Order No. Standard type		J	m
rpm		kW (HP)	Nm (lb _f -in)	Nm (lb _f -in)	A			10 ⁻⁴ kgm ² (lb _f -in-s ²)	kg (lb)
1500	100	9.3 (12.47)	65 (575.3)	59 (522.2)	21.7	1FT6 105-8SB7 ■ - ■ ■ ■ ■ ■	4	168 (0.1487)	45.5 (100.3)
		13 (17.43)	90 (796.6)	83 (734.6)	31	1FT6 108-8SB7 ■ - ■ ■ ■ ■ ■	4	260 (0.2301)	61.5 (135.6)
	132	16 (21.45)	110 (973.6)	102 (902.8)	36	1FT6 132-6SB7 1 - ■ ■ ■ ■ ■	3	430 (0.3806)	91 (200.6)
		20.4 (27.35)	140 (1239.1)	130 (1150.6)	45	1FT6 134-6SB7 1 - ■ ■ ■ ■ ■	3	547 (0.4810)	106 (233.7)
		25.1 (33.65)	175 (1548.9)	160 (1416.2)	55	1FT6 136-6SB7 1 - ■ ■ ■ ■ ■	3	664 (0.5876)	123 (271.2)
2000	100	11.7 (15.68)	65 (575.3)	56 (495.6)	28	1FT6 105-8SC7 ■ - ■ ■ ■ ■ ■	4	168 (0.1487)	45.5 (100.3)
		16.8 (22.52)	90 (796.6)	80 (708.1)	40	1FT6 108-8SC7 ■ - ■ ■ ■ ■ ■	4	260 (0.2301)	61.5 (135.6)
	132	20.5 (27.48)	110 (973.6)	98 (867.4)	46	1FT6 132-6SC7 1 - ■ ■ ■ ■ ■	3	430 (0.3806)	91 (200.6)
		26.2 (35.12)	140 (1239.1)	125 (1106.4)	57	1FT6 134-6SC7 1 - ■ ■ ■ ■ ■	3	547 (0.4810)	106 (233.7)
		32.5 (43.56)	175 (1548.9)	155 (1371.9)	72	1FT6 136-6SC7 1 - ■ ■ ■ ■ ■	3	664 (0.5876)	123 (271.2)
• Type of construction:				IM B5 IM B14 ³⁾		1 2			
• Connector outlet direction:				Transverse - right Transverse - left Axially NDE (<u>not</u> for 1FT613) Axially DE		1 2 3 4			
• Encoder systems:				Incremental encoder sin/cos 1 V _{pp} 2048 pulses/revolution Absolute encoder EnDat 2048 pulses/revolution ¹⁾ Multipole resolver ⁴⁾ Resolver 2-pole		A E S T			
• Shaft extension: With fitted key and keyway With fitted key and keyway With fitted key and keyway With fitted key and keyway Plain shaft Plain shaft Plain shaft Plain shaft				• Radial eccentricity tolerance: N N R R N N R R		• Holding brake: without with without with without with without with	A B D E G H K L		
• Vibration severity grade: N N R R				• Degree of protection: ⁵⁾ IP64 IP65 IP64 IP65			0 1 3 4		

To select the degree of protection and type, see "Selection guide".

Selection and ordering data

Motor type (continued)	Standstill current	Calculated power $P_{\text{calc}} [\text{kW}] = \frac{M_0 \times n_{\text{rated}}}{9550}$	SIMODRIVE 611 power module Required rated current		Power cable, completely screened Motor connection (with brake connection) through power supply connector		
	I_0 at M_0 at $\Delta T=100 \text{ K}$	P_{calc} for M_0 at $\Delta T=100 \text{ K}$	I_{rated} at M_0 at $\Delta T=100 \text{ K}$	Order No.	Power supply connector	Motor cable cross- section ⁶⁾	Order No. Prefabricated cable
	A	kW (HP)	A		Size	mm ²	
1FT6 105-8SB7...	21.9	10.2 (13.67)	28	For ordering data, see "Power Modules" in Section 3	1.5	4 x 4	6FX ■ ■ 02 -5 ■ A41-....
1FT6 108-8SB7...	30	14.1 (18.9)	28 ⁷⁾		1.5	4 x 6	-5 ■ A51-....
1FT6 132-6SB7...	36	17.3 (23.19)	56		3	4 x 10	6FX ■ ■ 02 -5 ■ A13-....
1FT6 134-6SB7...	44	22.0 (29.49)	56		3	4 x 10	-5 ■ A13-....
1FT6 136-6SB7...	55	27.5 (36.86)	56		3	4 x 16	-5 ■ A23-....
1FT6 105-8SC7...	30	13.6 (18.23)	28 ⁷⁾		1.5	4 x 6	6FX ■ ■ 02 -5 ■ A51-....
1FT6 108-8SC7...	41	18.8 (25.2)	56		3	4 x 10	-5 ■ A13-....
1FT6 132-6SC7...	47	23.0 (30.83)	56		3	4 x 10	6FX ■ ■ 02 -5 ■ A13-....
1FT6 134-6SC7...	58	29.3 (39.28)	56 ⁷⁾		3	4 x 16	-5 ■ A23-....
1FT6 136-6SC7...	77	36.6 (49.06)	140		3	4 x 25	-5 D A33-....
Design of the power cable:							
• MOTION-CONNECT 800							8 0
• MOTION-CONNECT 700 (<u>only</u> with brake cores)							7 0
• MOTION-CONNECT 500							5 0
• MOTION-CONNECT 500 PLUS (<u>only</u> up to cross-section of 6 mm ²)							5 1
• Without brake cores							C
• With brake cores							D

For length code as well as power and signal cables, see "MOTION-CONNECT cables and connections".

Note on forced ventilation:

	Shaft heights 80 and 100	Shaft height 132
Direction of air flow	From NDE to DE	From DE to NDE
Connection system	Connector size 1	Terminal box
Type of connecting cable	6FX. 002-5CA01-....	6FX. 008-1BB11-....
Pin and terminal assignments	Pin 1: L1, Pin 2: N	U1/L1; V2/L2; W3/L3
Supply voltage	1 AC 220/260 V, 50/60 Hz	3 AC 400/460 V, 50/60 Hz
Max. fan current	0.3 A	0.4 A
Sound pressure level	70 dB (A)	74 dB (A)
Weight of the fan module, approx.	4.8 kg (10.6 lb)	5.6 kg (12.3 lb)

- 1) If the absolute encoder is used, M_{rated} is reduced by 10%.
- 2) Not for use in environments containing conductive dust. Forced ventilation cannot be used in the presence of flammable, corrosive, electrically conductive or explosive dust.
- 3) The same flange as for IM B5 type, but with metric threaded insert in the 4 fixing holes.
- 4) With SIMODRIVE 611 universal HR, the maximum operating frequency of 432 Hz must be complied with.
- 5) The degree of protection refers to the motor. The built-on fan meets the requirements of degree of protection IP54.

- 6) The current carrying capacity of the power cables corresponds to IEC 60204-1 for type of routing C under continuous operating conditions with an ambient air temperature of +40 °C (+104 °F), designed for I_0 (100 K), PVC/PUR-insulated cable.
- 7) With the specified power section, the motor cannot be fully utilized after $\Delta T = 100 \text{ K}$ winding overheating. If a larger power module is used, it must be checked that the specified power cable can be connected to the larger power module.

Synchronous motors

Servo motors for SIMODRIVE 611

1FT6 motors - standard type with forced ventilation

Selection and ordering data

Rated speed	Shaft height	Rated power	Standstill torque	Rated torque ¹⁾	Rated current	1FT6 synchronous motors Forced ventilation ²⁾	Pole pair No.	Rotor moment of inertia (without brake)	Weight (without brake)
n_{rated}		P_{rated} at $\Delta T=100$ K	M_0 at $\Delta T=100$ K	M_{rated} at $\Delta T=100$ K	I_{rated} at $\Delta T=100$ K	Order No. Standard type		J	m
rpm		kW (HP)	Nm (lb _f -in)	Nm (lb _f -in)	A			10 ⁻⁴ kgm ² (lb _f -in-s ²)	kg (lb)
3000	80	6.9 (9.25)	26 (230.1)	22 (194.7)	17	1FT6 084-8SF7 ■ - ■ ■ ■ ■ ■	4	48 (0.0425)	25 (55.1)
		9.7 (13)	35 (309.8)	31 (274.4)	24.5	1FT6 086-8SF7 ■ - ■ ■ ■ ■ ■	4	66.5 (0.0589)	30 (66.2)
	100	15.7 (21.05)	65 (575.3)	50 (442.6)	35	1FT6 105-8SF7 ■ - ■ ■ ■ ■ ■	4	168 (0.1487)	45.5 (100.3)
		22 (29.49)	90 (796.6)	70 (619.6)	53	1FT6 108-8SF7 ■ - ■ ■ ■ ■ ■	4	260 (0.2301)	61.5 (135.6)
	132	28.3 (37.94)	110 (973.6)	90 (796.6)	62	1FT6 132-6SF7 1 - ■ ■ ■ ■ ■	3	430 (0.3806)	91 (200.6)
		34.6 (46.38)	140 (1239.1)	110 (973.6)	72	1FT6 134-6SF7 1 - ■ ■ ■ ■ ■	3	547 (0.4810)	106 (233.7)
4500	80	9.4 (12.6)	26 (230.1)	20 (177)	24.5	1FT6 084-8SH7 ■ - ■ ■ ■ ■ ■	4	48 (0.0425)	25 (55.1)
		12.7 (17.02)	35 (309.8)	27 (239)	31.5	1FT6 086-8SH7 ■ - ■ ■ ■ ■ ■	4	66.5 (0.0589)	30 (66.2)
	100	18.8 (25.2)	65 (575.3)	40 (354)	41	1FT6 105-8SH7 ■ - ■ ■ ■ ■ ■	4	168 (0.1487)	45.5 (100.3)
6000	80	10.7 (14.34)	26 (230.1)	17 (150.5)	25.5	1FT6 084-8SK7 ■ - ■ ■ ■ ■ ■	4	48 (0.0425)	25 (55.1)
		13.8 (18.5)	35 (309.8)	22 (194.7)	29	1FT6 086-8SK7 ■ - ■ ■ ■ ■ ■	4	66.5 (0.0589)	30 (66.2)
• Type of construction:			IM B5 IM B14 ³⁾			1 2			
• Connector outlet direction:			Transverse - right Transverse - left Axially NDE (not for 1FT613) Axially DE				1 2 3 4		
• Encoder systems:			Incremental encoder sin/cos 1 V _{pp} 2048 pulses/revolution Absolute encoder EnDat 2048 pulses/revolution ¹⁾ Multipole resolver ⁴⁾ Resolver 2-pole				A E S T		
• Shaft extension: With fitted key and keyway With fitted key and keyway With fitted key and keyway With fitted key and keyway Plain shaft Plain shaft Plain shaft Plain shaft			• Radial eccentricity tolerance: N N R R N N R R			• Holding brake: without with without with without with without with		A B D E G H K L	
• Vibration severity grade: N N R R			• Degree of protection: ⁵⁾ IP64 IP65 IP64 IP65				0 1 3 4		

To select the degree of protection and type, see "Selection guide".

Motor type (continued)	Standstill current	Calculated power P_{calc} [kW] = $M_0 \times n_{\text{rated}}/9550$	SIMODRIVE 611 power module Required rated current		Power cable, completely screened Motor connection (with brake connection) through power supply connector		
	I_0 at M_0 at $\Delta T=100$ K A	P_{calc} for M_0 at $\Delta T=100$ K kW (HP)	I_{rated} at M_0 at $\Delta T=100$ K A	Order No.	Power supply connector Size	Motor cable cross- section ⁶⁾ mm ²	Order No. Prefabricated cable
1FT6 084-8SF7...	18.2	8.2 (10.99)	18 ⁷⁾	For ordering data, see "Power Modules" in Section 3	1.5	4 x 2.5	6FX ■ ■ 02 -5 ■ A31-....
1FT6 086-8SF7...	25	11.0 (14.75)	28		1.5	4 x 4	-5 ■ A41-....
1FT6 105-8SF7...	42	20.4 (27.35)	56		3	4 x 10	6FX ■ ■ 02 -5 ■ A13-....
1FT6 108-8SF7...	62	28.3 (37.94)	70		3	4 x 16	-5 ■ A23-....
1FT6 132-6SF7...	69	34.6 (46.38)	140		3	4 x 25	6FX ■ ■ 02 -5 D A33-....
1FT6 134-6SF7...	83	44.0 (58.98)	140		3	4 x 25	-5 D A33-....
1FT6 084-8SH7...	26	12.3 (16.49)	28		1.5	4 x 4	6FX ■ ■ 02 -5 ■ A41-....
1FT6 086-8SH7...	38	16.5 (22.12)	56		3	4 x 10	-5 ■ A13-....
1FT6 105-8SH7...	59	30.6 (41.02)	56 ⁷⁾		3	4 x 16	6FX ■ ■ 02 -5 ■ A23-....
1FT6 084-8SK7...	35	16.3 (21.85)	56		1.5	4 x 10	6FX ■ ■ 02 -5 ■ A61-....
1FT6 086-8SK7...	44	22.0 (29.49)	56		3	4 x 10	-5 ■ A13-....

8	0
7	0
5	0
5	1

- C**
D

	Shaft heights 80 and 100	Shaft height 132
Direction of air flow	From NDE to DE	From DE to NDE
Connection system	Connector size 1	Terminal box
Type of connecting cable	6FX. 002-5CA01-....	6FX. 008-1BB11-....
Pin and terminal assignments	Pin 1: L1, Pin 2: N	U1/L1; V2/L2; W3/L3
Supply voltage	1 AC 220/260 V, 50/60 Hz	3 AC 400/460 V, 50/60 Hz
Max. fan current	0.3 A	0.4 A
Sound pressure level	70 db (A)	74 dB (A)
Weight of the fan module, approx.	4.8 kg (10.6 lb)	5.6 kg (12.3 lb)

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Synchronous motors

Servo motors for SIMODRIVE 611

1FT6 motors - standard type with water cooling

Selection and ordering data

Rated speed	Shaft height	Rated power	Standstill torque	Rated torque	Rated current	1FT6 synchronous motors Water cooling ¹⁾²⁾	Number of pole pairs	Rotor moment of inertia (without brake)	Weight (without brake)
n_{rated}		P_{rated} at $\Delta T=100$ K	M_0 at $\Delta T=100$ K	M_{rated} at $\Delta T=100$ K	I_{rated} at $\Delta T=100$ K	Order No. Standard type		J	m
rpm		kW (HP)	Nm (lb _f -in)	Nm (lb _f -in)	A			10 ⁻⁴ kgm ² (lb _f -in-s ²)	kg (lb)
1500	100	18.2 (24.4)	119 (1053.3)	116 (1026.7)	43	1FT6 108-8WB7 ■ - ■ ■ ■ ■ ■	4	260 (0.2301)	61.5 (135.6)
2000	100	17.2 (23.06)	85 (752.3)	82 (725.8)	60	1FT6 105-8WC7 ■ - ■ ■ ■ ■ ■	4	168 (0.1487)	45.5 (100.3)
		24.1 (32.31)	119 (1053.3)	115 (1017.8)	57	1FT6 108-8WC7 ■ - ■ ■ ■ ■ ■	4	260 (0.2301)	61.5 (135.6)
3000	63	3.2 (4.29)	10.2 (90.3)	10 (88.5)	6.9	1FT6 062-6WF7 ■ - ■ ■ ■ ■ ■	3	8.5 (0.0075)	9.5 (20.9)
		5.1 (6.84)	16.2 (143.4)	16 (141.6)	10.3	1FT6 064-6WF7 ■ - ■ ■ ■ ■ ■	3	13 (0.0115)	12.5 (27.6)
	80	11.0 (14.75)	35 (309.8)	35 (309.8)	27	1FT6 084-8WF7 ■ - ■ ■ ■ ■ ■	4	48 (0.0425)	21 (46.3)
		14.5 (19.44)	47 (416)	46 (407.1)	37	1FT6 086-8WF7 ■ - ■ ■ ■ ■ ■	4	66.5 (0.0589)	26 (57.3)
	100	24.5 (32.84)	85 (752.3)	78 (690.4)	82	1FT6 105-8WF7 ■ - ■ ■ ■ ■ ■	4	168 (0.1487)	45.5 (100.3)
		34.2 (45.84)	119 (1053.3)	109 (964.8)	81	1FT6 108-8WF7 ■ - ■ ■ ■ ■ ■	4	260 (0.2301)	61.5 (135.6)
4500	63	4.7 (6.3)	10.2 (90.3)	10 (88.5)	9.6	1FT6 062-6WH7 ■ - ■ ■ ■ ■ ■	3	8.5 (0.0075)	9.5 (20.9)
		7.5 (10.05)	16.2 (143.4)	16 (141.6)	15.2	1FT6 064-6WH7 ■ - ■ ■ ■ ■ ■	3	13 (0.0115)	12.5 (27.6)
	80	16.5 (22.12)	35 (309.8)	35 (309.8)	39	1FT6 084-8WH7 ■ - ■ ■ ■ ■ ■	4	48 (0.0425)	21 (46.3)
		21.2 (28.42)	47 (416)	45 (398.3)	53	1FT6 086-8WH7 ■ - ■ ■ ■ ■ ■	4	66.5 (0.0589)	26 (57.3)
6000	63	6.2 (8.31)	10.2 (90.3)	9.8 (87)	12.7	1FT6 062-6WK7 ■ - ■ ■ ■ ■ ■	3	8.5 (0.0075)	9.5 (20.9)
		9.9 (13.27)	16.2 (143.4)	15.8 (139.8)	20	1FT6 064-6WK7 ■ - ■ ■ ■ ■ ■	3	13 (0.0115)	12.5 (27.6)
	80	21.4 (28.69)	35 (309.8)	34 (300.9)	51	1FT6 084-8WK7 ■ - ■ ■ ■ ■ ■	4	48 (0.0425)	21 (46.3)
		27.7 (37.13)	47 (416)	44 (389.4)	58	1FT6 086-8WK7 ■ - ■ ■ ■ ■ ■	4	66.5 (0.0589)	26 (57.3)
• Type of construction:				IM B5 IM B14 ³⁾		1 2			
• Connector outlet direction:				Transverse - right (not for 1FT606) Transverse - left (not for 1FT606) Axially NDE Axially DE (1FT6062 only with water connection on side or bottom) ¹⁾		1 2 3 4			
• Encoder systems:				Incremental encoder sin/cos 1 V _{pp} 2048 pulses/revolution Absolute encoder EnDat 2048 pulses/revolution Multipole resolver ⁴⁾ Resolver 2-pole		A E S T			
• Shaft extension: With fitted key and keyway With fitted key and keyway With fitted key and keyway With fitted key and keyway Plain shaft Plain shaft Plain shaft Plain shaft				• Radial eccentricity tolerance: N N R R N N R R		• Holding brake: without with without with without with without with		A B D E G H K L	
• Vibration severity grade: N N N N R R R R				• Degree of protection: IP64 IP65 IP67 IP68 IP64 IP65 IP67 IP68			0 1 2 6 3 4 5 7		

To select the degree of protection and type, see "Selection guide".

Synchronous motors

Servo motors for SIMODRIVE 611

1FT6 motors - standard type
with water cooling

Selection and ordering data

Motor type (continued)	Standstill current	Calculated power $P_{\text{calc}} [\text{kW}] = \frac{M_0 \times n_{\text{rated}}}{9550}$	SIMODRIVE 611 power module Required rated current		Power cable, completely screened Motor connection (with brake connection) through power supply connector		
	I_0 at M_0 at $\Delta T = 100 \text{ K}$ A	P_{calc} for M_0 at $\Delta T = 100 \text{ K}$ kW (HP)	I_{rated} at M_0 at $\Delta T = 100 \text{ K}$ A	Order No.	Power supply connector Size	Motor cable cross- section ⁵⁾ mm ²	Order No. Prefabricated cable
1FT6 108-8WB7...	43	18.7 (25.07)	56	For ordering data, see "Power Modules" in Section 3	3	4 x 10	6FX ■ ■ 02 -5 ■ A13-....
1FT6 105-8WC7...	58	17.8 (23.86)	56 ⁶⁾		3	4 x 16	6FX ■ ■ 02 -5 ■ A23-....
1FT6 108-8WC7...	57	24.9 (33.38)	56 ⁶⁾		3	4 x 16	-5 ■ A23-....
1FT6 062-6WF7...	6.9	3.2 (4.29)	9		1	4 x 1.5	6FX ■ ■ 02 -5 ■ A01-....
1FT6 064-6WF7...	10.3	5.1 (6.84)	18		1	4 x 1.5	-5 ■ A01-....
1FT6 084-8WF7...	24.5	11.0 (14.75)	28		1.5	4 x 4	6FX ■ ■ 02 -5 ■ A41-....
1FT6 086-8WF7...	34	14.8 (19.84)	56		1.5	4 x 10	-5 ■ A61-....
1FT6 105-8WF7...	83	26.7 (35.79)	140		3	4 x 25	6FX ■ ■ 02 -5 D A33-....
1FT6 108-8WF7...	86	37.4 (50.13)	140		3	4 x 35	-5 D A43-....
1FT6 062-6WH7...	9.7	4.8 (6.43)	18		1	4 x 1.5	6FX ■ ■ 02 -5 ■ A01-....
1FT6 064-6WH7...	15.4	7.6 (10.19)	18		1	4 x 2.5	-5 ■ A11-....
1FT6 084-8WH7...	37	16.5 (22.12)	56		1.5	4 x 10	6FX ■ ■ 02 -5 ■ A61-....
1FT6 086-8WH7...	52	22.1 (29.62)	56		3	4 x 16	-5 ■ A23-....
1FT6 062-6WK7...	12.9	6.4 (8.58)	18		1	4 x 1.5	6FX ■ ■ 02 -5 ■ A01-....
1FT6 064-6WK7...	20.5	10.2 (13.67)	28		1	4 x 2.5	-5 ■ A11-....
1FT6 084-8WK7...	47	22.0 (29.49)	56		3	4 x 10	6FX ■ ■ 02 -5 ■ A13-....
1FT6 086-8WK7...	59	29.5 (39.54)	70		3	4 x 16	-5 ■ A23-....

Design of the power cable:

- MOTION-CONNECT 800
- MOTION-CONNECT 700 (only with brake cores)
- MOTION-CONNECT 500
- MOTION-CONNECT 500 PLUS (only up to cross-section of 6 mm²)

8 0
7 0
5 0
5 1

- Without brake cores
- With brake cores

C
D

For length code as well as power and signal cables, see "MOTION-CONNECT cables and connections".

Notes on water cooling:

- Inlet temperature of the cooling water: max. +30 °C (+86 °F)
- Cooling water throughput: At least 5 l/min
- Pressure ahead of motor: $p_{\text{max}} = 3 \text{ bar}$
- Cooling water connection: G 3/8"
- Coolant: Water (up to max 25% corrosion protection, recommendation: Tyfocor)
- Loss of pressure between inlet and outlet < 0.1 bar

- 1) Water connection
 - right side: Order code Q20
 - left side: Order code Q21
 - bottom: Order code Q22
- 2) Delivered as standard with water connection on top.
- 3) The same flange as for IM B5 type, but with metric threaded insert in the 4 fixing holes.
- 4) With SIMODRIVE 611 universal HR, the maximum operating frequency of 432 Hz must be complied with.

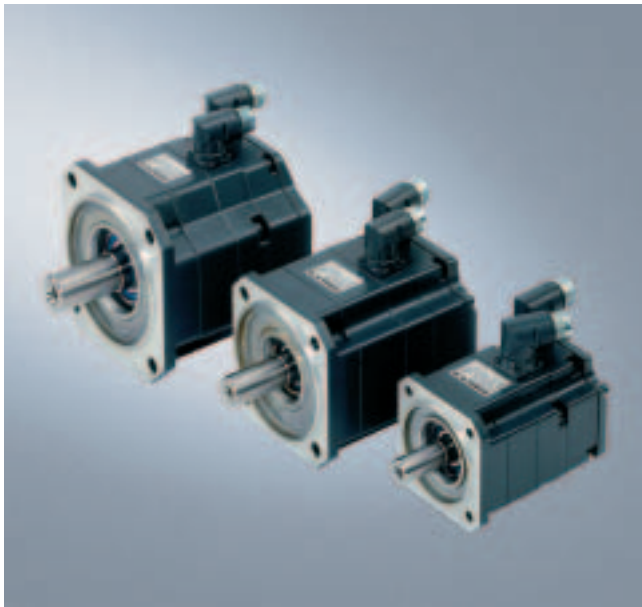
- 5) The current carrying capacity of the power cables corresponds to IEC 60204-1 for type of routing C under continuous operating conditions with an ambient air temperature of +40 °C (+104 °F), designed for I_0 (100 K), PVC/PUR-insulated cable.
- 6) With the specified power module, the motor cannot be fully utilized after $\Delta T = 100 \text{ K}$ winding overheating. If a larger power module is used, it must be checked that the specified power cable can be connected to the larger power module.

Synchronous motors

Servo motors for SIMODRIVE 611

1FK7 motors

Overview



The 1FK7 motors are extremely compact, permanent magnet excited synchronous motors. The available options, gearboxes and encoders, together with the expanded product range, mean that the 1FK7 motors can be optimally adapted to any application. They therefore also satisfy the permanently increasing demands of state-of-the-art machine generations.

Together with the SIMODRIVE 611 converter system, the 1FK7 motors comprise a powerful system with high functionality. The built-in encoder systems for speed and position control can be selected depending on the application.

The motors are designed for operation without external cooling and the heat is dissipated through the motor surface. The 1FK7 motors have a high overload capability.

Benefits

The 1FK7 Compact motors offer:

- Space-saving installation thanks to extremely high power/weight ratio
- Universal implementation in numerous applications
- Wide range of motors

The 1FK7 High Dynamic motors offer:

- Extremely high dynamic response thanks to low rotor moment of inertia

Application

- Machine tools
- Robots and manipulators
- Wood, glass, ceramics and stone working
- Packaging, plastics and textile machines
- Auxiliary axes

Technical data

1FK7 motors

Type of motor	Permanent magnet excited synchronous motor
Magnet material	Rare-earth magnet material
Insulation of the stator winding to EN 60034-1 (IEC 60034-1)	Temperature class F for a winding temperature of $\Delta T = 100$ K at an ambient temperature of $+40$ °C ($+104$ °F)
Type according to EN 60034-7 (IEC 60034-7)	IM B5 (IM V1, IM V3)
Degree of protection according to EN 60034-5 (IEC 60034-5)	IP64
Cooling	Natural cooling
Temperature monitoring	KTY 84 temperature sensor in stator winding
Paint finish	Unpainted
2nd rating plate	Glued to end shield
3rd rating plate	Supplied separately packed
Shaft extension on the drive end in accordance with DIN 748-3 (IEC 60072-1)	Plain shaft
Rotational accuracy, concentricity, and linear movement in accordance with DIN 42955 (IEC 60072-1)	Tolerance N (normal)
Vibration severity to EN 60034-14 (IEC 60034-14)	Grade N (normal)
Max. sound pressure level to EN ISO 1680	1FK702: 55 dB (A) 1FK703: 55 dB (A) 1FK704: 55 dB (A) 1FK706: 65 dB (A) 1FK708: 70 dB (A) 1FK710: 70 dB (A)

1FK7 motors

Built-in encoder systems	• Incremental encoder sin/cos $1 V_{pp}$, 2048 pulses/revolution • Absolute encoder, multiturn, 2048 pulses/revolution for 1FK704 to 1FK710. 512 pulses/revolution for 1FK702 and 1FK703 and traversing range 4096 revolutions with EnDat interface • Basic absolute encoder, multiturn, 32 pulses/revolution and traversing range 4096 revolutions with EnDat interface • Multipole resolver ¹⁾ (number of poles corresponds to number of pole pairs of the motor) • Resolver 2-pole
Connection	Connectors for signals and power can be rotated (270°)
Options	• Shaft extension on the drive end with fitted key and keyway (half-key balancing) • Built-in holding brake • Degree of protection IP65, additional drive end flange IP67 • Planetary gearbox (requires: plain shaft extension) • Anthracite paint finish

1) The operating frequency of max. 432 Hz must be observed with SIMODRIVE 611 universal HR.

Synchronous motors

Servo motors for SIMODRIVE 611

1FK7 Compact motors - core type with natural cooling

Selection and ordering data

Rated speed	Shaft height	Rated power	Standstill torque	Rated torque ¹⁾	Rated current	1FK7 synchronous motors Compact Natural cooling	Number of pole pairs	Rotor moment of inertia (without brake)	Weight (without brake)	
n_{rated}		P_{rated} at $\Delta T=100\text{ K}$	M_0 at $\Delta T=100\text{ K}$	M_{rated} at $\Delta T=100\text{ K}$	I_{rated} at $\Delta T=100\text{ K}$	Order No. Core type		J	m	
rpm		kW (HP)	Nm (lb _f -in)	Nm (lb _f -in)	A			10 ⁻⁴ kgm ² (lb _f -in-s ²)	kg (lb)	
2000	100	7.75 (10.39)	48 (424.8)	37 (327.5)	16	1FK7 105-5AC7 1 - 1 ■ ■ ■ ■	4	156 (0.1381)	39.1 (86.2)	
3000	48	0.82 (1.1)	3 (26.6)	2.6 (23)	1.95	1FK7 042-5AF7 1 - 1 ■ ■ ■ ■	4	3.01 (0.0027)	4.9 (10.8)	
	63	1.48 (1.98)	6 (53.1)	4.7 (41.6)	3.7	1FK7 060-5AF7 1 - 1 ■ ■ ■ ■	4	7.95 (0.0070)	7 (15.4)	
		2.29 (3.07)	11 (97.4)	7.3 (64.6)	5.6	1FK7 063-5AF7 1 - 1 ■ ■ ■ ■	4	15.1 (0.0134)	11.5 (25.4)	
	80	2.14 (2.87)	8 (70.8)	6.8 (60.2)	4.4	1FK7 080-5AF7 1 - 1 ■ ■ ■ ■	4	15 (0.0133)	10 (22.1)	
		3.3 (4.42)	16 (141.6)	10.5 (92.9)	7.4	1FK7 083-5AF7 1 - 1 ■ ■ ■ ■	4	27.3 (0.0242)	14 (30.9)	
	100	3.77 (5.05)	18 (159.3)	12 (106.1)	8	1FK7 100-5AF7 1 - 1 ■ ■ ■ ■	4	55.3 (0.0489)	19 (41.9)	
		4.87 (6.53)	27 (238)	15.5 (137.2)	11.8	1FK7 101-5AF7 1 - 1 ■ ■ ■ ■	4	79.9 (0.0707)	21 (46.3)	
		5.37 (7.2) ²⁾	36 (318.6)	20.5 (181.4) ²⁾	16.5 ²⁾	1FK7 103-5AF7 1 - 1 ■ ■ ■ ■	4	105 (0.0929)	29 (63.9)	
		8.17 (10.95)	48 (424.8)	26 (230.1)	18	1FK7 105-5AF7 1 - 1 ■ ■ ■ ■	4	156 (0.1381)	39.1 (86.2)	
4500	63	1.74 (2.33) 2.09 (2.8) ³⁾	6 (53.1) 11 (97.4)	3.7 (32.7) 5 (44.3) ³⁾	4.1 6.1 ³⁾	1FK7 060-5AH7 1 - 1 ■ ■ ■ ■ 1FK7 063-5AH7 1 - 1 ■ ■ ■ ■	4 4	7.95 (0.0070) 15.1 (0.0134)	7 (15.4) 11.5 (25.4)	
	80	2.39 (3.2) 3.04 (4.8) ⁴⁾	8 (70.8) 16 (141.6)	5.7 (50.5) 8.3 (73.5) ⁴⁾	5.6 9 ⁴⁾	1FK7 080-5AH7 1 - 1 ■ ■ ■ ■ 1FK7 083-5AH7 1 - 1 ■ ■ ■ ■	4 4	15 (0.0133) 27.3 (0.0242)	10 (22.1) 14 (30.9)	
		6000	28	0.4 (0.54)	0.85 (7.5)	0.6 (5.3)	1.4	1FK7 022-5AK7 1 - 1 ■ ■ ■ ■	3	0.28 (0.0002)
36	0.5 (0.63)		1.1 (9.7)	0.8 (7.1)	1.4	1FK7 032-5AK7 1 - 1 ■ ■ ■ ■	3	0.61 (0.0005)	2.7 (6)	
48	0.69 (0.92) 1.02 (1.41) ⁵⁾		1.6 (14.2) 3 (26.6)	1.1 (9.7) 2 (17.7) ⁵⁾	1.7 3.1 ⁵⁾	1FK7 040-5AK7 1 - 1 ■ ■ ■ ■ 1FK7 042-5AK7 1 - 1 ■ ■ ■ ■	4 4	1.69 (0.0015) 3.01 (0.0027)	3.5 (7.7) 4.9 (10.8)	
• Encoder systems:			Incremental encoder sin/cos 1 V _{pp} 2048 pulses/revolution Absolute encoder EnDat 2048 pulses/revolution ¹⁾⁶⁾ Absolute encoder EnDat 512 pulses/revolution ¹⁾⁷⁾ Basic absolute encoder EnDat 32 pulses/revolution ¹⁾⁶⁾ Multipole resolver ⁸⁾ 2-pole resolver			A E H G S T				
• Shaft extension: With fitted key and keyway With fitted key and keyway Plain shaft Plain shaft			• Radial eccentricity tolerance: N N N N		• Holding brake: Without With Without With		A B G H			
• Degree of protection:			IP64 IP65 and additional IP67 drive end flange IP64, anthracite paint finish IP65 and additional drive end flange IP67, anthracite paint finish IP65 and additional drive end flange IP67, anthracite paint finish and metal rating plate on motor			0 2 3 5 8				

To select the degree of protection and type, see "Selection guide".

Selection and ordering data

Motor type (continued)	Standstill current	Calculated power $P_{\text{calc}} [\text{kW}] = \frac{M_0 \times n_{\text{rated}}}{9550}$	SIMODRIVE 611 power module Required rated current		Power cable, completely screened Motor connection (with brake connection) through power supply connector		
	I_0 at M_0 at $\Delta T = 100 \text{ K}$ A	P_{calc} for M_0 at $\Delta T = 100 \text{ K}$ kW (HP)	I_{rated} at M_0 at $\Delta T = 100 \text{ K}$ A	Order No.	Power supply connector Size	Motor cable cross- section ⁹⁾ mm ²	Order No. Prefabricated cable
1FK7 105-5AC71...	20	10 (13.4)	28	For ordering data, see "Power Modules" in Section 3	1.5	4 x 2.5	6FX ■ ■ 02 -5 ■ A31-....
1FK7 042-5AF71...	2.2	0.9 (1.21)	3		1	4 x 1.5	6FX ■ ■ 02 -5 ■ A01-....
1FK7 060-5AF71...	4.5	1.9 (2.55)	5		1	4 x 1.5	6FX ■ ■ 02 -5 ■ A01-....
1FK7 063-5AF71...	8	3.5 (4.69)	9		1	4 x 1.5	■ -5 ■ A01-....
1FK7 080-5AF71...	4.8	2.5 (3.35)	5		1	4 x 1.5	6FX ■ ■ 02 -5 ■ A01-....
1FK7 083-5AF71...	10.4	5.0 (6.7)	9 ¹⁰⁾		1	4 x 1.5	■ -5 ■ A01-....
1FK7 100-5AF71...	11.2	5.7 (7.64)	18		1	4 x 1.5	6FX ■ ■ 02 -5 ■ A01-....
1FK7 101-5AF71...	19	8.5 (11.39)	18 ¹⁰⁾		1.5	4 x 2.5	■ -5 ■ A31-....
1FK7 103-5AF71...	27.5	11.3 (15.15)	28		1.5	4 x 4.0	■ -5 ■ A41-....
1FK7 105-5AF71...	31	15 (20.11)	28 ¹⁰⁾		1.5	4 x 10	■ -5 ■ A61-....
1FK7 060-5AH71...	6.2	2.8 (3.75)	9		1	4 x 1.5	6FX ■ ■ 02 -5 ■ A01-....
1FK7 063-5AH71...	12	5.2 (6.97)	18		1	4 x 1.5	■ -5 ■ A01-....
1FK7 080-5AH71...	7.4	3.8 (5.09)	9		1	4 x 1.5	6FX ■ ■ 02 -5 ■ A01-....
1FK7 083-5AH71...	15	7.5 (10.05)	18		1	4 x 1.5	■ -5 ■ A01-....
1FK7 022-5AK71...	1.8	0.5 (0.67)	3		1	4 x 1.5	6FX ■ ■ 02 -5 ■ A01-....
1FK7 032-5AK71...	1.7	0.7 (0.94)	3		1	4 x 1.5	6FX ■ ■ 02 -5 ■ A01-....
1FK7 040-5AK71...	2.25	1.0 (1.34)	3		1	4 x 1.5	6FX ■ ■ 02 -5 ■ A01-....
1FK7 042-5AK71...	4.4	1.9 (2.55)	5		1	4 x 1.5	■ -5 ■ A01-....

Design of the power cable:

- MOTION-CONNECT 800
- MOTION-CONNECT 700 (only with brake cores)
- MOTION-CONNECT 500
- MOTION-CONNECT 500 PLUS (only up to cross-section of 6 mm²)

8 0
7 0
5 0
5 1

- Without brake cores
- With brake cores

C
D

For length code as well as power and signal cables, see "MOTION-CONNECT cables and connections".

- 1) If the absolute encoder is used, M_{rated} is reduced by 10%.
- 2) Rated power/current based on $n = 2500 \text{ rpm}$.
- 3) Rated power/current based on $n = 4000 \text{ rpm}$.
- 4) Rated power/current based on $n = 3500 \text{ rpm}$.
- 5) Rated power/current based on $n = 5000 \text{ rpm}$.
- 6) Not possible for 1FK702 and 1FK703.
- 7) Only possible for 1FK702 and 1FK703.
- 8) The operating frequency of max. 432 Hz must be observed with SIMODRIVE 611 universal HR.

- 9) The current carrying capacity of the power cables corresponds to IEC 60204-1 for type of routing C under continuous operating conditions with an ambient air temperature of +40 °C (+104 °F), designed for I_0 (100 K), PVC/PUR-insulated cable.
- 10) With the specified power module, the motor cannot be fully utilized after $\Delta T = 100 \text{ K}$ winding overheating. If a larger power module is used, it must be checked that the specified power cable can be connected to the larger power module.

Synchronous motors

Servo motors for SIMODRIVE 611

1FK7 High Dynamic motors - core type with natural cooling

Selection and ordering data

Rated speed	Shaft height	Rated power	Standstill torque	Rated torque ¹⁾	Rated current	1FK7 High Dynamic synchronous motors with natural cooling	Pole pair No.	Rotor moment of inertia (without brake)	Weight (without brake)
n_{rated}		P_{rated} at $\Delta T=100\text{ K}$	M_0 at $\Delta T=100\text{ K}$	M_{rated} at $\Delta T=100\text{ K}$	I_{rated} at $\Delta T=100\text{ K}$	Order No. Core type		J	m
rpm		kW (HP)	Nm (lb _f -in)	Nm (lb _f -in)	A			10 ⁻⁴ kgm ² (lb _f -in-s ²)	kg (lb)
3000	48	1.1 (1.47)	4 (35.4)	3.5 (31)	4	1FK7 044-7AF7 1 - 1 ■ ■ ■ ■	3	1.28 (0.0011)	7.7 (17)
	63	1.7 (2.29)	6.4 (56.6)	5.4 (47.8)	5.3	1FK7 061-7AF7 1 - 1 ■ ■ ■ ■	3	3.4 (0.0030)	10 (22.1)
		2.51 (3.36)	12 (106.2)	8 (70.8)	7.5	1FK7 064-7AF7 1 - 1 ■ ■ ■ ■	3	6.5 (0.0058)	15.5 (34.2)
	80	2.51 (3.36)	14 (123.9)	8 (70.8)	6.7	1FK7 082-7AF7 1 - 1 ■ ■ ■ ■	4	14 (0.0124)	17.2 (37.9)
		3.14 (4.21) ²⁾	22 (194.7)	12 (106.2) ²⁾	12.5 ²⁾	1FK7 085-7AF7 1 - 1 ■ ■ ■ ■	4	23 (0.0204)	23.5 (51.8)
4500	48	1.23 (1.65)	3.1 (27.4)	2.6 (23)	4	1FK7 043-7AH7 1 - 1 ■ ■ ■ ■	3	1 (0.0009)	6.7 (14.8)
		1.41 (1.53)	4 (35.4)	3 (26.6)	4.9	1FK7 044-7AH7 1 - 1 ■ ■ ■ ■	3	1.28 (0.0011)	7.7 (17)
	63	2.03 (2.72)	6.4 (56.6)	4.3 (38.1)	5.9	1FK7 061-7AH7 1 - 1 ■ ■ ■ ■	3	3.4 (0.0030)	10 (22.1)
		2.36 (3.16)	12 (106.2)	5 (44.3)	7	1FK7 064-7AH7 1 - 1 ■ ■ ■ ■	3	6.5 (0.0058)	15.5 (34.2)
6000	36	0.57 (0.76)	1.3 (11.5)	0.9 (8)	1.5	1FK7 033-7AK7 1 - 1 ■ ■ ■ ■	3	0.27 (0.0002)	3.1 (6.8)
	48	1.26 (1.69)	3.1 (27.4)	2 (17.7)	4.4	1FK7 043-7AK7 1 - 1 ■ ■ ■ ■	3	1 (0.0009)	6.3 (13.9)
• Encoder systems:			Incremental encoder sin/cos 1 V _{pp} 2048 pulses/revolution Absolute encoder EnDat 2048 pulses/revolution ¹⁾³⁾ Absolute encoder EnDat 512 pulses/revolution ¹⁾⁴⁾ Basic absolute encoder EnDat 32 pulses/revolution ¹⁾³⁾ Multipole resolver ⁵⁾ 2-pole resolver			A E H G S T			
• Shaft extension: With fitted key and keyway With fitted key and keyway Plain shaft Plain shaft			• Radial eccentricity tolerance: N N N N		• Holding brake: Without With Without With		A B G H		
• Degree of protection:			IP64 IP65 and additional IP67 drive end flange IP64 anthracite paint finish IP65 and additional IP67 drive end flange, anthracite paint finish IP65 and additional IP67 drive end flange, anthracite paint finish and metal rating plate on motor			0 2 3 5 8			

To select the degree of protection and type, see "Selection guide".

Synchronous motors

Servo motors for SIMODRIVE 611

1FK7 High Dynamic motors - core type
with natural cooling

Selection and ordering data

Motor type (continued)	Standstill current	Calculated power $P_{calc} [kW] = \frac{M_0 \times n_{rated}}{9550}$	SIMODRIVE 611 power module Required rated current		Power cable, completely screened Motor connection (with brake connection) through power supply connector		
	I_0 at M_0 at $\Delta T = 100 \text{ K}$ A	P_{calc} for M_0 at $\Delta T = 100 \text{ K}$ kW (HP)	I_{rated} at M_0 at $\Delta T = 100 \text{ K}$ A	Order No.	Power supply connector Size	Motor cable cross- section ⁶⁾ mm ²	Order No. Prefabricated cable
1FK7 044-7AF71...	4.5	1.3 (1.74)	5	For ordering data, see "Power Modules" in Section 3	1	4 x 1.5	6FX ■ ■ 02 -5 ■ A01-....
1FK7 061-7AF71...	6.1	2.0 (2.68)	9		1	4 x 1.5	6FX ■ ■ 02 -5 ■ A01-....
1FK7 064-7AF71...	11	3.8 (5.09)	18		1	4 x 1.5	■ -5 ■ A01-....
1FK7 082-7AF71...	10.6	4.4 (5.9)	18		1	4 x 1.5	6FX ■ ■ 02 -5 ■ A01-....
1FK7 085-7AF71...	22.5	6.9 (9.25)	28		1.5	4 x 4	■ -5 ■ A41-....
1FK7 043-7AH71...	4.5	1.5 (2.01)	5		1	4 x 1.5	6FX ■ ■ 02 -5 ■ A01-....
1FK7 044-7AH71...	6.3	1.9 (2.55)	9		1	4 x 1.5	■ -5 ■ A01-....
1FK7 061-7AH71...	8	3.0 (4.02)	9		1	4 x 1.5	6FX ■ ■ 02 -5 ■ A01-....
1FK7 064-7AH71...	15	5.7 (7.64)	18		1	4 x 1.5	■ -5 ■ A01-....
1FK7 033-7AK71...	2.2	0.8 (1.07)	3		1	4 x 1.5	6FX ■ ■ 02 -5 ■ A01-....
1FK7 043-7AK71...	6.4	1.9 (2.55)	9		1	4 x 1.5	6FX ■ ■ 02 -5 ■ A01-....

Design of the power cable:

- MOTION-CONNECT 800
- MOTION-CONNECT 700 (only with brake cores)
- MOTION-CONNECT 500
- MOTION-CONNECT 500 PLUS (only up to cross-section of 6 mm²)

8 0
7 0
5 0
5 1

- Without brake cores
- With brake cores

C
D

For length code as well as power and signal cables, see "MOTION-CONNECT cables and connections".

1) If the absolute encoder is used, M_{rated} is reduced by 10%.
2) Rated power/current based on $n = 2500 \text{ rpm}$.
3) Not possible on the 1FK703.
4) Only possible on the 1FK703.

5) The operating frequency of max. 432 Hz must be observed with SIMODRIVE 611 universal HR.
6) The current carrying capacity of the power module corresponds to IEC 60204-1 for type of routing C under continuous operating conditions with an ambient air temperature of +40 °C (+104 °F), designed for I_0 (100 K), PVC/PUR-insulated cable.

Synchronous motors

Gearboxes for 1FT6 motors standard type

Planetary gearbox Series SP

Overview



1FT6 motors with attached planetary gearbox of Series SP

1FT6 motors can be combined with planetary gearboxes to form compact coaxial drive units. The gearboxes are flanged directly to the drive end of the motors.

When selecting the gearboxes, ensure that the permissible speed of the gearbox is not exceeded by the maximum speed of the motor. In the case of high operating frequencies, an allowance must be made for the jolt factor f_2 (see Planning Guide). The frictional losses of the gearbox must always be taken into account in planning.

The gearboxes are only available in non-balanced design.

Benefits

- High efficiency > 94% 2-stage, > 97% single-stage
- Power transmission from the central sun gear via planetary gears
- No shaft deflections in the planetary gear set due to the symmetrical force distribution
- Very low moment of inertia and hence short acceleration times of the motors
- Output shaft bearings dimensioned for high cantilever and axial loads with preloaded tapered-roller bearings
- The enclosed gearboxes, which are filled with oil before leaving the factory, are attached to the shaft by means of an integral clamping hub. A plain motor shaft extension is required for this purpose as well as vibration severity level N according to EN 60034-14. A radial eccentricity tolerance of N according to DIN 42955 is sufficient.
- Operation is possible in all mounting positions.
- The gearboxes are filled with a high-quality synthetic gear oil in viscosity class ISO VG 220 before leaving the factory. The amount of oil they contain is designed for the mounting position IM B5. In the case of single-stage gearboxes in sizes SP 060 to SP 140, the oil volumes are the same for all mounting positions. In the case of sizes SP 180 to SP 240 and all two-stage gearboxes, different amounts of oil are required for other mounting positions. In this case, please state the mounting position when ordering.
- Output shaft of gearbox exactly coaxial with the motor
- Oil seal to motor in gearbox
- Small dimensions
- Low weight
- Degree of protection IP64

Integration

The gearboxes assigned to the individual motors and gear ratios i available for these motor/gear combinations are listed in the selection table. When making your selection, note the maximum permissible input speed of the gearbox, which should be equal to the maximum motor speed.

The motor/gear combinations listed in the selection tables are mainly intended for use in positioning mode (S5). For applications involving continuous operation at high speed, please contact the gearbox manufacturer.

Follow the instructions contained in the Planning Guide when assigning gearboxes to the motor.

Synchronous motors

Gearboxes for 1FT6 motors standard type

Planetary gearbox, single-stage Series SP

Selection and ordering data

Ordering data: 1FT6 ...-A.7.-.    0



G 0
H 1
2
6

Order No. of the motor (standard type) with code "-Z" and order code for mounting the planetary gearbox assigned to the motor
Requirement for mounting planetary gearbox:
Plain motor shaft/rotational accuracy tolerance and vibration severity grade N

Motor with natural cooling	Planetary gearbox single-stage Torque play ¹⁾ ≤ 4 arcmin	Gearbox weight approx.	Available gear ratio $i =$				Maximum permissible input speed	Maximum permissible output torque	Max. perm. load on output shaft ²⁾	Moment of inertia of gearbox
Type	Type	kg (lb)	4	5	7	10	n_{G1} rpm	M_{G2} Nm (lb _f -ft)	F_r N (lb _f)	J_G at $i = 4$ 10 ⁻⁴ kgm ² (lb _f -in-s ²)
1FT6 024	SP 060-MF1	1.5 (3.3)	✓	✓	✓	✓	6000	40 (29.5) [32 (23.6) for $i = 10$]	2600 (584.5)	0.17 (0.00015)
1FT6 031			✓	✓	✓	✓				0.17 (0.00015)
1FT6 034			✓	✓	✓	–				0.17 (0.00015)
1FT6 034	SP 075-MF1	2.8 (6.2)	–	–	–	✓	6000	100 (73.8) [80 (59) for $i = 10$]	3800 (854.3)	0.57 (0.0005)
1FT6 041			✓	✓	✓	✓				0.63 (0.00055)
1FT6 044			✓	✓	✓	–				0.63 (0.00055)
1FT6 044	SP 100-MF1	6.2 (13.7)	–	–	–	✓	4500	250 (184.4) [200 (147.5) for $i = 10$]	6000 (1348.9)	2 (0.0018)
1FT6 061			✓	✓	✓	✓				2.7 (0.0024)
1FT6 062			✓	✓	✓	✓				2.7 (0.0024)
1FT6 064			✓	✓	✓	✓				2.7 (0.0024)
1FT6 081	SP 140-MF1	11.5 (25.4)	✓	✓	✓	✓	4000	500 (368.8) [400 (295) for $i = 10$]	9000 (2023.3)	8.4 (0.0074)
1FT6 082			✓	✓	✓	✓				8.4 (0.0074)
1FT6 084			✓	✓	✓	✓				8.4 (0.0074)
1FT6 086			✓	✓	✓	–				8.4 (0.0074)
1FT6 086	SP 180-MF1	27 (59.6)	–	–	–	✓	3500	1100 (811.4) [880 (649.1) for $i = 10$]	14000 (3147.3)	30.6 (0.0271)
1FT6 102			✓	✓	✓	✓				31.7 (0.0281)
1FT6 105			✓	✓	✓	–				31.7 (0.0281)
1FT6 108			✓	✓	✓	–				31.7 (0.0281)
1FT6 105	SP 210-MF1	53 (116.9)	–	–	–	✓	2500	1900 (1401.4) [1520 (1121.2) for $i = 10$]	18000 (4046.6)	75.8 (0.0671)
1FT6 108			–	–	–	✓				75.8 (0.0671)
1FT6 132			✓	✓	✓	–				75.8 (0.0671)
1FT6 134			✓	✓	✓	–				75.8 (0.0671)
1FT6 136			✓	✓	✓	–				75.8 (0.0671)
1FT6 132	SP 240-MF1	80 (176.4)	–	–	–	✓	2200	2720 (2006.3)	27000 (6069.9)	146.3 (0.1295)
1FT6 134			–	–	–	✓				146.3 (0.1295)
1FT6 136			–	–	–	✓				146.3 (0.1295)

Order codes

- Gear shaft with fitted key **V02 V03 V05 V09**
- Gear shaft without fitted key **V22 V23 V25 V29**

✓ Available
– Not available

1) For SP 060 and SP 075: ≤ 6 arcmin.

2) Guide value for the maximum permissible drive shaft loading at the center of the shaft for a speed $n_{G2} = 300$ rpm.
Axial load $F_a = 0.5 \times F_r$ at SP 060 to SP 180. $F_a = F_r$ at SP 210 and SP 240.

Synchronous motors

Gearboxes for 1FT6 motors standard type

Planetary gearbox, two-stage Series SP

Selection and ordering data

Ordering data: 1FT6 ...-A.7.-. ■ ■ -Z



G 0
H 1
2
6

Order No. of the motor (standard type) with code "-Z" and order code for mounting the planetary gearbox assigned to the motor
Requirement for mounting planetary gearbox:
Plain motor shaft/rotational accuracy tolerance and vibration severity grade N

Motor with natural cooling	Planetary gearbox two-stage Torque play ¹⁾ ≤ 6 arcmin		Available gear ratio $i =$					Maximum permissible input speed	Max. perm. output torque	Maximum perm. load on output shaft ²⁾	Moment of inertia of gearbox
Type	Type	Gearbox weight approx. kg (lb)	16	20	28	40	50	n_{G1} rpm	M_{G2} Nm (lb _f -ft)	F_r N (lb _f)	J_G at $i = 16$ 10 ⁻⁴ kgm ² (lb _f -in-s ²)
1FT6 024	SP 075-MF2	3.1 (6.8)	✓	✓	✓	✓	✓	6000	100 (73.8)	3800 (854.3)	0.52 (0.0005)
1FT6 031			✓	✓	✓	✓	✓				0.52 (0.0005)
1FT6 034			✓	✓	–	–	–				0.52 (0.0005)
1FT6 034	SP 100-MF2	7.1 (15.7)	–	–	✓	✓	✓	4500	250 (184.4)	6000 (1348.9)	1.7 (0.0015)
1FT6 041			✓	✓	✓	✓	–				1.8 (0.0016)
1FT6 044			✓	✓	–	–	–				2.5 (0.0016)
1FT6 061			✓	✓	✓	–	–				2.5 (0.0022)
1FT6 062	✓	✓	–	–	–	–	2.5 (0.0022)				
1FT6 041	SP 140-MF2	14.5 (32)	–	–	–	–	✓	4000	500 (368.8)	9000 (2023.3)	4.4 (0.0039)
1FT6 044			–	–	✓	✓	✓				5.1 (0.0039)
1FT6 061			–	–	–	✓	✓				5.1 (0.0045)
1FT6 062			–	–	✓	✓	–				5.1 (0.0045)
1FT6 064	✓	✓	–	–	–	–	5.1 (0.0045)				
1FT6 062	SP 180-MF2	29 (63.9)	–	–	–	–	✓	4000	1100 (811.4)	14000 (3147.3)	5.5 (0.0049)
1FT6 064			–	–	✓	✓	✓				8.2 (0.0049)
1FT6 081			✓	✓	✓	✓	✓				8.2 (0.0073)
1FT6 082			✓	✓	✓	✓	–				8.2 (0.0073)
1FT6 084			✓	✓	–	–	–				8.2 (0.0073)
1FT6 086			✓	✓	–	–	–				8.2 (0.0073)
1FT6 082	SP 210-MF2	48 (105.8)	–	–	–	–	✓	3500	1900 (1401.4)	18000 (4046.6)	34.5 (0.0305)
1FT6 084			–	–	✓	✓	–				34.5 (0.0305)
1FT6 086			–	–	✓	–	–				34.5 (0.0305)
1FT6 102	SP 240-MF2	70 (154.3)	✓	✓	✓	–	–	3500	3400 (2507.8)	27000 (6069.9)	35.6 (0.0315)
1FT6 105			✓	–	–	–	–				35.6 (0.0315)
1FT6 084			–	–	–	–	✓				43.1 (0.0381)
1FT6 086			–	–	–	✓	✓				43.1 (0.0381)
1FT6 102			–	–	–	✓	✓				44.2 (0.0391)
1FT6 105	–	✓	✓	–	–	44.2 (0.0391)					
1FT6 108	✓	✓	–	–	–	44.2 (0.0391)					

Order codes

• Gear shaft with fitted key	V12	V13	V15	V16	V17
• Gear shaft without fitted key	V32	V33	V35	V36	V37

✓ Available
– Not available

1) For SP 060 and SP 075: ≤ 8 arcmin.

2) Guide value for the maximum permissible drive shaft loading at the center of the shaft for a speed $n_{G2} = 300$ rpm.
Axial load $F_a = 0.5 \times F_r$ at SP 075 to SP 180. $F_a = F_r$ at SP 210 and SP 240.

Synchronous motors

Gearboxes for 1FK7 motors standard type

Planetary gearbox Series LP

Overview



Planetary gearbox Series LP

1FK7 motors can easily be combined with planetary gearboxes to form compact coaxial drive units. The gearboxes are flanged directly to the drive end of the motors.

When selecting the gearboxes, ensure that the permissible speed of the gearbox is not exceeded by the maximum speed of the motor. In the case of high operating frequencies, an allowance must be made for the jolt factor f_2 (see Planning Guide). The frictional losses of the gearbox must always be taken into account in planning.

The gearboxes are only available in non-balanced design and with fitted key.

Benefits

- High degree of efficiency > 97%
- Torque play: Single-stage ≤ 12 arcmin
- Power transmission from the central sun gear via planetary gears
- No shaft deflections in the planetary gear set due to the symmetrical force distribution
- The enclosed gearboxes, filled with grease before leaving the factory, are attached to the shaft by means of an integral clamping hub. A plain motor shaft extension is necessary for this purpose. The radial eccentricity tolerance N according to DIN 42955. The motor flange is adapted using adapter plates.
- Oil seal to motor in gearbox
- Output shaft of gearbox exactly coaxial with the motor
- The gearboxes are suitable for all mounting positions.
- The gearboxes are filled with grease at the factory. They are lubricated and sealed for their full service life (service life: 20000 hours).
- Degree of protection IP64
- Small dimensions
- Low weight

Integration

The gearboxes assigned to the individual motors and gear ratios i available for these motor/gear combinations are listed in the selection table. When making your selection, note the maximum permissible input speed of the gearbox (equal to the maximum motor speed).

The motor/gear combinations listed in the selection table are mainly intended for use as positioning drives (S5). At the rated speed and rated torque, continuous duty (S1) is permissible. It is not permissible that a gearbox temperature of +90 °C (+194 °F) is exceeded.

Synchronous motors

Gearboxes for 1FK7 motors standard type

Planetary gearbox Series LP

Selection and ordering data

Ordering data: **1FK7 ...-A.71-1.** **-Z**

V **H**

G

Order number of the motor (standard type) with code **"-Z"** and order code for mounting the planetary gearbox assigned to the motor
Requirement: Plain motor shaft

Motor with natural cooling	Planetary gearbox single-stage Torque play ≤ 12 arcmin		Available gear ratios <i>i</i> =		Max. perm. input speed ¹⁾	Max. perm. output torque ¹⁾		Max. perm. output shaft radial force ²⁾	Moment of inertia of gearbox
Type	Type	Gearbox weight approx. kg (lb)	5	10	<i>n</i> _{G1} rpm	<i>M</i> _{G2} with <i>i</i> = 5 Nm (lb _f -ft)	<i>M</i> _{G2} with <i>i</i> = 10 Nm (lb _f -ft)	<i>F</i> _r N (lb _f)	<i>J</i> _G with <i>i</i> = 5/10 10 ⁻⁴ kgm ² (lb _f -in-s ²)
1FK7 022	LP 050-M01	0.77 (1.7)	✓	–	8000	11.5 (8.5)	10.5 (7.7)	650 (146.1)	0.059 (0.00005)
1FK7 022	LP 070-M01	1.9 (4.2)	–	✓	6000	32 (23.6)	29 (21.4)	1450 (326)	0.28 (0.00025)
1FK7 032			✓	✓					
1FK7 033			✓	✓					
1FK7 040	LP 090-M01	4.1 (9)	✓	✓	6000	80 (59)	72 (53.1)	2400 (540)	1.77 (0.0016)
1FK7 042			✓	✓					
1FK7 043			✓	✓					
1FK7 044			✓	✓					
1FK7 060	LP 120-M01	9 (19.8)	✓	✓	4800	200 (147.5)	180 (132.8)	4600 (1034.1)	5.42 (0.0048)
1FK7 061			✓	✓					
1FK7 063			✓	✓					
1FK7 064			✓	–					
1FK7 080	LP 155-M01	17.5 (38.6)	✓	✓	3600	400 (295)	320 (236)	7500 (1686.1)	25.73 (0.0228)
1FK7 082			✓	✓					
1FK7 083			✓	✓					
1FK7 085			✓	–					
1FK7 100			✓	–					25.73 (0.0228)
1FK7 101			✓	–					
1FK7 103			✓	–					

Order code

• Gear shaft with fitted key

V40

V42

✓ Available
– Not available

Continuous operation S1

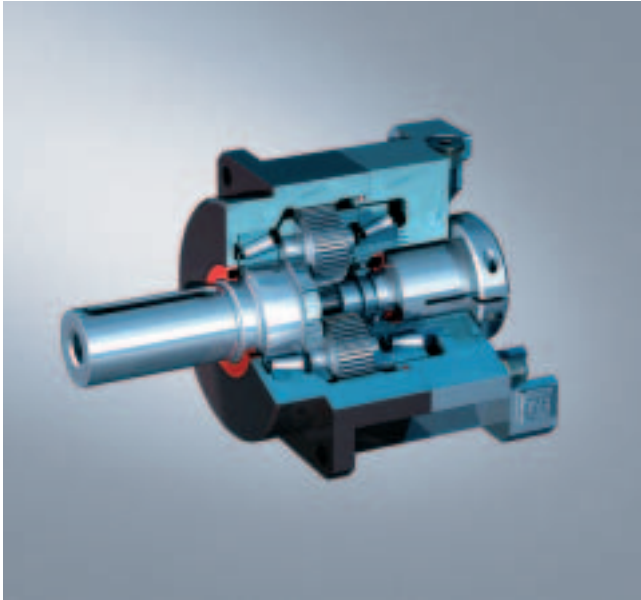
Continuous operation is permissible at the rated speed and rated torque of the gearbox. It is not permissible that a gearing temperature of +90 °C (+194 °F) is exceeded.

Planetary gearbox single-stage Torque play ≤ 12 arcmin	Rated input speed	Rated output torque	
Type	n_{rated1}	M_{rated2} with $i = 5$	M_{rated2} with $i = 10$
	rpm	Nm (lb _f -ft)	Nm (lb _f -ft)
LP 050-M01	4000	5.7 (4.2)	5.2 (3.8)
LP 070-M01	3700	16 (11.8)	15 (11.1)
LP 090-M01	3400	40 (29.5)	35 (25.8)
LP 120-M01	2600	100 (73.8)	90 (66.4)
LP 155-M01	2000	290 (213.9)	170 (125.4)

1) Values for positioning duty S5.

2) Referred to the center of the output shaft at 100 rpm.

Overview



ZF Servoplan planetary gearboxes can be directly mounted on 1FK7 motors. Together with a 1FK7 motor, the servo gearboxes offer a coaxial drive and output system.

The output shaft of the servo motor is connected to the sun wheel of the servo gearbox by means of a friction-locked clamping clutch. This sun wheel drives three planetary wheels in a planetary support. These roll off on a hollow wheel with internal gear teeth. The division among three planetary wheels results in a balanced distribution of power, and thus to a very compact design with high power/weight ratio.

The servo gearboxes are characterized by teeth with low backlash with polished pairs of gear wheels.

The servo gearboxes are designed according to EN 634-1 for operating modes S1, S4 and S5.

Benefits

- High axial loading capability thanks to rugged output-shaft shoulder
- High radial forces and extreme stall stiffness resulting from large-dimension tapered-roller bearings
- Maximum positioning accuracy resulting from polished, highly exact gear teeth
- Reliable and permanent sealing by rugged shaft gaskets
- High torsional stiffness resulting from optimized planetary supports with stable bearing of the planetary wheels on both sides
- Low-noise operation thanks to optimized gear teeth shape
- Compact design through separation of output bearing
- Enclosure with special electroplating treatment of surface resistant even to harsh environmental conditions
- Hermetically sealed enclosure with rugged sealing screws
- Special treatment of hollow wheel teeth surfaces for optimum distribution of lubricant on drive teeth
- Extremely reliable emergency stop torque with keyed transmission of power in the gearbox
- Low gear unit temperatures and minimum power dissipation as result of smallest possible gasket diameter
- Force transmission free of backlash with friction-locked motor clutch

Further information

The ZF-Servoplan gearboxes can only be obtained from the company ZF Friedrichshafen.

You can obtain further technical information concerning the ZF-Servoplan gearboxes directly from the manufacturer or on the Internet.

ZF Maschinenantriebe GmbH

Postfach 25 49
D-88015 Friedrichshafen

Tel.: +49 (0) 75 41 - 77 - 0
Fax: +49 (0) 75 41 - 77 - 34 70

E-Mail: industrial-drives@zf.com

More information is available on the Internet at



<http://www.zf.com>

Synchronous motors

Gearboxes for 1FT6/1FK7 motors

Cycloid gearbox (manufacturer: SUMITOMO)

Overview



CYCLO cycloid gearboxes can be directly mounted on 1FT6/1FK7 motors.

Gearbox installation kits free of backlash from the FINE CYCLO series

The FINE CYCLO A series for point-to-point control applications is a cycloid gearbox with three cam plates free of mechanical circumferential backlash which permits rated torques up to 5140 Nm (3791 lb_f-ft) and acceleration/braking torques up to 7610 Nm (5613 lb_f-ft). The single-stage gearbox is available in 6 sizes with ratios from 29:1 to 179:1.

The FINE CYCLO T series is predestined for continuous-path control applications: together with a new curve profile, integral tapered-roller bearing and integral spur gear stage, it is available in 7 sizes with ratios from 81:1 to 171:1. Rated torques up to 6140 Nm (4529 lb_f-ft) and acceleration/braking torques up to 11000 Nm (8113 lb_f-ft) are possible.

Gearboxes with small backlash from the SERVO 100 and SERVO 4000 series

Available in four sizes, they achieve single-stage ratios from 6:1 to 119:1. Speeds ranging from 2000 rpm to 6000 rpm are possible, depending on the motor type.

Benefits

Cycloid gearbox FINE CYCLO series

- No mechanical torque play and low hysteresis losses
- High rotational stiffness
- Extremely low vibration
- Small moment of inertia
- High efficiency
- Compact design
- Long service life with maintenance-free lubrication
- High reliability thanks to overload capability
- Problem-free installation and simple mounting on motor
- Rapid delivery

Cycloid gearbox SERVO series

- Mechanical torque play ≤ 3 to 6 angular minutes
- Compact design and low weight (partially aluminum enclosure)
- High reliability thanks to overload capability
- Operational safety even in EMERGENCY STOP situations
- Maintenance-free with lubrication for complete service life
- Coaxial arrangement of motor and gearbox output shafts
- All sizes are suitable for any mounting position
- Easy mounting with only one float-free plug-in connection and a clamping element
- Rapid delivery

Further information

The FINE CYCLO and SERVO gearboxes can only be obtained from the company SUMITOMO CYCLO DRIVE.

You can obtain further technical information concerning the CYCLO cycloid gearboxes of the FINE and SERVO series directly from the manufacturer or on the Internet.

SUMITOMO CYCLO DRIVE GERMANY GmbH

Cyclostraße 92
D-85229 Markt Indersdorf

Tel.: +49 (0) 81 36 66 - 0

Fax: +49 (0) 81 36 57 71

E-mail: marktind@sce-cyclo.com

More information is available on the Internet at



<http://www.sumitomo-cyclo.com>

Synchronous motors

Linear motors for SIMODRIVE 611

1FN3 linear motors with water cooling

Overview



In combination with the SIMODRIVE 611 digital/universal HR, 1FN3 linear motors provide an optimally tuned linear direct drive system for the requirements of modern machine construction.

The motors comprise a primary section and a secondary section with magnets made of rare-earth material. The primary section has fixed dimensions, while the secondary section is made up of individual elements (segments) to suit the required traversing range. Through parallel operation of the motors, force and length can be scaled beyond the available spectrum.

Benefits

- Outstanding dynamic response and very high traversing velocity
- Excellent precision
- Simple installation
- Drive components are free of wear thanks to contactless drive force transmission

The main advantage of linear direct drive technology is the extensive avoidance of the effects of elasticity, play, and friction, as well as natural oscillation in the drive train. This results in a higher dynamic response and increased precision. If suitable measuring systems are used and the temperature conditions are appropriate, the motors can be positioned in the nanometer range.

Design

The simple mechanical construction without transmission elements, such as ballscrew, coupling or belt, enhances the reliability of the drive components.

Heat loss occurs almost exclusively in the primary section and is dissipated via an integrated liquid cooling system. The Thermo-Sandwich® dual-circuit cooling system permits both a thermal decoupling of the motor from the machine, and also a low-priced cooling concept.

The stainless metal encapsulation of the primary section ensure high mechanical ruggedness and resistance to soiling required for use in machine tools, as well as high resistance to corrosive liquids. In addition, the motor places minimal demands on the preparation of mounting surfaces thanks to the large air gap. The mounting tolerances for the air gap are ± 0.3 mm (0.01 in).

Construction variants

1FN3 linear motors are available as single-sided or double-sided motors.

• Single-sided motors

The single-sided version consists of a primary section with standard winding that is mounted parallel to the associated secondary section.

• Double-sided motors

The secondary section of the double-sided version lies between two primary sections (one primary section with standard winding and one with complementary winding).

The construction as double-sided motor is particularly suitable for applications with movable secondary section and small traversing paths with fast acceleration (e.g. non-circular machining).

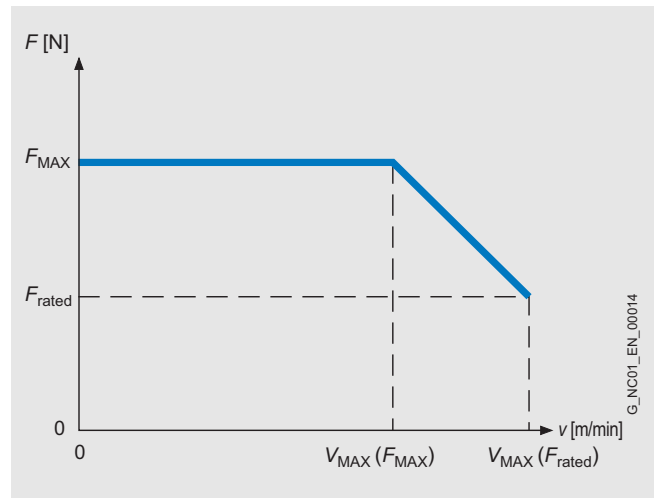
Application 1FN3 linear motors

- High-dynamic and flexible machine tool construction
- Laser machining
- Handling

Technical data

1FN3 linear motors	
Type of motor	Permanent magnet excited synchronous linear motor
Magnet material	Rare-earth material
Insulation of stator winding according to EN (IEC) 60034-1	Temperature class H for a winding temperature of +120 °C (+248 °F)
Overload ratio ($F_{MAX}:F_{rated}$) up to max.	2.75
Degree of protection according to EN 60034-5 (IEC 60034-5)	IP65
Cooling method	Water-cooled
Water cooler connections	G 1/8 internal thread on all primary and secondary section coolers
Temperature influence on surrounding construction with precision cooling, max.	+4 K
Max. permissible coolant inlet temperature	+ 35 °C (+95 °F) (prevent condensation) >+35 °C (+95 °F) for reduction of the rated motor force
Temperature monitoring integrated in the primary section winding	2 monitoring circuits (Temp-S with PTC thermistor) and Temp-F with KTY 84 temperature sensor (for 1FN3050, Temp-S only)
Available configurations	Different graduations due to modular construction
Cover for secondary section	Exchangeable through all segments or segment by segment
2nd rating plate	Supplied separately packed
Recommended measuring systems	See "Overview of Measuring Systems"
Type of connection	Terminal box with cable gland Optional: accessory for connector and cable connection

The 1FN3 linear motors have an overload range available for acceleration processes. The maximum force F_{MAX} can only be utilized up to a maximum speed $V_{MAX}(F_{MAX})$; at speed $V_{MAX}(F_{rated})$ only the rated force F_{rated} is available.



Synchronous motors

Linear motors for SIMODRIVE 611

1FN3 linear motors - standard type with water cooling

Selection and ordering data

Force of feed		Maximum speed ²⁾		1FN3 linear motors with water cooling		Weight, approx.	
F_{rated} ¹⁾³⁾	F_{MAX}	V_{MAX} at F_{MAX}	V_{MAX} at F_{rated}	Primary section Order No.	Secondary section Order No.	Primary section without/with precis. cooling	Secondary section without/with heatsink profile
N (lb _f)	N (lb _f)	m/min (ft/min)	m/min (ft/min)			kg (lb)	kg (lb)
200 (45)	550 (123.7)	146 (479.1)	373 (1224)	1FN3 050-2WC00-0AA0	1FN3 050-4SA00-0AA0	2.4/2.9 (5.3/6.4)	0.4/0.5 (0.9/1.1)
200 (45)	490 (110.2)	138 (452.8)	322 (1056.6)	1FN3 100-1WC00-0AA1	1FN3 100-4SA00-0AA0	2.2/- (4.9/-) ⁴⁾	0.7/0.8 (1.5/1.8)
450 (101.2)	1100 (247.3)	131 (429.9)	297 (974.6)	1FN3 100-2WC00-0AA1		3.8/4.4 (8.4/9.7)	
450 (101.2)	1100 (247.3)	237 (777.7)	497 (1630.9)	1FN3 100-2WE00-0AA1		3.8/4.4 (8.4/9.7)	
675 (151.8)	1650 (371)	120 (393.8)	277 (909)	1FN3 100-3WC00-0AA1		5.4/6.2 (11.9/13.7)	
675 (151.8)	1650 (371)	237 (777.7)	497 (1630.9)	1FN3 100-3WE00-0AA1		5.4/6.2 (11.9/13.7)	
900 (202.4)	2200 (494.6)	131 (429.9)	297 (974.6)	1FN3 100-4WC00-0AA1		7.4/8.5 (16.3/18.7)	
1125 (252.9)	2750 (618.3)	109 (357.7)	255 (836.8)	1FN3 100-5WC00-0AA1		9.1/10.4 (20.1/22.9)	
340 (76.4)	820 (184.4)	126 (413.5)	282 (925.4)	1FN3 150-1WC00-0AA1	1FN3 150-4SA00-0AA0	3.0/- (6.6/-) ⁴⁾	1.2/1.3 (2.6/2.9)
675 (151.8)	1650 (371)	126 (413.5)	282 (925.4)	1FN3 150-2WC00-0AA1		5.3/6 (11.7/13.2)	
1015 (228.2)	2470 (555.3)	126 (413.5)	282 (925.4)	1FN3 150-3WC00-0AA1		7.8/8.7 (17.2/19.2)	
1350 (303.5)	3300 (742)	126 (413.5)	282 (925.4)	1FN3 150-4WC00-0AA1		10.2/11.4 (22.5/25.1)	
1690 (380)	4120 (926.3)	126 (413.5)	282 (925.4)	1FN3 150-5WC00-0AA1		12.8/14.2 (28.2/31.3)	
615 (138.3)	1720 (386.7)	128 (420)	309 (1014)	1FN3 300-1WC00-0AA1	1FN3 300-4SA00-0AA0	6.2/- (13.7/-) ⁴⁾	2.4/2.6 (5.3/5.7)
1225 (275.4)	3450 (775.7)	63 (206.7)	176 (577.5)	1FN3 300-2WB00-0AA1		11.4/12.4 (25.1/27.3)	
1225 (275.4)	3450 (775.7)	125 (410.2)	297 (974.6)	1FN3 300-2WC00-0AA1		11.4/12.4 (25.1/27.3)	
1840 (413.7)	5170 (1162.4)	125 (410.2)	297 (974.6)	1FN3 300-3WC00-0AA1		17/18.4 (37.5/40.6)	
2450 (550.8)	6900 (1551.4)	63 (206.7)	176 (577.5)	1FN3 300-4WB00-0AA1		22.2/24 (49/52.9)	
2450 (550.8)	6900 (1551.4)	125 (410.2)	297 (974.6)	1FN3 300-4WC00-0AA1		22.2/24 (49/52.9)	
1930 (433.9)	5180 (1164.6)	30 (98.4)	112 (367.5)	1FN3 450-2WA50-0AA1	1FN3 450-4SA00-0AA0	15.9/17.1 (35.1/37.7)	3.8/4 (8.4/8.8)
1930 (433.9)	5180 (1164.6)	120 (393.8)	275 (902.4)	1FN3 450-2WC00-0AA1		15.9/17.1 (35.1/37.7)	
2895 (650.9)	7760 (1744.7)	62 (203.5)	164 (538.2)	1FN3 450-3WB00-0AA1		22.6/24.3 (49.8/53.6)	
2895 (650.9)	7760 (1744.7)	120 (393.8)	275 (902.4)	1FN3 450-3WC00-0AA1		22.6/24.3 (49.8/53.6)	
3860 (867.9)	10350 (2327)	62 (203.5)	164 (538.2)	1FN3 450-4WB00-0AA1		30.9/33.1 (68.1/73)	
3860 (867.9)	10350 (2327)	120 (393.8)	275 (902.4)	1FN3 450-4WC00-0AA1		30.9/33.1 (68.1/73)	
3860 (867.9)	10350 (2327)	240 (787.6)	519 (1703.1)	1FN3 450-4WE00-0AA1		30.9/33.1 (68.1/73)	
2610 (586.8)	6900 (1551.4)	36 (118.1)	120 (393.8)	1FN3 600-2WA50-0AA1	1FN3 600-4SA00-0AA0	22.2/24.7 (49/54.5)	4.6/5 (10.1/11)
3915 (880.2)	10350 (2327)	58 (190.3)	155 (508.6)	1FN3 600-3WB00-0AA1		31.5/33.4 (69.5/73.6)	
3915 (880.2)	10350 (2327)	112 (367.5)	254 (833.5)	1FN3 600-3WC00-0AA1		31.5/33.4 (69.5/73.6)	
5220 (1173.6)	13800 (3102.7)	58 (190.3)	155 (508.6)	1FN3 600-4WB00-0AA1		40.8/43.3 (90/95.5)	
5220 (1173.6)	13800 (3102.7)	91 (298.6)	215 (705.5)	1FN3 600-4WB50-0AA1		40.8/43.3 (90/95.5)	
5220 (1173.6)	13800 (3102.7)	112 (367.5)	254 (833.5)	1FN3 600-4WC00-0AA1		40.8/43.3 (90/95.5)	
4050 (910.6)	10350 (2327)	65 (213.3)	160 (525)	1FN3 900-2WB00-0AA1	1FN3 900-4SA00-0AA0	28.2/29.7 (62.2/65.5)	7.5/7.9 (16.5/17.4)
4050 (910.6)	10350 (2327)	115 (377.4)	253 (830.2)	1FN3 900-2WC00-0AA1		28.2/29.7 (62.2/65.5)	
6075 (1365.9)	15530 (3491.7)	75 (246.1)	181 (594)	1FN3 900-3WB00-0AA1		42.2/44.3 (93.1/97.7)	
8100 (1821.2)	20700 (4654)	65 (213.3)	160 (525)	1FN3 900-4WB00-0AA1		56.2/58.9 (123.9/129.9)	
8100 (1821.2)	20700 (4654)	115 (377.4)	253 (830.2)	1FN3 900-4WC00-0AA1		56.2/58.9 (123.9/129.9)	

One temperature monitoring circuit: Temp-S 0
Two temperature monitoring circuits: Temp-S und Temp-F 1

Synchronous motors

Linear motors for SIMODRIVE 611

1FN3 linear motors - standard type
with water cooling

Selection and ordering data

Motor type Primary section (continued)	Motor phase current		Calculated power	SIMODRIVE 611 power module Required rated current		Power cable with complete shield Motor connection through adapter cable with power supply connector for increased speed/acceleration				
	$I_{\text{rated}}^{1)}$ I_{MAX}			$I_{\text{rated}}/I_{\text{MAX}}$	Order No.	Order No. Prefabricated motor adapter cable	Cable cross-section		Order No. Prefabricated base cable to converter	
	A	A					P_{calc} kW (HP)	A		Motor ⁵⁾⁷⁾ mm ² Size
1FN3 050-2WC00-...	2.7	8.2	4.1 (5.5)	5/10	For ordering data see "Power Modules" in Section 3	6FX7 002-5LM40-....	4 x 1.5	1	6FX7 002 -5EA02-....	
1FN3 100-1WC00-...	2.4	6.5	3.1 (4.16)	5/10		6FX7 002-5LM40-....	4 x 1.5	1	6FX7 002 -5EA02-....	
1FN3 100-2WC00-...	5.1	13.5	6.3 (8.45)	9/18			4 x 1.5	1	-5EA02-....	
1FN3 100-2WE00-...	8.1	21.5	8.3 (11.13)	18/36			4 x 1.5	1	-5EA02-....	
1FN3 100-3WC00-...	7.2	19.1	9.2 (12.33)	18/36			4 x 1.5	1	-5EA02-....	
1FN3 100-3WE00-...	12.1	32.2	12.4 (16.62)	18/36			4 x 1.5	1	-5EA02-....	
1FN3 100-4WC00-...	10.1	27.0	12.6 (16.89)	18/36			4 x 1.5	1	-5EA02-....	
1FN3 100-5WC00-...	11.0	29.5	14.4 (19.3)	18/36			4 x 1.5	1	-5EA02-....	
1FN3 150-1WC00-...	3.6	9.5	4.3 (5.76)	5/10		6FX7 002-5LM40-....	4 x 1.5	1	6FX7 002 -5EA02-....	
1FN3 150-2WC00-...	7.2	19.1	8.7 (11.66)	18/36			4 x 1.5	1	-5EA02-....	
1FN3 150-3WC00-...	10.7	28.6	13.0 (17.43)	18/36			4 x 1.5	1	-5EA02-....	
1FN3 150-4WC00-...	14.3	38.2	17.4 (23.32)	28/56			4 x 1.5	1	-5EA02-....	
1FN3 150-5WC00-...	17.9	47.7	21.7 (29.09)	28/56			4 x 2.5	1	-5EB11-....	
1FN3 300-1WC00-...	6.5	20.0	8.7 (11.66)	18/36		6FX7 002-5LM60-....	4 x 1.5	1	6FX7 002 -5EA02-....	
1FN3 300-2WB00-...	8.0	24.7	13.2 (17.69)	18/36			4 x 1.5	1	-5EA02-....	
1FN3 300-2WC00-...	12.6	39.2	16.8 (22.52)	28/56			4 x 1.5	1	-5EA02-....	
1FN3 300-3WC00-...	19.0	58.7	25.1 (33.65)	56/112			4 x 2.5	1	-5EB11-....	
1FN3 300-4WB00-...	16.0	49.4	26.3 (35.25)	28/56			4 x 2.5	1	-5EB11-....	
1FN3 300-4WC00-...	25.3	78.3	33.5 (44.91)	56/112			6FX7 002-5LM70-....	4 x 4	1.5	-5EA41-....
1FN3 450-2WA50-...	8.6	25.3	15.9 (21.31)	18/36			6FX7 002-5LM60-....	4 x 1.5	1	6FX7 002 -5EA02-....
1FN3 450-2WC00-...	18.8	55.3	23.1 (30.97)	28/56		6FX7 002-5LM70-....	4 x 2.5	1	-5EB11-....	
1FN3 450-3WB00-...	17.9	52.7	27.5 (36.86)	28/56			4 x 2.5	1	-5EB11-....	
1FN3 450-3WC00-...	28.1	83.0	34.6 (46.38)	56/112			4 x 6	1.5	-5EA51-....	
1FN3 450-4WB00-...	23.8	70.3	36.7 (49.2)	56/112			4 x 4	1.5	-5EA41-....	
1FN3 450-4WC00-...	37.5	110.6	46.2 (61.93)	56/112			6FX7 002-5LM30-....	4 x 10	1.5	-5EA61-....
1FN3 450-4WE00-...	67.6	199.5	65.3 (87.53)	140/210			Only sold by the meter ⁶⁾	4 x 25	– ⁶⁾	6FX7 008 -1BC25-....
1FN3 600-2WA50-...	12.4	36.0	21.9 (29.36)	18/36			6FX7 002-5LM60-....	4 x 1.5	1	6FX7 002 -5EA02-....
1FN3 600-3WB00-...	23.2	67.3	35.4 (47.45)	56/112		6FX7 002-5LM70-....	4 x 4	1.5	-5EA41-....	
1FN3 600-3WC00-...	35.2	102.4	41.6 (55.76)	56/112		6FX7 002-5LM30-....	4 x 6	1.5	-5EA51-....	
1FN3 600-4WB00-...	30.9	89.8	47.2 (63.27)	56/112			4 x 6	1.5	-5EA51-....	
1FN3 600-4WB50-...	40.8	118.5	52.2 (69.97)	70/140			4 x 10	1.5	-5EA61-....	
1FN3 600-4WC00-...	46.9	136.5	55.5 (74.4)	70/140			4 x 10	1.5	-5EA61-....	
1FN3 900-2WB00-...	24.7	69.5	34.5 (46.25)	56/112			6FX7 002-5LM70-....	4 x 4	1.5	6FX7 002 -5EA41-....
1FN3 900-2WC00-...	36.7	103.3	41.0 (54.96)	56/112			6FX7 002-5LM30-....	4 x 10	1.5	-5EA61-....
1FN3 900-3WB00-...	40.6	114.0	54.5 (73.06)	70/140			4 x 10	1.5	-5EA61-....	
1FN3 900-4WB00-...	49.4	138.9	68.9 (92.36)	70/140		Only sold by the meter ⁶⁾	4 x 10	1.5	-5EA61-....	
1FN3 900-4WC00-...	73.5	206.5	81.9 (109.79)	140/210			4 x 25	– ⁶⁾	6FX7 008 -1BC25-....	

For length code as well as power and signal cables, see "MOTION-CONNECT cables and connections".

- 1) For water cooling with inlet temperature +35 °C (+95 °F).
- 2) Speed values refer to a converter DC link voltage of 600 V DC.
- 3) A reduction of up to 30% must be expected in case of motor standstill, at very low speeds, or with very short traverse paths.
- 4) No precision cooler available.
- 5) The current load capability of the power cables complies with IEC 60204-1 for installation type C, Table 5, under continuous operating conditions at an ambient air temperature of +40 °C (+104 °F).
- 6) Motor connection via terminal box. Power cable only available by the meter.
- 7) Sensor cable cross-section: 4 x 0.5 mm².

Synchronous motors

Linear motors for SIMODRIVE 611

1FN3 linear motors - standard type with water cooling

Selection and ordering data

Linear motors	Optional components		Cover end pieces for secondary section cover ²⁾
	Secondary section cover		
	Continuous ¹⁾	Segmented	
Type	Order No.	Order No.	Order No.
1FN3 050-...	1FN3 050-0TB00-1 ■ ■ 0	1FN3 050-4TP00-1A ■ ■	1FN3 050-0TC00-0AA0
1FN3 100-...	1FN3 100-0TB00-1 ■ ■ 0	1FN3 100-4TP00-1A ■ ■	1FN3 100-0TC00-0AA0
1FN3 150-...	1FN3 150-0TB00-1 ■ ■ 0	1FN3 150-4TP00-1A ■ ■	1FN3 150-0TC00-0AA0
1FN3 300-...	1FN3 300-0TB00-1 ■ ■ 0	1FN3 300-4TP00-1A ■ ■	1FN3 300-0TC00-0AA0
1FN3 450-...	1FN3 450-0TB00-1 ■ ■ 0	1FN3 450-4TP00-1A ■ ■	1FN3 450-0TC00-0AA0
1FN3 600-...	1FN3 600-0TB00-1 ■ ■ 0	1FN3 600-4TP00-1A ■ ■	1FN3 600-0TC00-0AA0
1FN3 900-...	1FN3 900-0TB00-1 ■ ■ 0	1FN3 900-4TP00-1A ■ ■	1FN3 900-0TC00-0AA0
	• Number of secondary sections 0 10 20 30 40 50 A B C D E F • Number of secondary sections for all frame sizes 2.5 3 3.5 4 5 C D D E F 5 0 • Number of secondary sections for frame sizes 1FN3600/1FN3900 5.5 6.5 F G 5 5		

Selection and ordering data

Linear motors Type	Optional components Precision cooler
	Order No.
1FN3 050-2W...	1FN3 050-2PK00-0AA0
1FN3 100-2W...	1FN3 100-2PK00-0AA0
1FN3 100-3W...	1FN3 100-3PK00-0AA0
1FN3 100-4W...	1FN3 100-4PK00-0AA0
1FN3 100-5W...	1FN3 100-5PK00-0AA0
1FN3 150-2W...	1FN3 150-2PK00-0AA0
1FN3 150-3W...	1FN3 150-3PK00-0AA0
1FN3 150-4W...	1FN3 150-4PK00-0AA0
1FN3 150-5W...	1FN3 150-5PK00-0AA0
1FN3 300-2W...	1FN3 300-2PK00-0AA0
1FN3 300-3W...	1FN3 300-3PK00-0AA0
1FN3 300-4W...	1FN3 300-4PK00-0AA0
1FN3 450-2W...	1FN3 450-2PK00-0AA0
1FN3 450-3W...	1FN3 450-3PK00-0AA0
1FN3 450-4W...	1FN3 450-4PK00-0AA0
1FN3 600-2W...	1FN3 600-2PK00-0AA0
1FN3 600-3W...	1FN3 600-3PK00-0AA0
1FN3 600-4W...	1FN3 600-4PK00-0AA0
1FN3 900-2W...	1FN3 900-2PK00-0AA0
1FN3 900-3W...	1FN3 900-3PK00-0AA0
1FN3 900-4W...	1FN3 900-4PK00-0AA0

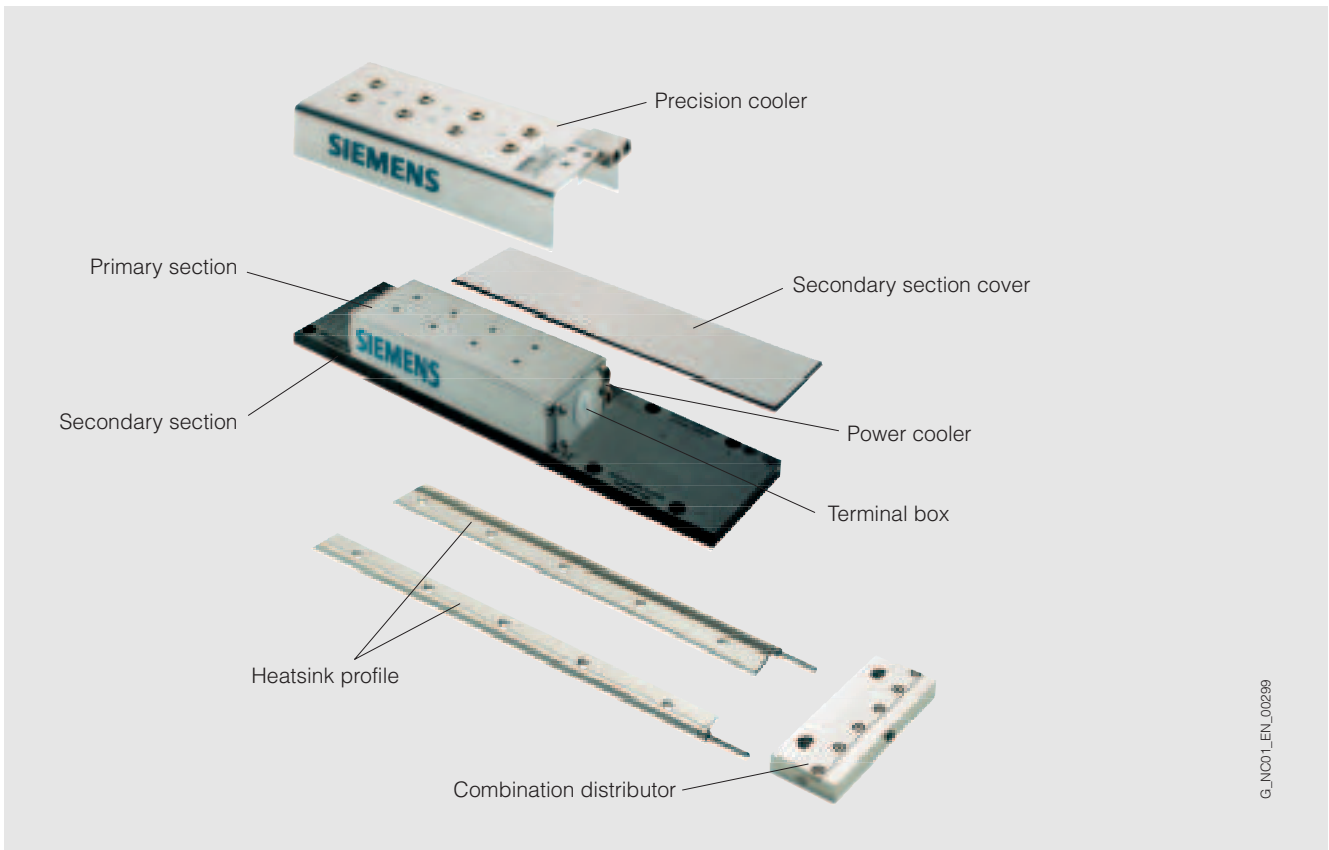
- Continuous cover for several secondary sections. The maximum length of the secondary section cover is 6 m (19.7 ft). For the following frame sizes, this corresponds to: 1FN3050 to 1FN3150, a maximum number of 50 secondary sections (AB to FA). 1FN3300 to 1FN3900, a maximum number of 32 secondary sections (AB to DC).
- The secondary section end pieces are designed to allow clamping of the integrated secondary section cover.
- Sizes
1FN3050 to 1FN3450: 2 pieces per secondary section track.
1FN3600 to 1FN3900: 3 pieces per secondary section track.
The maximum available length of a single-part heatsink profile is 3 m (9.8 ft).
This corresponds to sizes:
1FN3050 to 1FN3150, a maximum of 24 secondary sections (AB to CE)
1FN3300 to 1FN3900, a maximum of 16 secondary sections (AB to BG).

Synchronous motors

Linear motors for SIMODRIVE 611

1FN3 linear motors - standard type
with water cooling

4



G_N001_EN_00299

Selection and ordering data

Linear motors Type	Optional components		Secondary section end pieces ²⁾		
	Heatsink profile ³⁾		Combi distributor	Combi adapter	Combi end piece
	Order No.		Order No.	Order No.	Order No.
1FN3 050-...	1FN3 002-0TK0	■ -1 ■ ■ 0	1FN3 050-0TJ01-0AA0	1FN3 050-0TG01-0AA0	1FN3 050-0TF01-0AA0
1FN3 100-...	1FN3 002-0TK0	■ -1 ■ ■ 0	1FN3 100-0TJ01-0AA0	1FN3 100-0TG01-0AA0	1FN3 100-0TF01-0AA0
1FN3 150-...	1FN3 002-0TK0	■ -1 ■ ■ 0	1FN3 150-0TJ01-0AA0	1FN3 150-0TG01-0AA0	1FN3 150-0TF01-0AA0
1FN3 300-...	1FN3 003-0TK0	■ -1 ■ ■ 0	1FN3 300-0TJ01-0AA0	1FN3 300-0TG01-0AA0	1FN3 300-0TF01-0AA0
1FN3 450-...	1FN3 003-0TK0	■ -1 ■ ■ 0	1FN3 450-0TJ01-0AA0	1FN3 450-0TG01-0AA0	1FN3 450-0TF01-0AA0
1FN3 600-...	1FN3 004-0TK0	■ -1 ■ ■ 0	1FN3 600-0TJ01-0AA0	—	—
1FN3 900-...	1FN3 005-0TK0	■ -1 ■ ■ 0	1FN3 900-0TJ01-0AA0	—	—

- With plug-in coupling prepared for connection to combi distributor with plug-in coupling, combi adapter with plug-in coupling, combi end piece with plug-in coupling or as intermediate unit for heatsink profile with cable grommet nipple
- Sizes 1FN3050 to 1FN3450:
Cable nipple only at right-hand end of the secondary section track
- Sizes 1FN3600/1FN3900:
Cable nipple at both ends of the secondary section track
- Sizes 1FN3050 to 1FN3450:
Cable nipple only on left-hand end of secondary section track

4

A
B
C

6

A
B
C
D
E
F
G
H
J
K

7

- Number of secondary sections
- 0
- 10
- 20
- 0
- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9

Synchronous motors

Linear motors for SIMODRIVE 611

1FN3 linear motors Hall sensor box

1FN3 linear motors Connector box

Overview



The motor position can be identified with an incremental linear measuring system using an additional Hall sensor box, or also motion-based when considering certain additional conditions.

Overview



A connector box is required to connect a Hall sensor box (option).

Selection and ordering data

Linear motor	Hall sensor box	
Type	Mounted <u>opposite</u> primary section terminal end	
	Straight cable outlet	Lateral cable outlet
1FN3	Order No.	Order No.
1FN3 050-2W...	1FN3 002-OPH00-0AA0	1FN3 002-OPH01-0AA0
1FN3 100-2W...		
1FN3 100-4W...		
1FN3 150-2W...		
1FN3 150-4W...		
1FN3 100-1W...	1FN3 005-OPH00-0AA0	1FN3 005-OPH01-0AA0
1FN3 100-3W...		
1FN3 100-5W...		
1FN3 150-1W...		
1FN3 150-3W...		
1FN3 150-5W...		
1FN3 300-2W...	1FN3 003-OPH00-0AA0	1FN3 003-OPH01-0AA0
1FN3 300-4W...		
1FN3 450-2W...		
1FN3 450-4W...		
1FN3 600-2W...		
1FN3 600-4W...		
1FN3 900-2W...		
1FN3 900-4W...		
1FN3 300-1W...	1FN3 006-OPH00-0AA0	1FN3 006-OPH01-0AA0
1FN3 300-3W...		
1FN3 450-3W...		
1FN3 600-3W...		
1FN3 900-3W...		

Linear motor	Hall sensor box	
Type	Mounted <u>on</u> primary section terminal end	
	Straight cable outlet	Lateral cable outlet
1FN3	Order No.	Order No.
1FN3 050-...	1FN3 002-OPH00-0AA0	1FN3 002-OPH01-0AA0
1FN3 100-...		
1FN3 150-...		
1FN3 300-...	1FN3 003-OPH00-0AA0	1FN3 003-OPH01-0AA0
1FN3 450-...		
1FN3 600-...		
1FN3 900-...		

Technical data

Connector box	
Degree of protection to EN 60529 (IEC 60529)	IP65
Permissible air humidity to DIN 40040	95% (without condensation)
Weight, approx.	0.26 kg (0.6 lb)
Dimensions (W x H x D) (without sockets or cable glands)	69.6 mm x 54 mm x 25 mm (2.7 in x 2.1 in x 1 in)

Selection and ordering data

Designation	Order No.
Connector box for connection of incremental encoder	1FN1 910-0AA00-0AA0

Overview

Recommended encapsulated linear measuring systems for 1FN linear motors		LC 181/LC 481 absolute encoder EnDat encapsulated	LS 186 incremental encoder sin/cos 1 V _{pp} encapsulated	LS 486 incremental encoder sin/cos 1 V _{pp} encapsulated	LIDA 185/LIDA 485 incremental encoder sin/cos 1 V _{pp} open	Renishaw RG2 incremental encoder sin/cos 1 V _{pp} open
Signal cycle	µm	16/20	20	20	40/20	20
Max. permissible acceleration in measuring direction	m/s ² (ft/s ²)	50 (164)	50 (164)	50 (164)	200 ¹⁾ (656)	300 ¹⁾ (984)
Max. permissible traversing speed	m/min (ft/min)	120 (394)	120 (394)	120 (394)	480 (1575)	300 (984)
Maximum measuring length	mm (in)	3040 (120)	3040 (120)	2040 (80)	30040 (1183)	50000 (1968)
Output signal		EnDat/1 V _{pp}	1 V _{pp}	1 V _{pp}	1 V _{pp}	1 V _{pp}

Temperature sensors

The signal cables of the temperature sensors (Temp-S and Temp-F) are decoupled from the power cable and directly connected to the SIMODRIVE 611 digital or SIMODRIVE 611 universal HR. For monitoring the motor temperature, the temperature switch Temp-S is connected to a safely electrically isolated

thermistor motor protection device 3RN1013-1BW10 and evaluated by the PLC.

The temperature of the motor can be monitored if required (e.g. for start-up) by connecting the temperature sensor Temp-F through a voltage-resistant multimeter.

1FN3 linear motors Liquid cooling

Overview

Please contact the contact persons of the cooler manufacturers listed below for technical information.

Non-Siemens products whose fundamental suitability is familiar to us. It goes without saying that equivalent products from other

manufacturers may be used. Our recommendations are to be seen as helpful information, not as requirements or dictates. We do not warrant the composition, nature, state or quality of non-Siemens products.

Further information

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Mr. Hille 21035 Hamburg, Germany
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Fax: +49 (0) 40 - 7 34 12 - 1 01
E-mail: werner.hille@pfannenberg.com
Internet: www.pfannenberg.com

Helmut Schimpke and Team Industriekühlanlagen GmbH + Co. KG

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Fax: +49 (0) 21 29 - 94 38 - 99
E-mail: info@schimpke.de
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Rittal GmbH & Co. KG

Contact: Postfach 16 62
Mr. Cieslar 35726 Herborn, Germany
Phone: +49 (0) 27 72 - 5 05 - 20 63
Fax: +49 (0) 27 72 - 5 05 - 29 66
E-mail: cieslar.g@rittal.de
Internet: www.rittal.de

Hydac System GmbH

Contact: Postfach 12 51
Mr. Klein 66273 Sulzbach/Saar, Germany
Phone: +49 (0) 68 97 - 5 09 - 7 08
Fax: +49 (0) 68 97 - 5 09 - 4 54
E-mail: winfried.klein@hydac.com
Internet: www.hydac.com

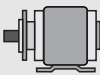
For design of cooling units, see Planning Guide (see documentation for Order No.).

1) Refers to the measuring head.

Synchronous motors

Selection guide

Type

Type	Designation	Type	Designation	Type	Designation
	IM B3		IM B5 IM B14		IM B35
	IM V5		IM V1 IM V18		IM V15
	IM V6		IM V3 IM V19		IM V36

Degree of protection

The designation for the degree of protection according to EN 60034-5 and IEC 60034-5 is made using the letters "IP" and two digits (e.g. IP64). The second digit in the designation represents the protection against water, the first digit the protection against penetration of foreign matter.

Since coolants are used which contain oil, are able to creep, and/or may also be corrosive, protection against water alone is insufficient. The designation for the degree of protection should only be considered here as a guideline. Our sealing systems are based on many years of practical experience, exceed the IEC specifications by far, and are appropriate to the requirements of machine tools.

The table can serve as a decision aid for selecting the proper degree of protection for motors. With the IM V3/IM V19 designs, permanent liquid on the flange is only permissible with IP67/IP68.

Fluids	General shop-floor environment	Water gen. coolants (95% water, 5% oil); oil	Oil creepage; petroleum; corrosive coolants
Effect			
Dry	IP64	–	–
Water-enriched environment	–	IP64	IP67 ¹⁾
Mist	–	IP65	IP67
Spatter	–	IP65	IP68
Jet	–	IP67	IP68
Surge, brief immersion; constant inundation	–	IP67	IP68

1) IP64 with dry run at shaft exit.

Asynchronous motors



5/2	Introduction
5/3	1PH7 motors
5/14	1PH4 motors
5/18	Liquid cooling Heat exchanger manufacturers
5/19 5/19	Gearboxes Two-speed gearboxes for 1PH7/1PH4 motors
5/21 5/21 5/21	Selection guide Type Degree of protection



Note:

For products
approved for
Canada and USA,
see "Appendix".

Asynchronous motors

Servo motors for SIMODRIVE 611

Introduction

Overview

	1PH7	1PH4
	Asynchronous motors	
Type according to EN 60034-7 (IEC 60034-7):	IM B3 (IM V5, IM V6) IM B5 (IM V1, IM V3, only possible for 1PH710/1PH713 motors) IM B35 (IM V15, IM V36)	IM B35 (IM V15, IM V36)
Type of circuit	Y-connection	
Rated power P_{rated} (S1)	3.7 ... 100 kW (5 ... 134 HP)	7.5 ... 52 kW (10 ... 70 HP)
Maximum speed	Up to 12000 rpm	
Rated torque M_{rated}	23.6 ... 750 Nm (17.4 ... 553 lb _f -ft)	48 ... 331 Nm (35.4 ... 244 lb _f -ft)
Encoder system, integrated	Incremental encoder sin/cos 1 V _{pp} , 2048 pulses/revolution	
Sound pressure level according to EN ISO 1680 P.1 and P. 2	70 ... 76 dB (A) for 50 Hz mains operation of the separately driven fan Tolerance +3 dB	69 ... 71 dB (A) Tolerance +3 dB
Degree of protection according to EN 60034-5 (IEC 60034-5)	IP55 Fan IP54	IP65 IP55 at shaft exit
Cooling	Forced ventilation	Water cooling
Insulation of the stator winding to EN 60034-1 (IEC 60034-1)	Temperature class F for a coolant temperature (air) of up ... +40 °C (+104 °F)	Temperature class F for a coolant temperature of +30 °C (+86 °F)
Holding brake	–	Fitted to drive end (option)
Type of motor	Squirrel-cage asynchronous motor	
Paint finish	No paint finish/primed; anthracite (option)	Anthracite
Mounted gearing	Prepared (option)	

Application

The areas of application for the 1PH asynchronous motors are extremely varied. On machine tools, they are usually used as main spindle motors. On production machines such as printing, packaging and metalforming machine tools, they are used as high-output asynchronous servo motors. In the description below, the motors are generally designated as asynchronous motors on the basis of their operating principle.

Core types can be supplied for certain motor types. These core types have several advantages over the standard types: shorter delivery time and faster spare parts supply. For this reason, core types should be used for configuration wherever possible.

Overview



1PH7 motors (shaft heights 100 to 160 and 180/225)

The air-cooled 1PH7 motors are rugged, low-maintenance 4-pole asynchronous motors with squirrel-cage rotors. A fan for providing separate ventilation is mounted axially on the rear side of the motor. The normal direction of air flow is from the drive end to the non-drive end in order to keep the exhaust heat of the motor away from the machine tool. The inverse air direction can be ordered as an option. The motors are equipped with a built-in encoder system for sensing the motor speed and indirect position. On machine tools, the encoder system is capable of C-axis operation as standard, that is, an additional encoder is not required for C-axis operation.

Benefits

- Short overall length of motor
- Minimized noise curve thanks to the integrated terminal box (shaft heights 100 to 160)
- Maximum speeds of up to 9000 rpm (optionally: 12000 rpm)
- Full rated torque is always available, even during idle times
- Optimum matching to the performance levels SIMODRIVE 611

Application

- Small compact machine tools
- Complex machining centers and lathes
- Special machines
- Printing industry:
 - Single drives for printing units
- Manufacture of rubber, plastic, wire and glass:
 - Drives for extruders, calenders, rubber spray units, foil machines, fleece machines
 - Wire-drawing machines, wire-stranding machines, etc.
- General applications such as coiler and winder drives

Asynchronous motors

Servo motors for SIMODRIVE 611

1PH7 motors

Technical specifications (general)

1PH7 motors

Insulation of the stator winding to EN 60034-1 (IEC 60034-1)	Temperature class F for a coolant temperature of up to +40 °C (+104 °F)
Motor fan ratings	3 AC 400 V ±10%, 50/60 Hz 3 AC 480 V +5% –10% 60 Hz
Encoder system, integrated	Incremental encoder sin/cos 1 V _{pp} , 2048 pulses/revolution
Terminal box connection type	
• Motor	Terminals in terminal box
• Fan	Terminals in terminal box
• Motor encoder and PTC thermistor	12/17-pin circular socket (without mating connector)
Type according to EN 60034-7 (IEC 60034-7)	IM B3, IM B35
Rating plates	1 supplied separately packed in terminal box
Permissible coolant temperature	–15 ... +40 °C (+5 ... +104 °F)
Temperature monitoring	KTY 84 temperature sensor in stator winding
Sound pressure level to EN ISO 1680 (tolerance +3 dB)	From DE to NDE (at 50 Hz mains operation of fan) 1PH710.: 70 dB (A) 1PH713.: 70 dB (A) 1PH716.: 75 dB (A) ¹⁾ 1PH718.: 73 dB (A) ²⁾ 1PH722.: 76 dB (A) ²⁾

Technical data (core type)

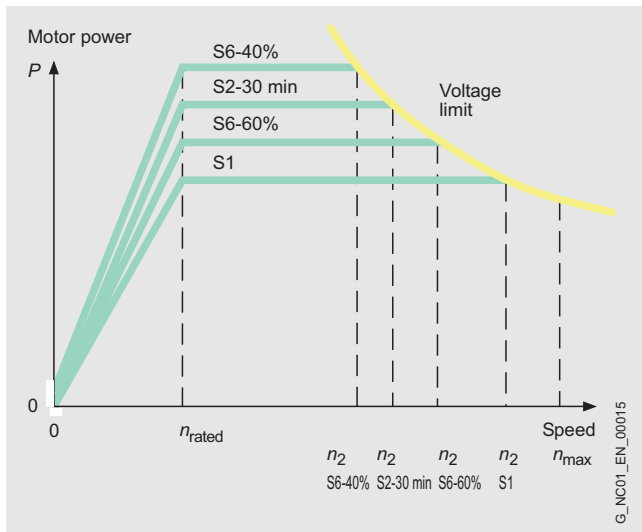
1PH7 motors

Type according to EN 60034-7 (IEC 60034-7):	1PH710: IM B5 (IM V1, IM V3) 1PH713: IM B5 (IM V1, IM V3) 1PH716: IM B35 (IM V15, IM V36)
Terminal box arrangement (view onto drive end) ³⁾	Top, cable infeed from right
Bearing design on drive end ⁴⁾	Bearing for belt or coupling output
Vibration severity to EN 60034-14 (IEC 60034-14)	Stage S
Shaft and flange accuracy to DIN 42955 (IEC 60072-1)	Tolerance R (reduced)
Degree of protection to EN 60034-5 (IEC 60034-5)	Motor IP55, fan IP54
Paint finish	No paint finish/primed Anthracite (option)

1) The sound pressure level can be reduced if the fan is operating on a 60 Hz supply system with option K44.
2) The sound pressure level can be reduced with an air flow from the drive end to the non-drive end with option G15.

3) DE is the front of the motor with the shaft. NDE is the rear of the motor.
4) For permissible loads, see the 1PH Motors Planning Guide.

Characteristics



Typical speed/power graph for AC motors ¹⁾

The graph shows the typical relationship between motor speed and drive power for 1PH7 motors in the following duty types (according to IEC 60034-1):

S1: Continuous duty

S6: Continuous duty with intermittent loading and a relative ON period of 60% (S6-60%) or 40% (S6-40%) with a maximum duty cycle time of 10 min.

S2: Short-time duty with an ON period of 30 min (S2-30 min) followed by standstill.

Motor Type	Rated speed n_{rated} rpm	Achievable speed for rated power in duty type according to IEC 60034-1 n_2 ²⁾			
		S1 rpm	S6-60% rpm	S6-40% rpm	S2-30 min rpm
1PH7 101-.NF	1500	8200	7000	6000	6500
1PH7 103-.ND	1000	3750	3750	3100	3350
1PH7 103-.NF	1500	5000	4600	3900	4500
1PH7 103-.NG	2000	9000	7500	6400	6900
1PH7 105-.NF	1500	7900	6750	5750	6150
1PH7 107-.ND	1000	5800	4800	4100	4650
1PH7 107-.NF	1500	6500	6200	5250	5650
1PH7 107-.NG	2000	7000	7000	6900	7000
1PH7 131-.NF	1500	6700	5500	4500	5000
1PH7 133-.ND	1000	4700	3700	2800	3450
1PH7 133-.NF	1500	6800	5600	4500	5100
1PH7 133-.NG	2000	6500	6500	5900	6450
1PH7 135-.NF	1500	7500	6200	5200	5650
1PH7 137-.ND	1000	5400	4500	3600	4100
1PH7 137-.NF	1500	7000	7000	6200	6800
1PH7 137-.NG	2000	6000	6000	5800	6000
1PH7 163-.NB	500	2500	1900	1500	1730
1PH7 163-.ND	1000	5800	4800	4000	4400
1PH7 163-.NF	1500	5500	5500	5500	5500
1PH7 163-.NG	2000	3500	3500	3500	3500
1PH7 167-.NB	500	2100	1600	1250	1400
1PH7 167-.ND	1000	6250	5200	4300	4700
1PH7 167-.NF	1500	4500	4500	4500	4500
1PH7 167-.NG	2000	3250	3250	3250	3250
1PH7 184-.NT	500	4500	3800	3350	3350
1PH7 184-.ND	1000	5000	4400	3600	3600
1PH7 184-.NE	1250	5000	4680	4190	3600
1PH7 184-.NF	1500	5000	5000	5000	5000
1PH7 184-.NL	2500	5000	5000	5000	5000
1PH7 186-.NT	500	4800	4100	3580	4000
1PH7 186-.ND	1000	5000	4650	3850	3850
1PH7 186-.NE	1250	5000	4260	3780	3580
1PH7 224-.NC	700	3020	2570	2290	2170
1PH7 224-.ND	1000	4500	4500	4100	3730
1PH7 224-.NF	1500	4500	4330	4000	3890

1) For additional information, see the 1PH Motors Planning Guide.

2) Values taken from the speed/power graph with closed-loop control infeed. When an uncontrolled infeed is used, the Planning Guide for 1PH motors must be complied with.

Asynchronous motors

Servo motors for SIMODRIVE 611

1PH7 motors – Core type
Shaft heights 100 to 160

Selection and ordering data

Shaft height	Rated speed	Max. continuous speed		Max. speed ¹⁾		Rated power for duty type according to IEC 60034-1				1PH7 asynchronous motors Forced ventilation Order No. Core type
	n_{rated}	$n_{S1 \text{ cont.}}^{2)}$	$n_{S1 \text{ cont.}}^{3)}$	n_{max}	$n_{max}^{4)}$	P_{rated}				
	rpm	rpm	rpm	rpm	rpm	S1 kW (HP)	S6-60% kW (HP)	S6-40% kW (HP)	S2-30 min kW (HP)	
100	2000	5500	–	9000	–	7 (9.38)	8.5 (11.39)	10 (13.4)	9.25 (12.4)	1PH7 103- ■ NG0 2 -0C ■ 0
	1500	5500	–	9000	–	9 (12.06)	11 (14.75)	13 (17.43)	12 (16.09)	1PH7 107- ■ NF0 2 -0C ■ 0
132	1000	4500	–	8000	–	12 (16.09)	15 (20.11)	18.5 (24.8)	16 (21.45)	1PH7 133- ■ ND0 2 -0C ■ 0
	2000					20 (26.81)	25 (33.51)	30 (40.21)	27.5 (36.86)	1PH7 133- ■ NG0 2 -0C ■ 0
	1000	4500	–	8000	–	17 (22.79)	20.5 (27.48)	25 (33.51)	22.5 (30.16)	1PH7 137- ■ ND0 2 -0C ■ 0
	2000					28 (37.53)	35 (46.92)	43 (57.64)	39 (52.28)	1PH7 137- ■ NG0 2 -0C ■ 0
160	1000	3700	–	6500	–	22 (29.49)	27 (36.19)	33 (44.24)	30 (40.21)	1PH7 163- ■ ND0 3 -0C ■ 0
	1500					30 (40.21)	37 (49.6)	45 (60.32)	41 (54.96)	1PH7 163- ■ NF0 3 -0C ■ 0
	1500	3700	–	6500	–	37 (49.6)	46 (61.66)	56 (75.07)	51 (68.36)	1PH7 167- ■ NF0 3 -0C ■ 0
• Fans:				Separately driven fan Heavy-gauge threaded cable entry in terminal box Separately driven fan Metric cable entry in terminal box						2 7
• Type: ⁵⁾				IM B5 (IM V1, IM V3) IM B35 (IM V15, IM V36)						2 3
• Shaft extension (DE) ⁵⁾ : Fitted key Smooth shaft				• Balancing: Half-key –		• Direction of air flow (fan): DE → NDE DE → NDE		• Exhaust direction: Axial Axial		A J

For type, see "Selection guide".

Asynchronous motors

Servo motors for SIMODRIVE 611

1PH7 motors – Core type
Shaft heights 100 to 160

Selection and ordering data

Motor type (continued)	Rated torque	Moment of inertia	Weight, approx.	Rated current for duty type according to IEC 60034-1				SIMODRIVE 611 power module	
	M_{rated}	J	m	I_{rated}				Required rated current	Order No.
	Nm (lb _f -ft)	kgm ² (lb _f -in-s ²)	kg (lb)	S1 A	S6-60% A	S6-40% A	S2- 30 min A	I_{rated} S1 A	
1PH7 103-.NG02-...	33.4 (24.6)	0.017 (0.1504)	40 (88.2)	17.5	20.5	23.5	21.5	24	For ordering data see "Power Modules" in Section 3
1PH7 107-.NF02-...	57.3 (42.3)	0.029 (0.2566)	63 (139)	23.5	27.5	31	29	24	
1PH7 133-.ND02-...	114.6 (84.5)	0.076 (0.6726)	90 (198.5)	30	36	43	37.5	30	
1PH7 133-.NG02-...	95.5 (70.4)	0.076 (0.6726)	90 (198.5)	45	54	63	59	45	
1PH7 137-.ND02-...	162.3 (119.8)	0.109 (0.9646)	130 (286.7)	43	50	60	54	45	
1PH7 137-.NG02-...	133.7 (96.6)	0.109 (0.9646)	130 (286.7)	60	73	87	80	60	
1PH7 163-.ND03-...	210.1 (155)	0.19 (1.6815)	180 (397)	55	65	77	71	60	
1PH7 163-.NF03-...	191.0 (140.9)	0.19 (1.6815)	180 (397)	72	86	102	94	85	
1PH7 167-.NF03-...	235.5 (173.7)	0.23 (2.0355)	228 (502.7)	82	97	115	104	85	



1PH7 motor (shaft heights 100 to 160)

- 1) For continuous duty (with 30% n_{max} , 60% $\frac{2}{3} n_{max}$, 10% standstill) for a duty cycle time of 10 min. For motor and component maintenance intervals, see the 1PH Motors Planning Guide.
- 2) Bearing version for coupling/belt output.
- 3) Bearing version for increased maximum speed.
- 4) Version for increased maximum speed only possible in combination with vibration severity SR. The following options are not possible:
 - Prepared for ZF mounted gearing
 - Shaft seal.
- 5) With "Prepared for ZF mounted gearing", the following motor versions are required (for gear selection, see "Gearboxes"):
 - Sizes IM B5 or IM B35
 - Shaft with fitted key and full-key balancing.

Asynchronous motors

Servo motors for SIMODRIVE 611

1PH7 motors – Standard type
Shaft heights 100/132

Selection and ordering data

Shaft height	Rated speed	Max. continuous speed		Max. speed ¹⁾		Rated power for duty type according to IEC 60034-1				1PH7 asynchronous motors Forced ventilation							
	n_{rated}	$n_{S1 \text{ cont.}}^{2)}$	$n_{S1 \text{ cont.}}^{3)}$	n_{max}	$n_{max}^{4)}$	P_{rated}											
	rpm	rpm	rpm	rpm	rpm	S1 kW (HP)	S6-60% kW (HP)	S6-40% kW (HP)	S2-30 min kW (HP)	Order No. Standard type							
100	1500	5500	10000	9000	12000	3.7 (4.96)	4.5 (6.03)	5.25 (7.04)	4.9 (6.57)	1PH7 101- ■ NF ■ ■ -0 ■ ■ ■ ■							
	1000	5500	10000	9000	12000	3.7 (4.96)	4.5 (6.03)	5.25 (7.04)	4.7 (6.3)	1PH7 103- ■ ND ■ ■ -0 ■ ■ ■ ■							
	1500					5.5 (7.37)	6.7 (8.98)	7.7 (10.32)	7 (9.38)	1PH7 103- ■ NF ■ ■ -0 ■ ■ ■ ■							
	2000					7 (9.38)	8.5 (11.39)	10 (13.4)	9.25 (12.4)	1PH7 103- ■ NG ■ ■ -0 ■ ■ ■ ■							
	1500	5500	10000	9000	12000	7 (9.38)	8.5 (11.39)	10 (13.4)	9.25 (12.4)	1PH7 105- ■ NF ■ ■ -0 ■ ■ ■ ■							
	1000	5500	10000	9000	12000	6.25 (8.38)	7.5 (10.05)	8.8 (11.8)	7.75 (10.39)	1PH7 107- ■ ND ■ ■ -0 ■ ■ ■ ■							
	1500					9 (12.06)	11 (14.75)	13 (17.43)	12 (16.09)	1PH7 107- ■ NF ■ ■ -0 ■ ■ ■ ■							
	2000					10.5 (14.08)	12.5 (16.76)	14.5 (19.44)	13.5 (18.1)	1PH7 107- ■ NG ■ ■ -0 ■ ■ ■ ■							
132	1500	4500	8500	8000	10000	11 (14.75)	13.5 (18.1)	16.5 (22.12)	15 (20.11)	1PH7 131- ■ NF ■ ■ -0 ■ ■ ■ ■							
	1000	4500	8500	8000	10000	12 (16.09)	15 (20.11)	18.5 (24.8)	16 (21.45)	1PH7 133- ■ ND ■ ■ -0 ■ ■ ■ ■							
	1500					15 (20.11)	18.5 (24.8)	23 (30.83)	20.5 (27.48)	1PH7 133- ■ NF ■ ■ -0 ■ ■ ■ ■							
	2000					20 (26.81)	25 (33.51)	30 (40.21)	27.5 (36.86)	1PH7 133- ■ NG ■ ■ -0 ■ ■ ■ ■							
	1500	4500	8500	8000	10000	18.5 (24.8)	23 (30.83)	28 (37.53)	25.5 (34.18)	1PH7 135- ■ NF ■ ■ -0 ■ ■ ■ ■							
	1000	4500	8500	8000	10000	17 (22.79)	20.5 (27.48)	25 (33.51)	22.5 (30.16)	1PH7 137- ■ ND ■ ■ -0 ■ ■ ■ ■							
	1500					22 (29.49)	27.5 (36.86)	33 (44.24)	30 (40.21)	1PH7 137- ■ NF ■ ■ -0 ■ ■ ■ ■							
	2000					28 (37.53)	35 (46.92)	43 (57.64)	39 (52.28)	1PH7 137- ■ NG ■ ■ -0 ■ ■ ■ ■							
• Fans:				Separately driven fan Heavy-gauge threaded cable entry in terminal box Separately driven fan Metric cable entry in terminal box						2							
										7							
• Terminal box/ cable infeed:				Top/right Top/NDE Top/left							0						
											2						
											3						
• Type: ⁵⁾				IM B3 (IM V5, IM V6) IM B5 (IM V1, IM V3) IM B35 (IM V15, IM V36)							0						
											2						
											3						
• Bearing version for: Coupling/belt output Coupling/belt output Coupling/belt output Increased speed (coupling/belt output) ⁴⁾				• Vibration severity grade: R S SR SR				• Shaft and flange accuracy: R R R R				B C D L					
• Shaft extension (DE): ⁵⁾ Fitted key Fitted key Fitted key Fitted key Smooth shaft Smooth shaft				• Balancing: Half-key Half-key Full-key Full-key – –				• Direction of air flow (fan): DE → NDE NDE → DE DE → NDE NDE → DE DE → NDE NDE → DE				• Exhaust direction: Axial Axial Axial Axial Axial Axial					
												A B C D J K					
• Degree of protection: IP55, fan IP54 IP55, fan IP54				• Seal: – DE flange with shaft seal ⁶⁾				• Color: Unpainted Unpainted				0 2					
IP55, fan IP54 IP55, fan IP54				– DE flange with shaft seal ⁶⁾				Anthracite, standard paint finish (RAL 7016) Anthracite, standard paint finish (RAL 7016)				3 5					
IP55, fan IP54 IP55, fan IP54				– DE flange with shaft seal ⁶⁾				Anthracite, special paint finish (RAL 7016) Anthracite, special paint finish (RAL 7016)				6 8					

Selection of degree of protection and type of construction, see "Selection guide".

Asynchronous motors

Servo motors for SIMODRIVE 611

1PH7 motors – Standard type
Shaft heights 100/132

Selection and ordering data

Motor type (continued)	Rated torque	Moment of inertia	Weight, approx.	Rated current for duty type according to IEC 60034-1				SIMODRIVE 611 power module	
	M_{rated}	J	m	I_{rated}				Required rated current	Order No.
	Nm (lb _f -ft)	kgm ² (lb _f -in-s ²)	kg (lb)	S1 A	S6-60% A	S6-40% A	S2- 30 min A	I_{rated} S1 A	
1PH7 101-.NF...	23.6 (17.4)	0.017 (0.1504)	40 (88.2)	10	11.5	12.5	12	24	For ordering data see "Power Modules" in Section 3
1PH7 103-.ND...	35.3 (26)	0.017 (0.1504)	40 (88.2)	10	11.5	13	12	24	
1PH7 103-.NF...	35.0 (25.8)	0.017 (0.1504)	40 (88.2)	13	16	18	16.5	24	
1PH7 103-.NG...	33.4 (24.6)	0.017 (0.1504)	40 (88.2)	17.5	20.5	23.5	21.5	24	
1PH7 105-.NF...	44.6 (32.9)	0.029 (0.2566)	63 (139)	17.5	21	23.5	22	24	
1PH7 107-.ND...	59.7 (44)	0.029 (0.2566)	63 (139)	17.5	20.5	23	21	24	
1PH7 107-.NF...	57.3 (42.3)	0.029 (0.2566)	63 (139)	23.5	27.5	31	29	24	
1PH7 107-.NG...	50.1 (37)	0.029 (0.2566)	63 (139)	26	28.5	33	31	30	
1PH7 131-.NF...	70.0 (51.6)	0.076 (0.6726)	90 (198.5)	24	29	34	31.5	24	
1PH7 133-.ND...	114.6 (84.5)	0.076 (0.6726)	90 (198.5)	30	36	43	37.5	30	
1PH7 133-.NF...	95.5 (70.4)	0.076 (0.6726)	90 (198.5)	34	41	49	43.5	45	
1PH7 133-.NG...	95.5 (70.4)	0.076 (0.6726)	90 (198.5)	45	54	63	59	45	
1PH7 135-.NF...	117.8 (86.9)	0.109 (0.9646)	130 (286.7)	42	50	58	54	45	
1PH7 137-.ND...	162.3 (119.7)	0.109 (0.9646)	130 (286.7)	43	50	60	54	45	
1PH7 137-.NF...	140.1 (103.3)	0.109 (0.9646)	130 (286.7)	57	68	79	73	60	
1PH7 137-.NG...	133.7 (98.6)	0.109 (0.9646)	130 (286.7)	60	73	87	80	60	



1PH7 motor (shaft heights 100 to 160)

- 1) For continuous duty (with 30% n_{max} , 60% $\frac{2}{3} n_{max}$, 10% standstill) for a duty cycle time of 10 min. For motor and component maintenance intervals, see the 1PH Motors Planning Guide.
- 2) Bearing version for coupling/belt output.
- 3) Bearing version for increased maximum speed.
- 4) Version for increased maximum speed only possible in combination with vibration severity SR. The following options are not possible:
 - Prepared for ZF mounted gearing
 - Shaft seal.

- 5) With "Prepared for ZF mounted gearing", the following motor versions are required (for gear selection, see "Gearboxes"):
 - Sizes IM B5 or IM B35
 - Shaft with fitted key and full-key balancing.
- 6) Only recommended if oil spray/mist occasionally gets onto the sealing ring. A sealing ring is not possible at increased maximum speed.

Asynchronous motors

Servo motors for SIMODRIVE 611

1PH7 motors – Standard type
Shaft height 160

Selection and ordering data

Shaft height	Rated speed	Max. continuous speed		Max. speed ¹⁾		Rated power for duty type according to IEC 60034-1				1PH7 asynchronous motors Forced ventilation									
	n_{rated}	$n_{S1 \text{ cont.}}^{2)}$	$n_{S1 \text{ cont.}}^{3)}$	n_{max}	$n_{max}^{4)}$	P_{rated}													
	rpm	rpm	rpm	rpm	rpm	kW (HP)	kW (HP)	kW (HP)	kW (HP)	Order No. Standard type									
160	500	3700	7000	6500	8000	12 (16.09)	15 (20.11)	18 (24.13)	16.5 (22.12)	1PH7 163-	■	NB	■	■	-0	■	■	■	■
	1000					22 (29.49)	27 (36.19)	33 (44.24)	30 (40.21)	1PH7 163-	■	ND	■	■	-0	■	■	■	■
	1500					30 (40.21)	37 (49.6)	45 (60.32)	41 (54.96)	1PH7 163-	■	NF	■	■	-0	■	■	■	■
	2000					36 (48.26)	44 (59.98)	52 (69.71)	48 (64.34)	1PH7 163-	■	NG	■	■	-0	■	■	■	■
	500	3700	7000	6500	8000	16 (21.45)	19.5 (26.14)	24 (32.17)	21.5 (28.82)	1PH7 167-	■	NB	■	■	-0	■	■	■	
	1000					28 (37.53)	34.5 (46.25)	42 (56.3)	38 (50.94)	1PH7 167-	■	ND	■	■	-0	■	■	■	■
	1500					37 (49.6)	46 (61.66)	56 (75.07)	51 (68.36)	1PH7 167-	■	NF	■	■	-0	■	■	■	■
	2000					41 (54.96)	51 (68.36)	61 (81.77)	56 (75.07)	1PH7 167-	■	NG	■	■	-0	■	■	■	■
• Fans:				Separately driven fan Heavy-gauge threaded cable entry in terminal box Separately driven fan Metric cable entry in terminal box						2									
										7									
• Terminal box/ cable infeed:				Top/right Top/NDE Top/left							0								
											2								
											3								
• Type: ⁵⁾				IM B3 (IM V5, IM V6) IM B35 (IM V15, IM V36)							0								
											3								
• Bearing version for: Coupling/belt output Coupling/belt output Coupling/belt output Increased speed (coupling/belt output) ⁴⁾				• Vibration severity grade:		• Shaft and flange accuracy:													
				R		R													
				S		R													
				SR		R													
				SR		R													
				</															

Asynchronous motors

Servo motors for SIMODRIVE 611

1PH7 motors – Standard type
Shaft height 160

Selection and ordering data

Motor type (continued)	Rated torque	Moment of inertia	Weight, approx.	Rated current for duty type according to IEC 60034-1				SIMODRIVE 611 power module	
	M_{rated}	J	m	I_{rated}				Required rated current	Order No.
	Nm (lb _f -ft)	kgm ² (lb _f -in-s ²)	kg (lb)	S1 A	S6-60% A	S6-40% A	S2- 30 min A	I_{rated} S1 A	
1PH7 163-.NB...	229.2 (169.1)	0.19 (1.6815)	180 (396.9)	30	36	42	39	30	For ordering data see "Power Modules" in Section 3
1PH7 163-.ND...	210.1 (155)	0.19 (1.6815)	180 (396.9)	55	65	77	71	60	
1PH7 163-.NF...	191.0 (140.9)	0.19 (1.6815)	180 (396.9)	72	86	102	94	85	
1PH7 163-.NG...	171.9 (126.8)	0.19 (1.6815)	180 (396.9)	85	100	114	107	85	
1PH7 167-.NB...	305.5 (225.3)	0.23 (2.0355)	228 (502.7)	37	44	53	48	45	
1PH7 167-.ND...	267.4 (197.2)	0.23 (2.0355)	228 (502.7)	71	85	100	92	85	
1PH7 167-.NF...	235.5 (173.7)	0.23 (2.0355)	228 (502.7)	82	97	115	104	85	
1PH7 167-.NG...	195.8 (144.4)	0.23 (2.0355)	228 (502.7)	89	106	124	115	120	



1PH7 motor (shaft heights 100 to 160)

- 1) For continuous duty (with 30% n_{max} , 60% $\frac{2}{3} n_{max}$, 10% standstill) for a duty cycle time of 10 min. For motor and component maintenance intervals, see the 1PH Motors Planning Guide.
- 2) Bearing version for coupling/belt output.
- 3) Bearing version for increased maximum speed.
- 4) Version for increased maximum speed only possible in combination with vibration severity SR. The following options are not possible:
 - Prepared for ZF mounted gearing
 - Shaft seal.

- 5) With "Prepared for ZF mounted gearing", the following motor versions are required (for gear selection, see "Gearboxes"):
 - Sizes IM B5 or IM B35
 - Shaft with fitted key and full-key balancing.
- 6) Only appropriate if oil spray/mist occasionally gets onto the sealing ring. A sealing ring is not possible at increased maximum speed.

Asynchronous motors

Servo motors for SIMODRIVE 611

1PH7 motors – Standard type
Shaft heights 180/225

Selection and ordering data

Shaft height SH	Rated speed	Max. continuous speed				Max. speed ¹⁾		Rated power for duty type according to IEC 60034-1				1PH7 asynchronous motors Forced ventilation																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																			
	n_{rated}	$n_{S1\ cont. 2)}$	$n_{S3\ cont. 3)}$	$n_{S1\ cont. 4)}$	n_{max}	$n_{max 5)}$	P_{rated}																	Order No. Standard type																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																							
								S1	S6-60%	S6-40%	S2-30 min																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																				
	rpm	rpm	rpm	rpm	rpm	rpm	rpm	kW (HP)	kW (HP)	kW (HP)	kW (HP)																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																				
180	500	3500	3000	4500	5000	7000	21.5 (28.82)		26.5 (35.52)		30.5 (40.88)		30 (40.21)		1PH7 184- NT -0																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																
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Selection of degree of protection and type of construction, see "Selection guide".

Asynchronous motors

Servo motors for SIMODRIVE 611

1PH7 motors – Standard type
Shaft heights 180/225

Selection and ordering data

Motor type (continued)	Rated torque	Moment of inertia	Weight approx. ⁸⁾	Rated current for duty type according to IEC 60034-1				SIMODRIVE 611 power module	
	M_{rated}	J	m	I_{rated}				Required rated current	
	Nm (lb _f -ft)	kgm ² (lb _f -in-s ²)	kg (lb)	S1 A	S6-60% A	S6-40% A	S2-30 min A	S1 A	Order No.
1PH7 184-.NT...	410 (302.4)	0.5 (4.4249)	390 (860)	76	90	103	102	85	For ordering data see "Power Modules" in Section 3
1PH7 184-.ND...	372 (274.4)	0.5 (4.4249)		90	106	126	126	120	
1PH7 184-.NE...	305 (225)	0.5 (4.4249)		85	100	110	128	85	
1PH7 184-.NF...	325 (239.7)	0.5 (4.4249)		120	149	174	174	120	
1PH7 184-.NL...	298 (219.8)	0.5 (4.4249)		172	204	237	237	200	
1PH7 186-.NT...	565 (416.7)	0.67 (5.9294)	460 (1014.3)	105	126	147	130	120	
1PH7 186-.ND...	487 (359.2)	0.67 (5.9294)		118	141	164	164	120	
1PH7 186-.NE...	458 (337.8)	0.67 (5.9294)		120	135	150	156	120	
1PH7 224-.NC...	750 (553.2)	1.48 (13.1)	650 (1433.3)	117	135	149	155	120	
1PH7 224-.ND...	678 (500.1)	1.48 (13.1)		164	190	222	240	200	
1PH7 224-.NF...	636 (469.1)	1.48 (13.1)		188	230	248	256	200	



1PH7 motor (shaft heights 180 and 225)

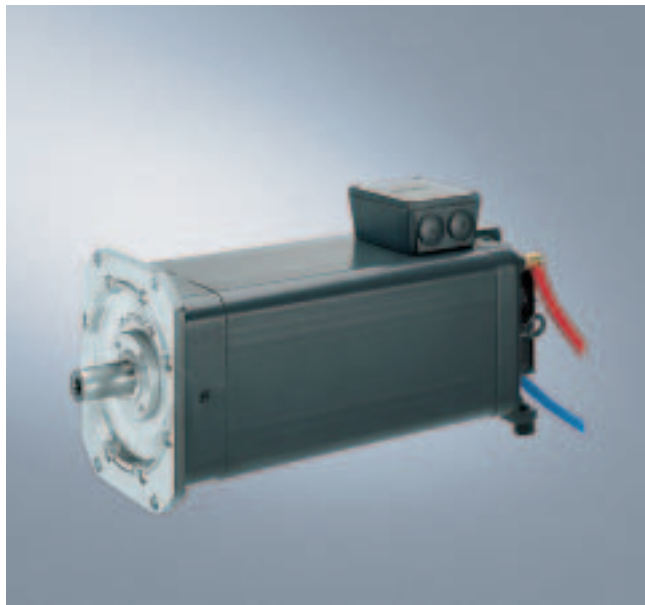
- For continuous duty (with 30% n_{max} , 60% $\frac{2}{3} n_{max}$, 10% standstill) for a duty cycle time of 10 min. For motor and component maintenance intervals, see the 1PH Motors Planning Guide.
- Bearing version for coupling/belt output.
- Bearing version for increased lateral force.
- Bearing version for increased maximum speed.
- Version for increased maximum speed only possible in combination with vibration severity S. The following options are not possible:
 - Prepared for ZF mounted gearing
 - Shaft seal.
- Only appropriate if oil spray/mist occasionally gets onto the sealing ring. A sealing ring is not possible on type IM B3 (IM V5, IM V6), version with increased lateral force or increased maximum speed.
- The following motor versions are required for "Prepared for ZF mounted gearing" (to select gearing see "Gearboxes"):
 - Type IM B35, IM V15 (not IM V36)
 - Shaft with fitted key and full-key balancing
 - Bearing version for coupling output
 - Shaft and flange accuracy R
 - DE flange with shaft seal
- Applies to type IM B35. In type IM B3 the motor is 20 kg (44 lb) lighter.

Asynchronous motors

Servo motors for SIMODRIVE 611

1PH4 motors – Standard type

Overview



Given the compact design of modern machines, heat losses from electrical drives can have an adverse effect on machining accuracy. The consequential requirement for cold motors at high power densities led to the development of the water-cooled 1PH4 motors.

Furthermore, a combination of high torque and small unit volume (low mass inertia) results in short acceleration and braking times and thus in a reduction in non-productive time.

1PH4 motors are robust, 4-pole asynchronous motors with squirrel cage rotors. Power loss and noise are minimized. Due to the compact design of the motors, high maximum speeds can be achieved.

The motors are equipped with an encoder system for sensing the motor speed and indirect position. On machine tools, the encoder system is capable of C-axis operation as standard, that is, an additional encoder is not required for C-axis operation.

Benefits

- High power density due to small unit volume
- Maximum speeds of up to 9000 rpm (12000 rpm optional)
- Full rated torque is always available, even at zero speed
- Cooled flange to prevent thermal stressing of the mechanical power train
- Low noise level
- High degree of protection (IP65, shaft exit IP55)
- High rotational accuracy

Application

- In applications in which extreme ambient conditions such as high temperature, dust, dirt or a corrosive atmosphere do not permit air cooling.
- In processes where no thermal stress may be placed on the environment.
- Milling machines with full enclosure
- High-load milling spindles
- Counterspindles on turning machines
- On special machines if cooling water is available depending on the process

Please see "Liquid cooling" for a list of heat exchanger manufacturers.

Technical data

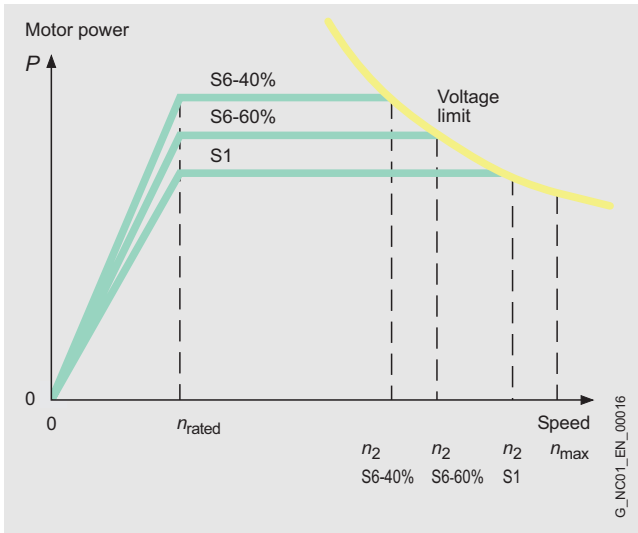
1PH4 motors

Insulation of the stator winding ¹⁾ to EN 60034-1 (IEC 60034-1)	Temperature class F for a coolant inlet temperature of up to +30 °C (+86 °F)
Encoder system, integrated	Incremental encoder sin/cos 1 V _{pp} , 2048 pulses/revolution
Type according to EN 60034-7 (IEC 60034-7)	IM B35 (IM V15, IM V36)
Terminal box arrangement (view onto drive end) ²⁾	Top, rotatable 4 x 90°
Terminal box connection type	Terminals in terminal box 12/17-pin circular socket (without mating connector)
• Motor	
• Motor encoder and PTC thermistor	
Bearing design on drive end ³⁾	Bearing for belt or coupling output
Vibration severity to EN 60034-14 (IEC 60034-14)	Grade R (reduced)
Shaft and flange accuracy to DIN 42955 (IEC 60072-1)	Tolerance N (normal)
Drive end shaft extension according to DIN 748	With fitted key and keyway
Degree of protection according to EN 60034-5 (IEC 60034-5)	IP65, IP55 on shaft exit
Paint finish	Anthracite
Permissible coolant temperature	Due to the formation of condensation water, we recommend a coolant inlet temperature of approximately +30 °C (+86 °F) (depending on ambient conditions)
Temperature monitoring	2 KTY 84 temperature sensors in the stator winding, 1 x as reserve
Sound pressure level to EN ISO 1680 (tolerance +3 dB)	1PH4 10: 69 dB (A) 1PH4 13: 69 dB (A) 1PH4 16: 71 dB (A)

¹⁾ Supply voltage of the SIMODRIVE 611 converter system	
3 AC 400 V ±10% (i. e. $U_{DC \text{ link}} \leq 600 \text{ V}$)	3 AC 480 V +6%, -10% (i. e. $U_{DC \text{ link}} = 680 \text{ V}$)
Operation of the 1PH4 motors possible.	Operation of the 1PH4 motors possible.

- ²⁾ DE is the front of the motor with the shaft. NDE is the rear of the motor.
³⁾ For permissible loads, see the 1PH Motors Planning Guide.

Characteristics



Typical speed/power graph for AC motors ¹⁾

The diagram shows the typical relationship between motor speed and drive power for 1PH4 motors in the following duty types (according to IEC 60034-1):

S1: Continuous duty

S6: Continuous duty with intermittent loading and a relative ON period of 60% (S6-60%) or 40% (S6-40%) with a maximum duty cycle time of 10 min.

Motor	Rated speed	Achievable speed for rated power in duty type according to IEC 60034-1		
Type	n_{rated}	$n_2^{2)}$		
	rpm	rpm	S6-60%	S6-40%
1PH4 103	1500	8600	7500	6500
1PH4 105	1500	8800	7600	6500
1PH4 107	1500	8600	7400	6400
1PH4 133	1500	8000	7400	6000
1PH4 135	1500	7400	6200	5500
1PH4 137	1500	6800	5800	5000
1PH4 138	1500	7800	6600	5800
1PH4 163	1500	6300	5200	4500
1PH4 167	1500	5200	4400	3800
1PH4 168	1500	6300	5300	4600

1) For more information about planning, see the 1PH Motors Planning Guide.

2) Values taken from the speed/power graph with closed-loop control infeed. When an uncontrolled infeed is used, the Planning Guide for 1PH motors must be complied with.

Asynchronous motors

Servo motors for SIMODRIVE 611

1PH4 motors – Standard type
Shaft heights 100 to 160

Selection and ordering data

Shaft height	Rated speed	Max. continuous speed			Maximum speed ¹⁰⁾ L37 ⁹⁾ ¹⁰⁾		Rated power for duty type according to IEC 60034-1			1PH4 asynchronous motors Water cooling Order No. Standard type
	n_{rated}	$n_{S1 \text{ cont.}}^{11)}$	$n_{S1 \text{ cont.}}^{12)}$	$n_{S1 \text{ cont.}}^{13)}$	n_{max}	n_{max}	P_{rated}	S6-60%	S6-40%	
	rpm	rpm	rpm	rpm	rpm	rpm	kW (HP)	kW (HP)	kW (HP)	
100	1500	5600	6500	10000	9000	12000	7.5 (10.05)	8.75 (11.73)	10 (13.4)	1PH4 103-4NF26
							11 (14.75)	12.75 (17.09)	14.75 (19.77)	1PH4 105-4NF26
							14 (18.77)	16.25 (21.78)	18.75 (25.13)	1PH4 107-4NF26
132	1500	5200	6000	9250	8000	10000	15 (20.11)	18 (24.13)	21 (28.15)	1PH4 133-4NF26
							22 (29.49)	26.5 (35.52)	31 (41.55)	1PH4 135-4NF26
							27 (36.19)	32.5 (43.57)	38 (50.94)	1PH4 137-4NF26
							30 (40.21)	36 (48.26)	42 (56.3)	1PH4 138-4NF26
160	1500	4000	4500	7000	6500	8000	37 (49.6)	45 (60.32)	52.5 (70.38)	1PH4 163-4NF26
							46 (61.66)	55 (73.72)	65 (87.13)	1PH4 167-4NF26
							52 (69.7)	62.5 (83.78)	73 (97.86)	1PH4 168-4NF26

Options

Bearing version (view onto DE)
 (standard = duplex bearing)

- Single bearing for coupling or planetary gearboxes or low to moderate cantilever forces

Order code
K00

Vibration severity according to EN 60034-14 (IEC 60034-14) (standard = vibration severity grade R, duplex bearing arrangement)

- Grade S with duplex bearing arrangement ¹⁾
- Grade S with single bearing arrangement ¹⁾
- Grade SR with single bearing arrangement ¹⁾

K05 ²⁾
K02 ²⁾
K03 ²⁾

Shaft and flange accuracy according to DIN 42955 (IEC 60072-1) (standard = tolerance N)

- Tolerance R

K04 ³⁾

Shaft extension (drive end)

(standard = full-key balancing with keyway)

- Plain shaft
- Half-key balancing

K42
L69

Shaft seal (drive end)

- Radial shaft seal, oil-tight, IP65

K18 ⁴⁾

Gearbox ⁵⁾ ⁶⁾

- Motor prepared for mounting ZF gearbox 2LG43... (types IM B35 or IM V15)

Order code
K00

Brake ⁶⁾

- With holding brake mounted on DE

G46

Terminal box arrangement
 (view onto DE) (standard = top)

- Side right ⁶⁾
- Side left ⁶⁾

K09
K10

Rotation of terminal box around its own axis

- By 90°, cable entry from drive end ⁷⁾
- By 90°, cable entry from non-drive end ⁷⁾
- By 180° ⁷⁾

K83
K84
K85

Speed ⁸⁾

- With increased maximum speed

L37

Other

- Second rating plate, separately packed

K31

Encoder system

- Without encoder

H30

When ordering options, an order code must also be stated for each specific version required.

Order codes must not be repeated in plain text in the order.

Example number **1PH4 1 ■ ■ -4NF26-Z**

Order code(s) **■ ■ ■ + ■ ■ ■ + . . .**

Asynchronous motors

Servo motors for SIMODRIVE 611

1PH4 motors – Standard type
Shaft heights 100 to 160

Selection and ordering data

Motor type (continued)	Rated torque	Moment of inertia	Weight, approx.	Rated current for duty type according to IEC 60034-1			SIMODRIVE 611 power module	
	M_{rated}	J	m	I_{rated}			Required rated current	Order No.
	Nm (lb _f -ft)	kgm ² (lb _f -in-s ²)	kg (lb)	S1 A	S6-60% A	S6-40% A	I_{rated} S1	
1PH4 103-...	48 (35.4)	0.017 (0.1504)	52 (114.7)	26	29	32	30	For ordering data see "Power Modules" in Section 3
1PH4 105-...	70 (51.6)	0.024 (0.2124)	67 (147.7)	38	42	47	45	
1PH4 107-...	90 (66.4)	0.031 (0.2743)	80 (176.4)	46	52	58	60	
1PH4 133-...	95 (70.1)	0.046 (0.4071)	90 (198.5)	55	65	74	60	
1PH4 135-...	140 (103.3)	0.071 (0.6283)	112 (247)	73	86	99	85	
1PH4 137-...	170 (125.4)	0.085 (0.7522)	130 (286.7)	85	100	114	85	
1PH4 138-...	190 (140.1)	0.097 (0.8584)	150 (330.8)	102	119	136	120	
1PH4 163-...	235 (173.3)	0.17 (1.5045)	175 (385.9)	107	125	142	120	
1PH4 167-...	293 (216.1)	0.206 (1.8231)	210 (463.1)	120	138	158	120	
1PH4 168-...	331 (244.1)	0.22 (1.947)	240 (529.2)	148	173	197	200	

5

- 1) Options are mutually exclusive.
- 2) Contains option K04.
- 3) Increased shaft accuracy.
- 4) Only appropriate if oil spray/mist occasionally gets onto the sealing ring.
- 5) Vibration severity grades S, SR not possible for integrated gearbox. Use code K00 + G97 for old ZF gearbox 2LG42... (see "Gearboxes" for gearbox selection).
- 6) Options are mutually exclusive.
- 7) Options are mutually exclusive.
- 8) Version for increased maximum speed includes vibration severity grade SR and half-key balancing. The following options are not possible:
 - Prepared for ZF mounted gearing
 - Shaft seal
- 9) Maximum speed using option L37 "increased maximum speed".
- 10) For continuous duty (with 30% n_{max} , 60% $\frac{2}{3} n_{max}$, 10% standstill) for a duty cycle time of 10 min. For motor and component maintenance intervals, see the 1PH Motors Planning Guide.
- 11) Bearing version for twin bearing.
- 12) Bearing version for single bearing.
- 13) Bearing version for increased maximum speed.

Asynchronous motors

Liquid cooling

For 1PH4 motors

Overview

Heat exchanger manufacturers

Please contact the companies below for technical information.

These are non-Siemens products whose fundamental suitability is familiar to us. It goes without saying that equivalent products from other manufacturers may be used. Our recommendations are to be seen as helpful information, not as requirements or dictates. We do not warrant the composition, nature, state or quality of non-Siemens products.

BKW Kälte-Wärme-Versorgungstechnik GmbH

Contact: Benzstraße 2
Mr. Walker 72649 Wolfschlugen, Germany
Phone: +49 (0) 70 22 - 50 03 - 0
Fax: +49 (0) 70 22 - 50 03 - 30
E-mail: info@bkw-kuema.de
Internet: www.bkw-kuema.de

Helmut Schimpke and Team Industriekühlanlagen GmbH + Co. KG

Contact: Ginsterweg 25-27
Mr. Geerkens 42781 Haan, Germany
Phone: +49 (0) 21 29 - 94 38 - 0
Fax: +49 (0) 21 29 - 94 38 - 99
Internet: www.schimpke.de

Hyfra Industriekühlanlagen

Contact: Industriestraße
Mr. Forberger 56593 Krunkel, Germany
Phone: +49 (0) 26 87 - 8 98 - 0
Fax: +49 (0) 26 87 - 8 98 - 25

KKT Kraus Industriekühlung GmbH

Contact: Mühlach 13a
Mr. Titschack 90552 Röthenbach a. d. Pegnitz
Phone: +49 (0) 911 - 953 33 - 40
Fax: +49 (0) 911 - 953 33 - 33
E-mail: gtitschack@kkt-kraus.com

KKW Kulmbacher Klimageräte-Werk GmbH

Geschäftsbereich RIEDEL Kältetechnik

Contact: Am Goldenen Feld 18
Mr. Beitz 95326 Kulmbach, Germany
Phone: +49 (0) 92 21 - 7 09 - 5 55
Fax: +49 (0) 92 21 - 7 09 - 5 49
E-mail: info@riedel-kkw.de

Pfannenberg GmbH

Contact: Werner-Witt-Straße 1
Mr. Hille 21035 Hamburg, Germany
Phone: +49 (0) 40 - 7 34 12 - 1 27
Fax: +49 (0) 40 - 7 34 12 - 1 01
E-mail: werner.hille@pfannenberg.com
Internet: www.pfannenberg.com

Application

Change-speed gearboxes increase the drive torque at low motor speeds and expand the band of constant power output available from the main spindle motor. The full cutting capacity of modern machine tools can therefore be utilized throughout the entire speed range.

Benefits

The performance features of the two-speed gearboxes for 1PH7/1PH4 motors are as follows:

- Drive power up to 100 kW (134 HP)
- Constant power band at drive shaft up to 1:24
- Bidirectional
- Motor shaft heights 100 to 225
- Types IM B35 and IM V15 (IM V36 available on request)

Mounting the change-speed gearbox outside the headstock of the machine tool has the following advantages:

- Easy adaptation to the machine tool
- Low noise and no temperature fluctuations due to gearing inside the headstock
- Separate lubrication systems for the main spindle (grease) and the gearbox (oil)
- Gearbox efficiency > 95%
- Instead of V-belts, the drive power can also be transmitted from the gear drive output shaft by a spur gear pinion (available on request) or coaxially by means of a flexible coupling.

Design

The two-speed gearboxes are planetary units. The central sun gear distributes the power to several planet wheels, which revolve around it. The outstanding advantage of this design is its compactness. The gear-changing device, a splined sleeve that moves axially, is of form-fit design.

Position 1: Gear ratio $i_1 = 4$

Position 2: Gear ratio $i_2 = 1$.

The motor is flanged onto the gearbox via an adapter plate. The AC motor must be suitably prepared for mounting.

For shaft heights of 160 and above, motors of types IM B35 and IM V15 must be supported free from stress on the non-drive end.

Any lateral forces imported into the gear unit have to be borne by the gearbox and transmitted to the machine base.

The motors for all 2K gearboxes must be full-key balanced with fitted key. The 2K 120, 2K 250, 2K 300 gearboxes are enclosed, so that the motor flange is adequately sealed in the standard version.

Vertical mounting positions for the IM V15 and IM V36 require circulating-oil lubrication of the gearboxes.

The standard version of the change-speed gearboxes up to the 2K 300 have a maximum torque play of 30 angular minutes (measured at the gearbox output). Several special versions suitable for milling or machining with cut interruption can be supplied on request:

- Reduced backlash with special features: max. 20'
- Reduced backlash for high performance: max. 15'



Profile of a planetary gearbox

The power unit (i.e. the motor and gearbox) is supplied with vibration severity grade R according to EN 60034-14 (IEC 60034-14). This is also the case when the motor is ordered with grade S.

The belt pulley ¹⁾ should be of the cup wheel type. For mounting the belt pulley, the output shaft on the gearbox has a flange with an external centering spigot and tapped holes for easy fitting and removal of the pulley.

Motors with built-on planetary gearboxes

1PH motors can also be supplied with flange-mounted planetary gearboxes. The motor-gearbox unit is tested for correct functioning. The complete drive unit - i.e. 1PH7/1PH4 motor with mounted ZF change-speed gearbox - can be ordered directly from Siemens:

Siemens AG

Industrial Solutions and Services

Contact: Mr. Britz

Im Schiffelland 10
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The following details must be specified with the order:

Ordering example for 1PH4 motor:

Motor complete with gearbox

1PH4 133 - 4NF26 - Z

K00

2LG4 315 - 3FD11

Ordering example for 1PH7 motor:

Motor complete with gearbox

1PH7 186 - 2NE03 - 0BC2

2LG4 260 - 1JC21

1PH7 163 - 2NF03 - 0CC0

2LG4 320 - 3JD11

1) Not included.

Asynchronous motors

Gearboxes

Two-speed gearboxes for 1PH7/1PH4 motors

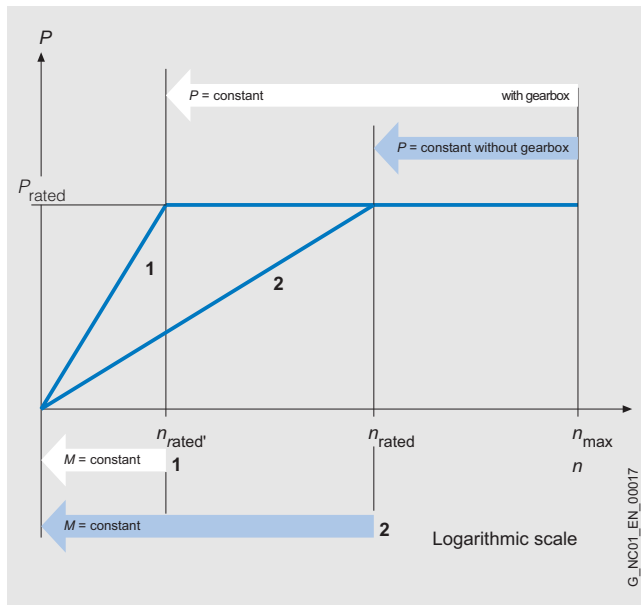
Technical data

Motor Shaft height	Gearbox		Permissible max. speed ²⁾	Permissible rated torque (S1 duty)			Permissible Maximum torque (S6-60% duty)			Moment of inertia of gearbox		Gearbox weight, approx. <i>m</i> kg (lb)
	ZF des.	Type		Drive	Output <i>i</i> = 1	Output <i>i</i> = 4	Drive	Output <i>i</i> = 1	Output <i>i</i> = 4	Output <i>i</i> = 1	Output <i>i</i> = 4	
<i>n</i> _{max} rpm	Nm (lb _f -ft)	Nm (lb _f -ft)	Nm (lb _f -ft)	Nm (lb _f -ft)	Nm (lb _f -ft)	Nm (lb _f -ft)	kgm ² (lb _f -in-s ²)	kgm ² (lb _f -in-s ²)				
100	2K 120	2LG4 312-...	8000	120 (88.5)	120 (88.5)	480 (354)	140 (103.3)	140 (103.3)	560 (413.1)	0.0110 (0.0973)	0.0114 (0.1009)	30 (66.2)
132	2K 250	2LG4 315-...	6300	250 (184.4)	250 (184.4)	1000 (737.6)	400 (295)	400 (295)	1600 (1180.2)	0.0270 (0.2389)	0.0570 (0.5044)	62 (136.7)
160	2K 300	2LG4 320-...	6300	300 (221.3)	300 (221.3)	1200 (885.1)	400 (295)	400 (295)	1600 (1180.2)	0.0270 (0.2389)	0.0570 (0.5044)	70 (154.4)
180	2K 800	2LG4 250-...	5000	800 (590.1)	800 (590.1)	3200 (2360.3)	900 (663.8)	900 (663.8)	3600 (2655.4)	0.1956 (1.731)	0.1766 (1.5629)	110 (242.6)
	2K 801	2LG4 260-...										
225	2K 802	2LG4 270-...	On request									

For further binding technical specifications and configuring instructions (e.g. lubrication, temperature rise and typical applications), please refer to Catalog No. 4161 750 002a supplied by ZF (Zahnradfabrik Friedrichshafen). The permissible ratings of the motor and gearbox must be taken into account when dimensioning the overall drive unit (i.e. the motor and gear).

On 1PH4168 or 1PH7167-2NB motors, for example, the rated torque must be reduced to 300 Nm (221.3 lb_f-ft). With motors of shaft height 132, please note that the maximum permissible speed of the 2K 250 gearbox for splash lubrication is 6300 rpm.

The use of a gearbox permits the constant power band to be increased significantly.



Speed-power graph

Legend:

- n_{rated} Rated speed
- n_{rated}' Rated speed with two-stage gearbox
- n_{max} Max. permissible speed
- P_{rated} Rated power and constant output of the motor in speed range of n_{rated} to n_{max} or n_{rated}' to n_{max}
- M Torque

1) Special versions, such as gearboxes with different torque play, or other gear ratios ($i = 3.17$ or $i = 5.5$), are available on request.

Type for whole unit	Output flange dimension D_2 (see technical documentation)	Two-speed gearbox (standard version) ¹⁾ Gear stage $i_1 = 4$	
	mm (in)	Order No.	ZF identifier

For 1PH710./1PH410. motors.

IM B5, IM B35, IM V1, IM V15	100 (3.9)	2LG4 312 - 3CC31	2K 120
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For 1PH713./1PH413. motors.

IM B5, IM B35	118 (4.6)	2LG4 315 - 3FD11	2K 250
IM V1, IM V15	118 (4.6)	2LG4 315 - 3FC11	2K 250

For 1PH716./1PH416. motors.

IM B35	130 (5.1)	2LG4 320 - 3JD11	2K 300
IM V15	130 (5.1)	2LG4 320 - 3JC11	2K 300

For 1PH7184 motors

IM B35, IM V15	180 (7.1)	2LG4 250 - 1JC11	2K 800
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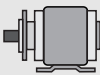
For 1PH7186 motors

IM B35, IM V15	180 (7.1)	2LG4 260 - 1JC21	2K 801
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2) Higher drive speeds are permitted for gear ratios in some instances with oil-cooled gearboxes (see the ZF Catalog).

Asynchronous motors

Selection guide

Type		Type		Type	
Type	Designation	Type	Designation	Type	Designation
	IM B3		IM B5 IM B14		IM B35
	IM V5		IM V1 IM V18		IM V15
	IM V6		IM V3 IM V19		IM V36

Degree of protection			
The designation for the degree of protection according to EN 60034-5 and IEC 60034-5 is made using the letters "IP" and two digits (e.g. IP64). The second digit in the designation represents the protection against water, the first digit the protection against penetration of foreign matter. Since coolants are used which contain oil, are able to creep, and may also be corrosive, protection against water alone is insufficient. The designation for the degree of protection should only be considered here as a guideline. Our sealing systems are based on many years of practical experience, exceed the IEC specifications by far, and are appropriate to the requirements of machine tools. The table can serve as a decision aid for selecting the proper degree of protection for motors. With the IM V3/IM V19 designs, permanent liquid on the flange is only permissible with IP67/IP68.			
Fluids	General shop-floor environment	Water gen. coolants (95% water, 5% oil); oil	Creep oil; petroleum; aggressive coolants
Effect			
Dry	IP64	–	–
Water-enriched environment	–	IP64	IP67 ¹⁾
Mist	–	IP65	IP67
Splatter	–	IP65	IP68
Jet	–	IP67	IP68
Surge, brief immersion; constant inundation	–	IP67	IP68

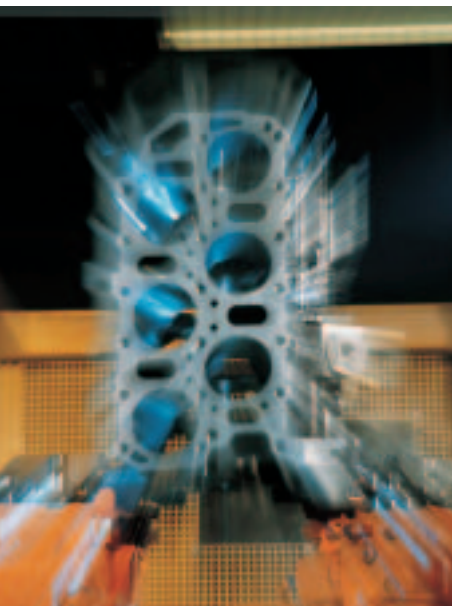
1) IP64 with dry run at shaft exit.

Asynchronous motors

Selection guide

Notes

5



6/2 **Built-on optoelectronic rotary encoders**

6/3 Incremental encoders

6/3 Absolute encoders

6/8 Mounting accessories

6/9 **SIMAG H2 hollow-shaft measuring system**

6/10 **Diagnostic device**



Measuring systems

SIMODRIVE sensor

Built-on optoelectronic rotary encoders

Overview



SIMODRIVE sensors are built-on optoelectronic encoders for the recording of paths, angles of rotation, or speeds of machines. They can be used in conjunction with numerical controllers, programmable logic controllers, drives and position displays, e.g.:

- SINAMICS drive systems
- SIMOTION Motion Control systems
- SINUMERIK CNC controls
- SIMATIC programmable logic controllers
- SIMODRIVE and SIMOVERT MASTERDRIVES drive systems

Application

A distinction is made between incremental and absolute measuring procedures. In the case of incremental encoders, the machine must travel to a reference point after each power-off state, as the position is not usually stored in the controller, and movements of the machine are not recorded while the power is off.

Absolute encoders, on the other hand, also record these movements while the power is off and return the actual position with power On. Travel to a reference point is not necessary.

Design

All encoders are available in synchronous flange and flange joint versions. Encoders with a synchronous flange can be attached to the machine by means of three clamp straps. Mounting with axial screws is also possible. The encoder is driven by means of a plug-in coupling or a spring disk coupling. Alternatively, pulleys can also be used.

The encoder supply voltage is 5 V DC or alternatively 10 V to 30 V DC. The 10 V to 30 V version supports longer cable lengths. Most control systems apply the supply voltage directly on the measuring circuit connector.

For rotary encoders with cables, the cable length including the connector is 1 m (3.3 ft).

The following bending radii for the cables at the encoder must be complied with:

Single bend: ≥ 20 mm (0.8 in)

Permanent bending: ≥ 75 mm (3 in)

Built-on optoelectronic rotary encoders Incremental encoder

Function



These encoders deliver a defined number of electrical pulses for each rotation, which represent the measurement of the traveled distance or angle.

Incremental encoders operate on the principle of optoelectronic scanning of dividing disks with the transmitted light principle. The light source is a light emitting diode (LED). The light-dark modulation generated as the encoder shaft rotates is picked up by photoelectronic elements. With an appropriate arrangement of the line pattern on the dividing disk connected to the shaft and the fixed aperture, the photoelectronic elements provide two trace signals A and B at 90° to one another, as well as a reference signal R. The encoder electronics amplify these signals and convert them into different output levels.

The following output levels are available:

- RS 422 difference signals (TTL)
In the case of RS 422 encoders (TTL), the resolution can be improved by a factor of four by means of edge evaluation.
- Analog signals sin/cos at a level of $1 V_{pp}$
Even better resolution can be achieved for encoders with sinusoidal signals by interpolating them in the higher-level controller.
- HTL (High Voltage Transistor Logic)
Encoders with HTL interfaces are designed for applications with digital inputs with 24 V levels.

Built-on optoelectronic rotary encoders Absolute encoders

Function



Absolute encoders (absolute shaft encoders) are designed on the same scanning principle as incremental encoders, but have a greater number of tracks. For example, if there are 13 tracks, then $2^{13} = 8192$ steps are coded in the case of single-turn encoders. The code used is a one-step code (gray code), which prevents any scanning errors from occurring.

After switching on the machine, the position value is transmitted immediately to the controller. There is no need to travel to a reference point. The data are transmitted between encoder and controller either via the synchronous serial interface (SSI), via EnDat or via PROFIBUS DP ¹⁾.

SSI and EnDat are of advantage in time-critical applications. In plants with a large number of encoders, PROFIBUS DP is more of an advantage due to the reduced wiring overhead. The encoders with PROFIBUS DP are programmable and support isochronous mode with internode communication.

Single-turn encoders divide one rotation (360 degrees mechanical) into a specific number of steps, e.g. 8192. A unique code word is assigned to each position. After 360 degrees the position values are repeated.

Multiturn encoders also record the number of revolutions, in addition to the absolute position within one revolution. To do this, further code discs which are coupled via gear steps with the encoder shaft are scanned. When evaluating 12 additional tracks, this means that $2^{12} = 4096$ revolutions can be coded.

1) For references on the subject of PROFIBUS, see "Documentation".

Measuring systems

SIMODRIVE sensor

Built-on optoelectronic rotary encoders Incremental encoders

Technical data

	Incremental encoder with TTL (RS 422)	Incremental encoder with sin/cos 1 V _{pp}	Incremental encoder with HTL	Double-track incremental encoder with TTL (RS 422)
Operating voltage at encoder	5 V DC ±10% or 10 ... 30 V DC	5 V DC ±10%	10 ... 30 V DC	5 V DC ±5%
Limit frequency, typical	–	≥ 180 kHz (-3 dB)	–	–
	–	≥ 450 kHz (-6 dB)	–	–
Scanning frequency, max.	300 kHz	–	300 kHz	Track 1: 160 kHz Track 2: 1 MHz
No-load current consumption, max.	150 mA			150 mA per track
Signal level	TTL (RS 422)	sinusoidal 1 V _{pp}	HTL V _H ≥ 21 V at I _H = 20 mA@ 24 V V _L ≤ 2.8 V at I _L = 20 mA@ 24 V	TTL (RS 422)
Outputs protected against short-circuit to 0 V	yes	yes	yes	yes
Switching time (10% ... 90%) (with 1 m (3.3 ft) cable and recommended input circuit)	Rise/fall time t _r /t _f ≤ 50 ns	–	Rise/fall time t _r /t _f ≤ 200 ns	Rise/fall time t _r /t _f ≤ 100 ns
Phase angle, signal A to B min. edge spacing at:	90	90 ±10°el.	90	90
• 1 MHz	–	–	–	≥ 0.125 μs (track 2)
• 300 kHz	≥ 0.45 μs	–	≥ 0.45 μs	–
• 160 kHz	–	–	–	≥ 0.8 μs (track 1)
Cable length to electronic circuitry ¹⁾ , max.	100 m (328 ft)	150 m (492 ft)	100 m (328 ft)	100 m (328 ft) (up to 500 kHz) 50 m (164 ft) (up to 1 MHz)
LED failure monitoring	High-resistance driver	–	High-resistance driver	–
Resolution, max.	5000 S/R	2500 S/R	2500 S/R	Track 1: 1024 S/R Track 2: 9000 S/R
Accuracy (in angular seconds)	±18° mech. × 3600/resolution z			Track 1: ±63 Track 2: ±12
Permissible electr. speed	(18 × 10 ⁶ rpm)/ increment	(27 × 10 ⁶ rpm) / increment (at -6 dB)	(18 × 10 ⁶ rpm)/ increment	Track 1: 9000 rpm Track 2: 6500 rpm
Mech. speed, max.	12000 rpm			
Friction torque	≤ 0.01 Nm (0.09 lb _f -in) (at +20 °C (+68 °F))			
Starting torque	≤ 0.01 Nm (0.09 lb _f -in) (at +20 °C (+68 °F))			
Shaft loading capacity				
• n > 6000 rpm	Axial 10 N (2.2 lb _f)/radial 20 N (4.5 lb _f) at shaft extension			–
• n ≤ 6000 rpm	Axial 40 N (9 lb _f)/radial 60 N (13.5 lb _f) at shaft extension			Axial 10 N (2.2 lb _f)/radial 20 N (4.5 lb _f) at shaft extension
Angular acceleration, max.	>10 ⁵ rad/s ²			
Moment of inertia of rotor	1.45 × 10 ⁻⁶ kgm ² (12.83 × 10 ⁻⁶ lb _f -in-s ²)			20 × 10 ⁻⁶ kgm ² (177 × 10 ⁻⁶ lb _f -in-s ²)
Vibration (55 ... 2000 Hz) to DIN IEC 68-2-6	≤ 300 m/s ² (984 ft/s ²) for encoder with cable ≤ 150 m/s ² (492 ft/s ²) for encoder with flange outlet			
Shock (6 ms) to DIN IEC 68-2-27	≤ 2000 m/s ² (6563 ft/s ²)			
Operating temperature, max.	+100 °C (+212 °F) at V _B = 5 V ±10% +70 °C (+158 °F) at V _p = 10 ... 30 V	+100 °C (+212 °F)	+85 °C (+185 °F) +100 °C (+212 °F) at V _p < 15 V	+70 °C (+158 °F)
Operating temperature, min.	Flange socket or fixed cable: -40 °C (-40 °F) Movable cable: -10 °C (+14 °F)			-10 °C (+14 °F)
Degree of protection according to EN 60529 (IEC 60529)	IP67 without shaft input IP64 with shaft input			
EMC	Tested in accordance with the guidelines for electromagnetic compatibility 89/336/EEC and the regulations of the EMC guidelines (applicable basic standards)			
Weight, approx.	0.25 kg (0.55 lb)			0.7 kg (1.5 lb)
CE mark	yes			

1) With recommended cable and input circuitry of the follow-up electronics, observe max. permissible cable length of module to be evaluated.

Selection and ordering data

Designation	Order No.
Incremental encoder with RS 422 interface (TTL)	
<u>Synchronous flange and 5 V DC supply voltage</u>	
Connection:	
• Axial flange outlet	6FX2 001-2G ■■■
• Radial flange outlet	6FX2 001-2E ■■■
• Cable 1 m (3.3 ft) with connector ¹⁾	6FX2 001-2C ■■■
<u>Synchronous flange and 10 ... 30 V DC supply voltage</u>	
Connection:	
• Axial flange outlet	6FX2 001-2H ■■■
• Radial flange outlet	6FX2 001-2F ■■■
• Cable 1 m (3.3 ft) with connector ¹⁾	6FX2 001-2D ■■■
<u>Supported flange joint and 5 V DC supply voltage</u>	
Connection:	
• Axial flange outlet	6FX2 001-2R ■■■
• Radial flange outlet	6FX2 001-2P ■■■
• Cable 1 m (3.3 ft) with connector ¹⁾	6FX2 001-2M ■■■
<u>Supported flange joint and 10 ... 30 V DC supply voltage</u>	
Connection:	
• Axial flange outlet	6FX2 001-2S ■■■
• Radial flange outlet	6FX2 001-2Q ■■■
• Cable 1 m (3.3 ft) with connector ¹⁾	6FX2 001-2N ■■■
<u>Resolution</u>	
500 pulses/rev.	A 5 0
1000 pulses/rev.	B 0 0
1024 pulses/rev.	B 0 2
1250 pulses/rev.	B 2 5
1500 pulses/rev.	B 5 0
2000 pulses/rev.	C 0 0
2048 pulses/rev.	C 0 4
2500 pulses/rev.	C 5 0
3600 pulses/rev.	D 6 0
5000 pulses/rev.	F 0 0

Designation	Order No.
Incremental encoder with analog signals sin/cos 1 V_{pp}	
<u>Synchronous flange and 5 V DC supply voltage</u>	
Connection:	
• Axial flange outlet	6FX2 001-3G ■■■
• Radial flange outlet	6FX2 001-3E ■■■
• Cable 1 m (3.3 ft) with connector ¹⁾	6FX2 001-3C ■■■
<u>Resolution</u>	
1000 pulses/rev.	B 0 0
1024 pulses/rev.	B 0 2
2500 pulses/rev.	C 5 0
Incremental encoder with HTL interface	
<u>Synchronous flange and 10 ... 30 V DC supply voltage</u>	
Connection:	
• Axial flange outlet	6FX2 001-4H ■■■
• Radial flange outlet	6FX2 001-4F ■■■
• Cable 1 m (3.3 ft) with connector ¹⁾	6FX2 001-4D ■■■
<u>Supported flange joint and 10 ... 30 V DC supply voltage</u>	
Connection:	
• Axial flange outlet	6FX2 001-4S ■■■
• Radial flange outlet	6FX2 001-4Q ■■■
• Cable 1 m (3.3 ft) with connector ¹⁾	6FX2 001-4N ■■■
<u>Resolution</u>	
100 pulses/rev.	A 1 0
500 pulses/rev.	A 5 0
1000 pulses/rev.	B 0 0
2500 pulses/rev.	C 5 0
Double-track incremental encoder with RS 422 interface (TTL)	6FX2 001-2UK00
<u>Synchronous flange and 5 V DC supply voltage</u>	
Connection:	
• Cable 1 m (3.3 ft) with axial connector	
2 types of resolution:	
9000/1024 pulses/rev.	
Replacement connectors with external threads for encoders (3 units)	
• 12-pole with 12 contact pins for incremental encoder with RS 422, sin/cos 1 V _{pp} , HTL for absolute encoder with SSI	6FX2 003-1CF12

1) Universal integrated cable outlet for axial and radial outlet direction.

Measuring systems

SIMODRIVE sensor

Built-on optoelectronic rotary encoders Absolute encoders

Technical data

	Absolute encoder with SSI	Absolute encoder with EnDat	Absolute encoder with PROFIBUS DP (EN 50170)
Operating voltage at encoder	10 ... 30 V DC	5 V DC $\pm 10\%$	10 ... 30 V DC
Power consumption, approx.	250 mA multi-turn, 180 mA single-turn		300 ... 100 mA (2.5 W)
Clock input	Differential cable receiver according to EIA standard RS 485		
Data output	Differential cable driver according to EIA standard RS 485		
Short-circuit resistance	yes		
Data transfer rate	100 kHz ... 1 MHz	100 kHz ... 2 MHz	12 Mbit/s
LED for bus diagnostics	–	–	yes (green/red)
Permissible electr. speed	5000 rpm with ± 1 bit accuracy 10000 rpm with ± 100 bit accuracy		5800 rpm at ± 1 -bit accuracy
Mech. speed, max.	12000 rpm single-turn 10000 rpm multi-turn		12000 rpm single-turn 6000 rpm multi-turn
Cable length to electronic circuitry ¹⁾ , max.	50 m (164 ft) up to 1 MHz cycle 100 m (328 ft) up to 300 kHz cycle 400 m (1313 ft) up to 100 kHz cycle	50 m (164 ft) up to 1 MHz cycle 150 m (492 ft) up to 300 kHz cycle –	100 m (328 ft) up to 12 Mbit/s 200 m (656 ft) up to 1.5 Mbit/s 1200 m (3938 ft) up to 93.75 kbit/s
Number of nodes, max.	–	–	99
Connection	Flange socket, axial/radial		Terminal block with address selector switch and bus terminating resistor in removable cover with 3 radial cable glands
Cable diameter	–		6.5 ... 9 mm (0.26 ... 0.35 in) Mounting on end of cover is possible without interruption of the bus
Resolution	13 bits single-turn (8192 steps) 25 bits multi-turn (8192 $\times$ 4096 steps)		13 bits single-turn (8192 steps) 27 bits multi-turn (8192 $\times$ 16384 steps)
Message frame length	13 bit single-turn, without parity 25 bit multi-turn, without parity	According to EnDat specification	–
Incremental track	–	512 pulses/rev., 1 V _{pp}	–
Code type			
• Sampling	Gray	Gray	Gray
• Transfer	Gray, fir tree format	Binary	Binary
Parameterization capability			
• Resolution per revolution	–	–	Arbitrary 1 ... 8192
• Total resolution	–	–	Arbitrary 1 ... 16384
• Preset	–	–	yes
• Counting direction	yes	–	yes
• Speed signal	–	–	yes
• Limit switch	–	–	yes, 2
• Isochronous mode and internode communication acc. to DP V2	–	–	yes
Online parameterization	–	–	yes
Network load, approx.	–	–	20 μ s per encoder at 12 Mbit/s
Cycle time	–	–	667 μ s
Accuracy	± 60 angular seconds	± 60 angular seconds (incr. track) tested acc. to EN	$\pm \frac{1}{2}$ LSB
EMC	Tested acc. to EN 50081 and EN 50082		
Friction torque	≤ 0.01 Nm (0.09 lb _f -in) (at +20 °C (+68 °F))		
Starting torque	< 0.01 Nm (0.09 lb _f -in) (at +20 °C (+68 °F))		
Shaft loading capacity			
• $n > 6000$ rpm	Axial 10 N (2.2 lb _f)/radial 20 N (4.5 lb _f) at shaft extension		
• $n \leq 6000$ rpm	Axial 40 N (9 lb _f)/radial 60 N (13.5 lb _f) at shaft extension		
Angular acceleration, max.	10^5 rad/s ²		
Moment of inertia of rotor	1.45×10^{-6} kgm ² (12.83 $\times 10^{-6}$ lb _f -in-s ²)		

1) Observe the maximum permissible cable length of the connected module.

Technical data (continued)

	Absolute encoder with SSI	Absolute encoder with EnDat	Absolute encoder with PROFIBUS DP (EN 50170)
Vibration (55 ... 2000 Hz) to IEC 68-2-6	$\leq 100 \text{ m/s}^2$ (328 ft/s ²)		
Shock (6 ms) to IEC 68-2-27	$\leq 1000 \text{ m/s}^2$ (3281 ft/s ²)		
Operating temperature, max.	+85 °C (+185 °F)	+100 °C (+212 °F)	+70 °C (+158 °F)
Operating temperature, min.	-40 °C (-40 °F)	-40 °C (-40 °F)	-40 °C (-40 °F)
Degree of protection according to EN 60529 (IEC 60529)	IP67 without shaft input IP64 with shaft input		
Weight, approx. Single-turn/multi-turn	0.35 kg (0.8 lb)/0.35 kg (0.8 lb)		0.5 kg (1.1 lb)/0.7 kg (1.5 lb)
CE mark	yes	yes	yes
PROFIBUS certificate	–	–	yes
Supported profiles	–	–	Class 1, Class 2

Selection and ordering data

Designation	Order No.	Designation	Order No.
Absolute encoder with SSI <u>Synchronous flange and 10 ... 30 V DC supply voltage</u> Connection: • SSI with axial flange outlet • SSI with radial flange outlet <u>Supported flange joint and 10 ... 30 V DC supply voltage</u> Connection: • SSI with axial flange outlet • SSI with radial flange outlet <u>Resolution</u> • Single-turn 8192 steps/revolution (13 bits) • Multi-turn 8192 steps/revolution, 4096 revolutions (25 bits)		Absolute encoder with PROFIBUS DP <u>Synchronous flange and 10 ... 30 V DC supply voltage</u> • Radial connection <u>Supported flange joint and 10 ... 30 V DC supply voltage</u> • Radial connection <u>Resolution</u> • Single-turn 8192 steps/revolution (13 bits) • Multi-turn 8192 steps/revolution, 16384 revolutions (27 bits)	
	6FX2 001-5HS ■ ■ 6FX2 001-5FS ■ ■ 6FX2 001-5SS ■ ■ 6FX2 001-5QS ■ ■ 1 2 2 4		6FX2 001-5FP ■ ■ 6FX2 001-5QP ■ ■ 1 2 2 4
Absolute encoder with EnDat <u>Synchronous flange and 5 V DC supply voltage</u> Connection: • EnDat with axial flange outlet • EnDat with radial flange outlet <u>Supported flange joint and 5 V DC supply voltage</u> Connection: • EnDat with axial flange outlet • EnDat with radial flange outlet <u>Resolution</u> • Single-turn 8192 steps/revolution (13 bits) • Multi-turn 8192 steps/revolution, 4096 revolutions (25 bits)		User Manual for start-up and parameterization of PROFIBUS encoders Languages: German/English Replacement connectors with external threads for encoders (3 units) • 12-pole with 12 contact pins for incremental encoder with RS 422, sin/cos 1 V _{pp} , HTL for absolute encoder with SSI • 17-pole with 17 contact pins for absolute encoder with EnDat	
	6FX2 001-5HE ■ ■ 6FX2 001-5FE ■ ■ 6FX2 001-5SE ■ ■ 6FX2 001-5QE ■ ■ 1 3 2 5		6SN1 197-0AB10-0YP3 6FX2 003-1CF12 6FX2 003-1CF17

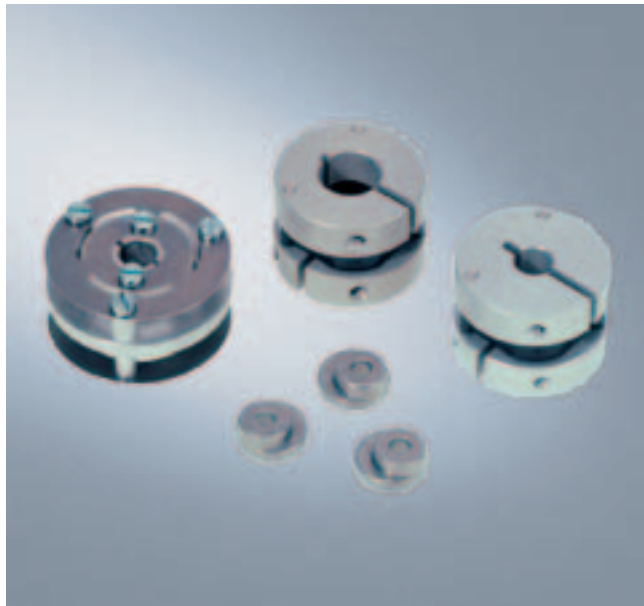
Measuring systems

SIMODRIVE sensor

Built-on optoelectronic rotary encoders

Mounting accessories

Overview



Clamp straps/couplings

Clamp straps and couplings are available as mounting accessories for the rotary encoders. The clamp straps are used to fix the encoders with a synchronous flange.

Mating connector

A mating connector is available for the encoder with flange outlet or with cable and encoder connector for cable diameters 5.5 mm (0.22 in) to 12 mm (0.47 in). The connectors with 12 contacts fit all incremental encoders as well as absolute encoders with SSI. Connectors with 17 contacts are suitable for encoders with EnDat.

Technical data

	Spring disk coupling	Plug-in coupling
Transmission torque, max.	0.8 Nm (7.1 lb _f -in)	0.7 Nm (6.2 lb _f -in)
Shaft diameter	6 mm (0.24 in) on both sides or $d_1 = 6$ mm (0.24 in), $d_2 = 5$ mm (0.2 in)	6 mm (0.24 in) on both sides or 10 mm (0.39 in) on both sides
Center offset of shafts, max.	0.4 mm (0.016 in)	0.5 mm (0.02 in)
Axial offset	±0.4 mm (0.016 in)	±0.5 mm (0.02 in)
Angular displacement of shafts, max.	3°	1°
Torsional rigidity	150 Nm/rad (110.6 lb _f -ft/rad)	31 Nm/rad (22.9 lb _f -ft/rad)
Lateral spring stiffness	6 N/mm (34 lb _f /in)	10 N/mm (57 lb _f /in)
Moment of inertia	19 gcm ² (168 x 10 ⁻⁷ lb _f -in-s ²)	20 gcm ² (177 x 10 ⁻⁷ lb _f -in-s ²)
Max. speed	12000 rpm	12000 rpm
Operating temperature		
• Maximum	+150 °C (+302 °F)	+80 °C (+176 °F)
• Minimum	-40 °C (-40 °F)	-40 °C (-40 °F)
Weight, approx.	16 g (0.03 lb)	20 g (0.04 lb)

Selection and ordering data

Designation	Order No.
Clamp strap for double-track encoder and encoder with synchro flange (3 units are required)	6FX2 001-7KP01
Spring disk coupling Shaft diameter:	
• 6 mm (0.24 in)/6 mm (0.24 in)	6FX2 001-7KF10
• 6 mm (0.24 in)/5 mm (0.22 in)	6FX2 001-7KF06
Plug-in coupling Shaft diameter:	
• 6 mm (0.24 in)/6 mm (0.24 in)	6FX2 001-7KS06
• 10 mm (0.39 in)/10 mm (0.39 in)	6FX2 001-7KS10
Mating connector for the flange outlet or encoder connector (3 units) Female crimp contacts for cable diameters of 5.5 ... 12 mm (0.22 ... 0.47 in)	
• 12-pin 12 socket contacts for incremental encoder with TTL, sin/cos 1 V _{pp} , HTL for absolute encoder with SSI	6FX2 003-0CE12
• 17-pin 17 socket contacts for absolute encoder with EnDat	6FX2 003-0CE17

SIMAG H2 hollow-shaft measuring system

Application



SIMAG H2 is an incremental system for measuring angles of rotation and rotational speeds. Applications include hollow-shaft applications with direct drives 1FE1 and 1PH2 as well as applications as an autonomous spindle encoder. SIMAG H2 is intended to replace the SIZAG 2 hollow-shaft measuring system in new applications.

The electrical signals and the flange outlet are compatible with existing motor measuring systems. SIMAG H2 can be operated digitally on the SIMODRIVE 611 converter system with all available controls as motor measuring system or as direct measuring system.

Design

The SIMAG H2 measuring system consists of three components:

- Measuring wheel
- Scanning head with connecting lead
- Connection kit

The magnetic division on the measuring wheel is used as unit of measurement. Different internal diameters are available for each outer diameter, whereby the internal diameter can be reworked. The measuring wheel is attached with the shaft nut; alternatives are screw fitting to a shaft shoulder (not possible with all measurement variants) or shrink fitting.

The non-contact scanning head scans the incremental and reference tracks at the measuring wheel and amplifies the signals.

It is connected via a lead attached to the scanning head. The end of the lead is preassembled with contacts and an insulation insert. For assembly, the insulation insert can be fixed into a straight or angular flange outlet. For confined spaces, the encoder can also be supplied with free lead ends.

1) The internal diameters can be reworked (hollowed up to max. 65 mm (2.56 in)); see Planning/Installation Guide.

Technical data

SIMAG H2 hollow-shaft measuring system

Output signals	2 voltage signals 1 V _{pp} in quadrature; 1 reference signal per encoder revolution
Operating voltage	5 V DC ±5%
Typical power consumption	30 mA
Resolution	256 pulses/rev.
Indexing accuracy of measuring wheel	±72 angular seconds at resolution = 256 pulses/rev.
Limit speed	≤ 25000 rpm at 256 pulses/rev.
Rated distance between measuring wheel and scanning head	200 µm
Operating temperature range	-20 ... +120 °C (-4 ... +248 °F)
Shock resistance (11 ms)	1000 m/s ² (3282 ft/s ²)
Vibration (50 ... 2000 Hz)	200 m/s ² (656 ft/s ²)
Degree of protection to EN 60529 (IEC 60529)	IP67 when installed
Bending radius of the cable module lines	One-time bending: ≥ 25 mm (1 in) Multiple bending: ≥ 60 mm (2.4 in)
Max. length of line to converter	50 m (164 ft)
Dimensions (W x H x D), approx. Scanning head (mounted)	37 mm x 18 (+4) mm x 16 mm (1.4 in x 0.7 (+0.2) in x 0.6 in)

Measuring wheel

Internal diameter ¹⁾	45 ^{H6} mm (1.77 in)	60 ^{H6} mm (2.36 in)
External diameter D _a	81.14 mm (3.19 in)	
Thickness	15 mm (0.59 in)	
Pulse number	256	
Moment of inertia, approx.	4.0 x 10 ⁻⁴ kgm ² (35.4 x 10 ⁻⁴ lb _f -in-s ²)	3.0 x 10 ⁻⁴ kgm ² (26.5 x 10 ⁻⁴ lb _f -in-s ²)
Weight, approx.	0.4 kg (0.9 lb)	0.25 kg (0.5 lb)

Selection and ordering data

Designation	Order No.
Scanning head, incremental 1 mm (0.04 in) pole pitch, 1 V _{pp}	
• with plug insert, with 0.2 m cable (0.7 ft)	6FX2 001-6AA12-1CA0
• with plug insert, with 0.5 m cable (1.6 ft)	6FX2 001-6AA12-1FA0
• with plug insert, with 2.0 m cable (6.6 ft)	6FX2 001-6AA12-3AA0
• open wire ends, with 1.0 m cable (3.3 ft)	6FX2 001-6AA12-2AA5
Measuring wheel, D_a 81.14 mm (3.2 in)	
• Internal diameter 45 ^{H6} mm (1.77 in)	6FX2 001-6RB12-4EF0
• Internal diameter 60 ^{H6} mm (2.36 in)	6FX2 001-6RB12-4GA0
Connection kit for insulation insert	
• Straight flange outlet	6FX2 001-6FA12-0GA0
• Angular flange outlet	6FX2 001-6FA12-0WA0
Extraction tool for insulation insert of straight or angular flange outlet	6FX2 001-6FK12-0AA0
Configuring/Installation Instructions	
• German	6SN1 197-0AB31-0AP1
• English	6SN1 197-0AB31-0BP1

Diagnostic device

Overview



The diagnostic device permits the checking of encoders with analog signals $\sin/\cos 1 V_{pp}$. The signals, size of the signal amplitudes, offset values, and the assignment of the zero signal to the incremental track can be measured.

The device has its own encoder power supply with monitoring. This permits checking of the encoder system without requiring additional external components, such as a converter or control.

The preassembled cables 6FX. 002-2CA31-.... or 6FX. 002-2CA51-.... can be used to connect built-in encoders to the diagnostic device.

Technical data

Diagnostic device	
Supply voltage	230 V AC, 50/60 Hz
Inputs	Encoder signal connections
Outputs	
• Encoder power supply	5 ... 8 V DC depending on encoder type $I_{max} = 250 \text{ mA}$
• Analog outputs	Encoder signal A Encoder signal B Encoder signal R (= marker pulse) Offset from the encoder signal A or B
• Square-wave signal outputs	Encoder signal A and B converted to square signal and ANDed logically Encoder signal R (= marker pulse) converted to square signal
Displays	
LED measurement valid	
LED encoder power supply	

Selection and ordering data

Designation	Order No.
Diagnostic device	6FX2 007-1AA00

MOTION-CONNECT cables and connections



7/2	General information
7/5	Power cables
7/10	Signal cables
7/11	MPI cables
7/13	PROFIBUS cables for SIMODRIVE POSMO
7/14	Length code



Note:
For products
approved for
Canada and USA,
see "Appendix".

General information

Overview

MOTION-CONNECT cables are suitable for use with many different types of machine tools and production machines.

The power cables and signal cables can be ordered by the meter or preassembled.

The following MOTION-CONNECT cable designs are available:

- **MOTION-CONNECT 500**, the solution for mainly fixed routing.
- **MOTION-CONNECT 500 PLUS** can be trailed, is resistant to mineral oil (except biological oils and cutting oils) and is therefore particularly suitable for woodworking machines, printing machines and simple machine tools. The existing MOTION-CONNECT 500 signal cables even fulfill the requirements of MOTION-CONNECT 500 PLUS, so that no new signal cable type is required.
- **MOTION-CONNECT 700**, the ideal complement to linear motors and machines with high mechanical requirements.
- **MOTION-CONNECT 800** satisfies all demands for use in trailing configurations with machine tools and production machines.

Benefits

The use of preassembled MOTION-CONNECT cables offers the following advantages:

- High quality, ensuring safety and perfect functioning
- Cost savings with logistics, design, assembly and purchasing
- Liability for defects by Siemens
- Supplied in exact meter lengths (other lengths available on request).

Application

The maximum permissible technical cable lengths specified must be observed when determining the cable lengths for systems and applications described in this catalog. Malfunctions can occur if longer lengths are used.

Siemens AG provides no warranty for correct transmission of signals or power in this case.

The cables are not suitable for outdoor use.



Technical data

Cables	MOTION-CONNECT 500 PLUS Type 6FX5 1	MOTION-CONNECT 500 Type 6FX5 0	MOTION-CONNECT 700 Type 6FX7	MOTION-CONNECT 800 Type 6FX8
Approvals				
Power/signal cables				
• VDE ¹⁾	yes	yes	yes	yes
• cUL or UL/CSA	UL758-CSA-C22.2-N.210.2-M90	UL758-CSA-C22.2-N.210.2-M90	UL758-CSA-C22.2-N.210.2-M90	UL758-CSA-C22.2-N.210.2-M90
• UL-CSA File No. ²⁾	yes	yes	yes	yes
Electrical data to DIN VDE 0472				
Rated voltage				
• Power cable V_0/V				
- Supply cores	600 V/1000 V	600 V/1000 V	600 V/1000 V	600 V/1000 V
- Signal cores	24 V (VDE) 1000 V (UL/CSA)	24 V (VDE) 1000 V (UL/CSA)	24 V (VDE) 1000 V (UL/CSA)	24 V (VDE) 1000 V (UL/CSA)
• Signal cable	–	30 V	30 V	30 V
Test voltage (eff)				
• Power cable				
- Supply cores	4 kV	4 kV	4 kV	4 kV
- Signal cores	2 kV	2 kV	2 kV	2 kV
• Signal cable	–	500 V	500 V	500 V

1) The respective registration number is printed on the cable sheath (applies only to power cables).

2) The file number is printed on the cable sheath.

Technical data (continued)

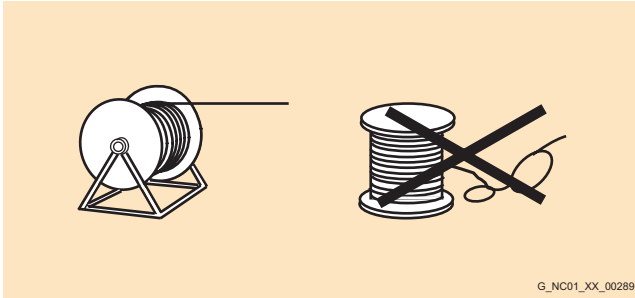
Cables	MOTION-CONNECT 500 PLUS Type 6FX5 1	MOTION-CONNECT 500 Type 6FX5 0	MOTION-CONNECT 700 Type 6FX7	MOTION-CONNECT 800 Type 6FX8
Operating temperature				
On the surface				
• Fixed installation	-20 ... +80 °C (-4 ... +176 °F)	-20 ... +80 °C (-4 ... +176 °F)	-50 ... +80 °C (-58 ... +176 °F)	-50 ... +80 °C (-58 ... +176 °F)
• Flexible installation	0 ... +60 °C (+32 ... +140 °F)	0 ... +60 °C (+32 ... +140 °F)	-20 ... +60 °C (-4 ... +140 °F)	-20 ... +60 °C (-4 ... +140 °F)
Mechanical data				
Max. tensile stress on power/signal cables				
• Fixed installation	50 N/mm ² (7252 lb _f /in ²)	50 N/mm ² (7252 lb _f /in ²)	50 N/mm ² (7252 lb _f /in ²)	50 N/mm ² (7252 lb _f /in ²)
• Flexible installation	20 N/mm ² (2900 lb _f /in ²)	20 N/mm ² (2900 lb _f /in ²)	20 N/mm ² (2900 lb _f /in ²)	20 N/mm ² (2900 lb _f /in ²)
Minimum permissible bending radius				
• Power cable				
- Fixed installation	5 x D _{max}	5 x D _{max}	4 x D _{max}	6 x D _{max}
- Flexible installation	See "Power cables"	See "Power cables"	See "Power cables"	See "Power cables"
• Signal cable, max.				
- Fixed installation	–	60 mm (2.4 in)	60 mm (2.4 in)	60 mm (2.4 in)
- Flexible installation	–	100 mm (3.9 in)	95 mm (3.9 in)	100 mm (3.9 in)
Torsional stress	Absolute 30°/m	Absolute 30°/m	Absolute 30°/m	Absolute 30°/m
Bending				
• Power cables				
- 1.5 ... 6 mm ²	2 mill.	100,000	10 mill.	10 mill.
- 10 ... 185 mm ²	–	100,000	10 mill.	3 mill.
• Signal cables	–	2 mill.	10 mill.	10 mill.
Traversing speed				
• Power cables				
- 1.5 ... 6 mm ²	180 m/min (590.7 ft/min)	30 m/min (98.4 ft/min)	200 m/min (656.3 ft/min)	180 m/min (590.7 ft/min)
- 10 ... 50 mm ²	–	30 m/min (98.4 ft/min)	200 m/min (656.3 ft/min)	100 m/min (328.2 ft/min)
• Signal cables	–	180 m/min (590.7 ft/min)	200 m/min (656.3 ft/min)	180 m/min (590.7 ft/min)
Acceleration				
• Power cables	5 m/s ² (16.4 ft/s ²)	2 m/s ² (6.6 ft/s ²)	30 m/s ² (98.4 ft/s ²)	5 m/s ² (16.4 ft/s ²) (5 m (16.4 ft)) 10 m/s ² (32.8 ft/s ²) (2.5 m (8.2 ft))
• Signal cables	–	5 m/s ² (16.4 ft/s ²)	30 m/s ² (98.4 ft/s ²)	5 m/s ² (16.4 ft/s ²) (5 m (16.4 ft)) 10 m/s ² (32.8 ft/s ²) (2.5 m (8.2 ft))
Chemical data				
Insulation material	CFC/silicone-free	CFC/silicone-free	CFC/halogen/silicone-free DIN 472 815/IEC 60754-1	CFC/halogen/silicone-free DIN 472 815/IEC 60754-1
Oil resistance	EN 60811-1-1/-2-1 (mineral oil only)	VDE 0472, Part 803 Test mode B (mineral oil only)	VDE 0472, Part 803 Test mode B	VDE 0472, Part 803 Test mode B
Outer shield	PVC	PVC	PUR, DIN VDE 0282, Part 10	PUR, DIN VDE 0282, Part 10
• Power cable	DESINA color orange RAL 2003	DESINA color orange RAL 2003	DESINA color orange RAL 2003	DESINA color orange RAL 2003
• Signal cable	–	DESINA color green RAL 6018	DESINA color green RAL 6018	DESINA color green RAL 6018
Flame-retardant	IEC 60332.1	IEC 60332.1	IEC 60332.1	IEC 60332.1

The technical specifications of these cables apply only to single bending with horizontal traverse paths up to 5 m (16.4 ft).

Degree of protection of preassembled power and signal cables and their extension cables in closed and inserted state: IP67

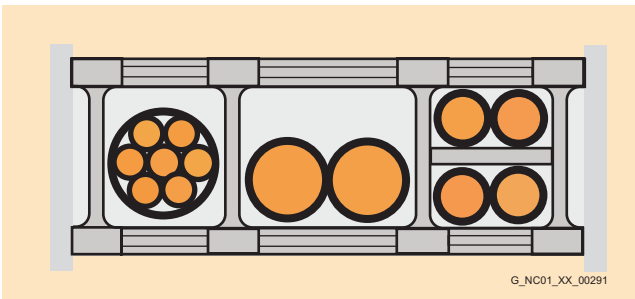
General information

Function



G_NC01_XX_00289

The cables must be removed from the drum without twisting, i.e. the cables must be unwound and must never be lifted over the drum flange while still wound in loops.

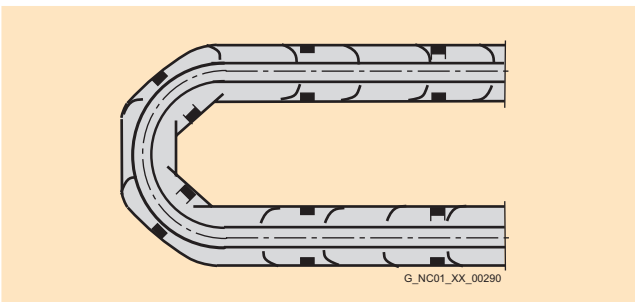


G_NC01_XX_00291

To maximize the service life of the cable carrier and cables, cables in the carrier made from different materials must be installed in the cable carrier with spacers. The spacers must be installed uniformly to ensure that the position of the cables does not change during operation. The cables should be distributed as symmetrically as possible on the basis of their weight and dimensions. Cables with very different outer diameters should be separated by spacers.

When inserting preassembled cables in the cable carrier, do **not** pull at the connector, as this may damage the strain relief or cable clamping.

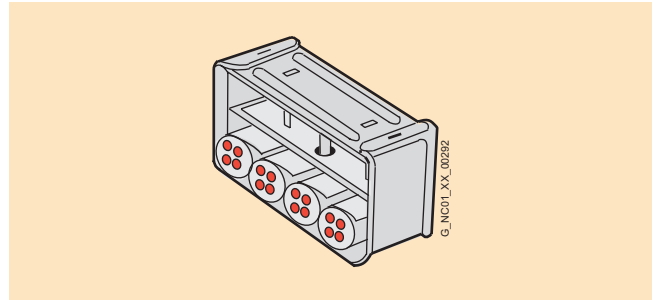
The cables must not be fixed in the cable carrier. They must be freely movable.



G_NC01_XX_00290

The cables must be able to move unrestricted in particular in the radii of curvature of the carrier. The prescribed minimum bending radii must not be undershot.

The cable fixings must be attached at both ends at an appropriate distance away from the end points of the moving parts in a "dead" zone.



G_NC01_XX_00292

MOTION-CONNECT cables are tested in a cable carrier. During testing, a strain-relief assembly is attached to one end of the cable at the moving ends of the cable carrier. Strain relief is applied to a wide area of the peripheral surface without crushing the cable assembly.

When installing cables, you must always observe the information in the Installation Guide provided by the cable carrier manufacturer as appropriate for the way in which the system has been constructed.

Notes:

If, for example, preassembled cables are routed in a cable carrier in such a way that the connector would inhibit the installation, preassembled cables can also be supplied without assembled connectors (signal and power cables). On these cables, the contacts are crimped and the connector housing is supplied separately packed. Once the cables have been installed, the customer assembles the connector housing.

When routing the cables, always observe the instructions of the cable carrier manufacturer.

MOTION-CONNECT cables are approved for a horizontal traverse path of up to 5 m (16.4 ft).

In the event of vibrational loads and if horizontal or vertical cable entries are used, we always recommend the use of an additional cable fixing, if part of the cable hangs loose or is not guided in between the strain relief on the cable carrier and the connection on the motor. To prevent machine vibrations being transmitted to the connectors, the cable should be fixed at the moving part where the motor is mounted.

Overview



Synchronous motors and asynchronous motors are connected over the MOTION-CONNECT power cables.

The preassembled MOTION-CONNECT power cables offer excellent quality and ensure safety and perfect functioning.

Depending on the design, the MOTION-CONNECT power cables are either preassembled at one end or both ends.

Note:

The maximum length of the cables (basic cables and extensions) must be observed. The total maximum permissible length is reduced by 2 m (6.6 ft) for each interruption point. All power cables are also available on request with crimped contacts and with the connector housing supplied separately.

Enclosed connector housing for motor side

Order No. 6FX. 042-5...-1...

Enclosed connector housing for module side

Order No. 6FX. 012-5...-1...

Selection and ordering data

MOTION-CONNECT power cables without brake cores

No. of cores x cross- section mm ²	Connector size, motor side	Preassembled cable for 1FT/1FK motors Order No.	D_{max} 6FX50	D_{max} 6FX51	D_{max} 6FX8	Cable by the meter ²⁾ for 1PH/1PM/1FE motors Order No.	Weight (by the meter)			Smallest perm. bending radius ¹⁾		
			mm (in)	mm (in)	mm (in)		6FX50 kg/m (lb/ft)	6FX51 kg/m (lb/ft)	6FX8 kg/m (lb/ft)	6FX50 mm (in)	6FX51 mm (in)	6FX8 mm (in)
4x1.5	1	6FX ■ 02-5CA01-....	8.4 (0.33)	10.1 (0.40)	10.4 (0.41)	6FX ■ 08-1BB11-....	0.18 (0.12)	0.16 (0.11)	0.16 (0.11)	155 (6.1)	105 (4.1)	100 (3.9)
	1.5	6FX ■ 02-5CA21-....										
4x2.5	1	6FX ■ 02-5CA11-....	10 (0.39)	11.5 (0.45)	12.1 (0.48)	6FX ■ 08-1BB21-....	0.24 (0.16)	0.24 (0.16)	0.24 (0.16)	180 (7.1)	115 (4.5)	120 (4.7)
	1.5	6FX ■ 02-5CA31-....										
4x4	1.5	6FX ■ 02-5CA41-....	11.4 (0.45)	13.3 (0.52)	13.2 (0.52)	6FX ■ 08-1BB31-....	0.27 (0.18)	0.31 (0.21)	0.31 (0.21)	210 (8.3)	135 (5.3)	130 (5.1)
4x6	1.5	6FX ■ 02-5CA51-....	13.6 (0.54)	15.5 (0.61)	16 (0.63)	6FX ■ 08-1BB41-....	0.46 (0.31)	0.44 (0.30)	0.43 (0.29)	245 (9.6)	160 (6.3)	170 (6.7)
4x10	1.5	6FX ■ 0 02-5CA61-....	20 (0.79)		19.4 (0.76)	6FX ■ 0 08-1BB51-....	0.73 (0.49)		0.63 (0.42)	360 (14.2)		210 (8.3)
	3	6FX ■ 0 02-5CA13-....										
4x16	3	6FX ■ 0 02-5CA23-....	24.2 (0.95)		23.6 (0.93)	6FX ■ 0 08-1BB61-....	1.10 (0.74)		0.95 (0.64)	440 (17.3)		260 (10.2)
4x25		—	28 (1.10)			6FX 5 0 08-1BB25-....	1.42 (0.95)			505 (19.9)		
4x35		—	31.5 (1.24)			6FX 5 0 08-1BB35-....	1.87 (1.26)			570 (22.4)		
4x50		—	38 (1.45)			6FX 5 0 08-1BB50-....	3.42 (2.30)			685 (27)		
4x70		—	42.6 (1.68)			6FX 5 0 08-1BB70-....	4.12 (2.77)			770 (30.3)		
4x95		—	51.7 (2.04)			6FX 5 0 08-1BB05-....	4.48 (3.01)			935 (36.8)		
4x120		—	56 (2.20)			6FX 5 0 08-1BB12-....	6.11 (4.11)			1010 (39.8)		
4x150		—	63 (2.48)			6FX 5 0 08-1BB15-....	7.75 (5.21)			1135 (44.7)		
4x185		—	66.2 (2.61)			6FX 5 0 08-1BB18-....	9.45 (6.35)			1195 (47)		
		5 0 MOTION-CONNECT 500				5 0						
		5 1 MOTION-CONNECT 500 PLUS				5 1						
		8 0 MOTION-CONNECT 800				8 0						

1) Valid for routing in cable carrier.

2) Power cables from 4 mm² can be ordered as specified in meters up to a length of 100 m (328 ft). Power cables of 1.5 mm² and 2.5 mm² are supplied as 50 m (164 ft), 100 m (328 ft), 200 m (656 ft) and 500 m (1641 ft) rings or on disposable drums.

MOTION-CONNECT cables and connections

Power cables for motors

Selection and ordering data

MOTION-CONNECT power cables with brake cores

No. of cores x cross-section mm ²	Connect. size, motor side	Preassembled cable for 1FT/1FK motors Order No.	D _{max}				Cable by the meter ²⁾ for 1PH motors Order No.	Weight (by the meter)				Smallest perm. bending radius ¹⁾			
			6FX50	6FX51	6FX7	6FX8		6FX50	6FX51	6FX7	6FX8	6FX50	6FX51	6FX7	6FX8
			mm (in)	mm (in)	mm (in)	mm (in)		kg/m (lb/ft)	kg/m (lb/ft)	kg/m (lb/ft)	kg/m (lb/ft)	mm (in)	mm (in)	mm (in)	mm (in)
4×1.5+2×1.5	1	6FX ■ 02-5DA01-....	10.8 (0.43)	13.1 (0.52)	14.0 (0.55)	12.9 (0.51)	6FX ■ 08-1BA11-....	0.22 (0.15)	0.26 (0.17)	0.26 (0.17)	0.25 (0.17)	195 (7.7)	135 (5.3)	100 (3.9)	125 (4.9)
	1.5	6FX ■ 02-5DA21-....													
4×2.5+2×1.5	1	6FX ■ 02-5DA11-....	12.4 (0.49)	14.2 (0.56)	15.2 (0.60)	14.2 (0.56)	6FX ■ 08-1BA21-....	0.28 (0.19)	0.32 (0.22)	0.33 (0.22)	0.31 (0.21)	225 (8.9)	145 (5.7)	110 (4.3)	140 (5.5)
	1.5	6FX ■ 02-5DA31-....													
4×4 +2×1.5	1.5	6FX ■ 02-5DA41-....	14 (0.55)	15.9 (0.62)	16.6 (0.65)	15.3 (0.60)	6FX ■ 08-1BA31-....	0.36 (0.24)	0.40 (0.27)	0.43 (0.29)	0.40 (0.27)	255 (10)	160 (6.3)	120 (4.7)	150 (5.9)
	1.5	6FX ■ 02-5DA51-....	16.1 (0.63)	16.9 (0.67)	18.3 (0.72)	17.8 (0.70)	6FX ■ 08-1BA41-....	0.54 (0.36)	0.50 (0.34)	0.52 (0.35)	0.53 (0.36)	290 (11.4)	170 (6.7)	130 (5.1)	195 (7.7)
4×10 +2×1.5	1.5	6FX ■ 0 02-5DA61-....	21.7 (0.85)		23.5 (0.93)	20.8 (0.82)	6FX ■ 0 08-1BA51-....	0.75 (0.50)		0.79 (0.53)	0.74 (0.50)	395 (15.6)		165 (6.5)	230 (9.1)
	3	6FX 5 0 02-5DA13-....													
4×16 +2×1.5	3	6FX ■ 0 02-5DA23-....	25 (0.98)		26.1 (1.03)	24.7 (0.97)	6FX ■ 0 08-1BA61-....	1.10 (0.74)		1.06 (0.71)	1.10 (0.74)	450 (17.7)		185 (7.3)	275 (10.8)
	3	6FX ■ 0 02-5DA33-....	29.4 (1.16)		30.5 (1.20)	27.9 (1.10)	6FX ■ 0 08-1BA25-....	1.56 (1.05)		1.52 (1.02)	1.46 (0.98)	530 (21)		215 (8.5)	325 (12.8)
4×35 +2×1.5	3	6FX 5 0 02-5DA43-....	32.6 (1.28)			32.0 (1.26)	6FX 5 0 08-1BA35-....	2.01 (1.35)			2.10 (1.41)	590 (23.2)			380 (15)
		6FX 8 0 02-5DA43-....					6FX 8 0 08-1BA35-....								
4×50 +2×1.5	3	6FX 5 0 02-5DA53-....	38.0 (1.50)			35.8 (1.41)	6FX 5 0 08-1BA50-....	3.30 (2.22)			2.75 (1.85)	685 (27)			420 (16.5)
		6FX 8 0 02-5DA53-....					6FX 8 0 08-1BA50-....								
		5 0 MOTION-CONNECT 500					5 0								
		5 1 MOTION-CONNECT 500 PLUS					5 1								
		7 0 MOTION-CONNECT 700					7 0								
		8 0 MOTION-CONNECT 800					8 0								

Preassembled MOTION-CONNECT power cables for 1PH7 motors

Motor type	PG type	No. of cores x cross-section mm ²	Preassembled cable for 1PH7 motors	Weight (by the meter)		Smallest perm. bending radius ¹⁾	
			Order No.	6FX5 kg/m (lb/ft)	6FX8 kg/m (lb/ft)	6FX5 mm (in)	6FX8 mm (in)
1PH710	PG29	4x10	6FX ■ 002-5CB10-....	0.73 (0.49)	0.63 (0.42)	20.0 (0.8)	19.4 (0.8)
		4x16	6FX ■ 002-5CB16-....	1.10 (0.74)	0.95 (0.64)	24.2 (1)	23.6 (0.9)
1PH713	PG36	4x16	6FX ■ 002-5CC16-....	1.10 (0.74)	0.95 (0.64)	24.2 (1)	23.6 (0.9)
		4x25	6FX 5 002-5CC25-....	1.42 (0.95)	–	28.0 (1.1)	–
		4x25	6FX 8 002-5DC25-....	–	1.46 (0.98)	–	27.9 (1.1)
		4x35	6FX 5 002-5CC35-....	1.87 (1.26)	–	31.5 (1.2)	–
		4x35	6FX 8 002-5DC35-....	–	2.10 (1.41)	–	32.0 (1.3)
1PH716	PG42	4x25	6FX 5 002-5CD25-....	1.42 (0.95)	–	28.0 (1.1)	–
		4x25	6FX 8 002-5DD25-....	–	1.46 (0.98)	–	27.9 (1.1)
		4x35	6FX 5 002-5CD35-....	1.87 (1.26)	–	31.5 (1.2)	–
		4x35	6FX 8 002-5DD35-....	–	2.10 (1.41)	–	32.0 (1.3)
MOTION-CONNECT 500			5				
MOTION-CONNECT 800			8				

Note:

1PH7 motors do not usually have a brake and therefore do not require power cables with brake cores.

If a brake is used, it must be supplied through a separate cable via the terminal box.

MOTION-CONNECT 800 power cables in the 25 mm² and 35 mm² cables are only available with brake cores.

1) Valid for routing in cable carrier.

2) Power cables from 4 mm² can be ordered as specified in meters up to a length of 100 m (328 ft). Power cables of 1.5 mm² and 2.5 mm² are supplied as 50 m (164 ft), 100 m (328 ft), 200 m (656 ft) and 500 m (1641 ft) rings or on disposable drums.

Selection and ordering data

MOTION-CONNECT power cables for SIMODRIVE POSMO CD/CA/SI

No. of cores x cross- section	Con- nector	Size (motor side)	Preassembled cable for SIMODRIVE POSMO CD/CA/SI	D_{max}	Weight, (by the meter)	Smallest perm. bending radius ¹⁾	Module side	Motor side
mm ²	Version		Order No.	mm (in)	kg/m (lb/ft)	mm (in)		
4x1.5+2x1.5		1	6FX1 002-5DA01-....	12.9 (0.51)	0.25 (0.17)	125 (4.9)	Angled connector with contact pins	Straight connector with socket contacts
4x2.5+2x1.5		1	6FX1 002-5DA02-....	14.2 (0.56)	0.31 (0.21)	140 (5.5)		
4x4 +2x1.5		1.5	6FX1 002-5DA03-....	15.3 (0.60)	0.40 (0.27)	150 (5.9)	Straight connector with contact pins	Straight connector with socket contacts
4x6 +2x1.5		POSMO	6FX1 002-5DA05-....	17.8 (0.70)	0.53 (0.36)	195 (7.7)		
		POSMO	6FX1 002-5DA15-....				Angled connector with contact pins	Angled connector with socket contacts
4x6		–	6FX1 002-5CA16-....	16 (0.63)	0.43 (0.29)	170 (6.7)		
4x4		–	6FX1 002-5CA23-....	13.2 (0.52)	0.31 (0.21)	130 (5.1)	Angled connector with contact pins	Open core ends
4x6 +2x1.5		POSMO	6FX1 002-5DA25-....	17.8 (0.70)	0.53 (0.36)	195 (7.7)		
4x1.5		–	6FX1 002-5CA31-....	10.4 (0.41)	0.16 (0.11)	100 (3.9)	Straight connector with contact pins	Angled connector with socket contacts
4x2.5		–	6FX1 002-5CA32-....	12.1 (0.48)	0.24 (0.16)	120 (4.7)		
4x6 +2x1.5		POSMO	6FX1 002-5DA35-....	17.8 (0.70)	0.53 (0.36)	195 (7.7)	Open core ends	Straight connector with socket contacts
		POSMO	6FX1 002-5DA45-....					
		POSMO	6FX1 002-5DA55-....				Open core ends	Angled connector with socket contacts
		POSMO	6FX1 002-5DA65-....					
		POSMO	6FX1 002-5DA75-....					
		1.5	6FX1 002-5DA85-....					

MOTION-CONNECT power cables for SIMODRIVE POSMO A UL STYLE No. 2570 80 °C 600 V; CSA AWM A*B II FT1

No. of cores x cross-section	Cable sold by the meter for SIMODRIVE POSMO A	D_{max}	Supplied as ring	Weight (by the meter)
mm ²	Order No.	mm (in)	m (ft)	kg/m (lb/ft)
2x4	6FX5 008-5FA00-1FA0	10.7 (0.42)	50 (164)	0.176 (0.12)

Separate variant extension set in MOTION-CONNECT 800 design for SIMODRIVE POSMO A 300 W (available soon)

Preassembled power and signal cable for separating the
drive unit and motor with SIMODRIVE POSMO A 300 W

Outgoing direction Side	Order No.	Length m (ft)
A	6FX8 002-6AA00-1AB0	1 (3.3)
A	6FX8 002-6AA00-1AD0	3 (9.8)
A	6FX8 002-6AA00-1AF0	5 (16.4)
B	6FX8 002-6AA10-1AB0	1 (3.3)
B	6FX8 002-6AA10-1AD0	3 (9.8)
B	6FX8 002-6AA10-1AF0	5 (16.4)

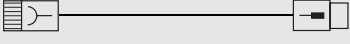
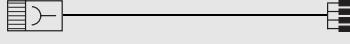
1) Valid for routing in cable carrier.

MOTION-CONNECT cables and connections

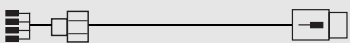
Power cables – extensions

Selection and ordering data

Power cable and extension for 1FT/1FK motors

No. of cores x cross-section mm ²	Connector size			Connector size		
		Extensions			Basic cables	
		Order No.			Order No.	
4x1.5	1	6FX 002-5 A05-....		1	6FX 002-5 A01-....	
4x2.5	1	6FX 002-5 A15-....		1	6FX 002-5 A11-....	
4x1.5	1.5	6FX 002-5 A28-....		1.5	6FX 002-5 A21-....	
4x2.5	1.5	6FX 002-5 A38-....		1.5	6FX 002-5 A31-....	
4x4	1.5	6FX 002-5 A48-....		1.5	6FX 002-5 A41-....	
4x6	1.5	6FX 002-5 A58-....		1.5	6FX 002-5 A51-....	
4x10	1.5	6FX 002-5 A68-....		1.5	6FX 002-5 A61-....	
4x10	3	6FX 002-5 X18-....		3	6FX 002-5 A13-....	
4x16	3	6FX 002-5 X28-....		3	6FX 002-5 A23-....	
4x25	3	6FX 002-5 D X38-....		3	6FX 002-5 D A31-....	
4x35	3	6FX 5 002-5 D X48-....		3	6FX 5 002-5 D A43-....	
	3	6FX 8 002-5 D X48-....		3	6FX 8 002-5 D A43-....	
4x50	3	6FX 5 002-5 D X58-....		3	6FX 5 002-5 D A53-....	
	3	6FX 8 002-5 D X58-....		3	6FX 8 002-5 D A53-....	
MOTION-CONNECT 500		5			5	
MOTION-CONNECT 700 ¹⁾		7			7	
MOTION-CONNECT 800		8			8	
Without brake cores		C			C	
With brake cores		D			D	

Power cable and extension for 1FN3 linear motors

No. of cores x cross-section mm ²	PG size			No. of cores x cross-section		
		Preamsembled motor adapter cable	Power connector size		Extension for basic cable	Basic cable to converter
		Order No.			Order No.	Order No.
4x2.5	16	6FX7 002-5LM40-...	1	4x1.5	6FX7 002-5EA05-...	6FX7 002-5EA02-...
4x2.5	21	6FX7 002-5LM60-...	1	4x1.5	6FX7 002-5EA05-...	6FX7 002-5EA02-...
4x2.5	21	6FX7 002-5LM60-...	1	4x2.5	6FX7 002-5EB11-...	6FX7 002-5EB18-...
4x4	21	6FX7 002-5LM70-...	1.5	4x4	6FX7 002-5EA48-...	6FX7 002-5EA41-...
4x4	21	6FX7 002-5LM70-...	1.5	4x6	6FX7 002-5EA58-...	6FX7 002-5EA51-...
4x10	29	6FX7 002-5LM30-...	1.5	4x10	6FX7 002-5EA68-...	6FX7 002-5EA61-...

The combinations of power cables and extensions shown are only provided by way of example.

¹⁾ MOTION-CONNECT 700 only in design "with brake cores".

Power cables Cable ducts/grounding

Overview

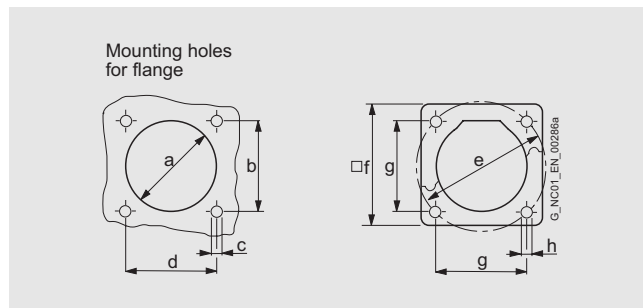
Flange mounting

Flanges are used to route or fix connectors in control cabinets. A flange can be subsequently mounted to connectors with union nuts or connectors with external threads (except for angled connectors).

HF (high-frequency) clamp

To ensure correct grounding, a ground clamp is optionally available together with the flanges for large-area discharging of high-frequency interferences.

Dimension drawings



Dimensions in mm (in)

Size 1	Size 1.5	Size 3
a = Ø 27.8 (1.09)	a = Ø 46 (1.81)	a = Ø 65 (2.56)
b = 28.3 (1.11)	b = 42.4 (1.67)	b = 75 (2.95)
c = M3 (4x)	c = M4 (4x)	c = M4 (4x)
d = 28.3 (1.11)	d = 42.4 (1.67)	d = 75 (2.95)
e = Ø 40 (1.57)	e = Ø 60 (2.36)	e = Ø 63 (2.48)
f = 35 (1.38)	f = 55 (2.16)	f = 85 (3.35)
g = 28.3 (1.11)	g = 42.4 (1.67)	g = 75 (2.95)
h = Ø 3.2 (0.13)	h = Ø 4.4 (0.17)	h = Ø 4.5 (0.18)

Selection and ordering data

Designation	Order No.
Flange for:	
• Connector size 1	6FX2 003-7BX00
• Connector size 1.5	6FX2 003-7CX00
• Connector size 3	6FX2 003-7AX00
HF clamp for:	
• Power connector, Size 1	6FX2 003-7FX00
• Power connector, Size 1.5	6FX2 003-7GX00
• Power connector, Size 3	Not required

Power cables Current carrying capacity/correction factors

Overview

Current carrying capacity (I_L) of PVC-insulated copper conductors acc. to IEC 60204-1: 1997 ++ Corrigendum 1998

The current carrying capacity (I_L) of PVC-insulated cables corresponds to IEC 60204-1 for routing type C under continuous operating conditions and is listed in the table with regard to an ambient air temperature of +40 °C (+104 °F). For other ambient temperatures, the user must calculate the values using the "correction factors" in the table. PUR cables must also meet the requirements of this standard.

Cross-section mm ²	Current carrying capacity (I_L) [A] with routing types (see C 1.2)			
	B1	B2	C	E
0.75	7.6	–	–	–
1.0	10.4	9.6	11.7	11.5
1.5	13.5	12.2	15.2	16.1
2.5	18.3	16.5	21	22
4	25	23	28	30
6	32	29	36	37
10	44	40	50	52
16	60	53	66	70
25	77	67	84	88
35	97	83	104	114
50	–	–	123	123
70	–	–	155	155
95	–	–	192	192
120	–	–	221	221
150	–	–	234	262
185	–	–	267	300
Electronics (pairs)				
0.2	–	–	4.0	4.0
0.3	–	–	5.0	5.0
0.5	–	–	7.1	7.1
0.75	–	–	9.1	9.1

Correction factors

Ambient air temperature °C (°F)	Correction factor
30 (86)	1.15
35 (95)	1.08
40 (104)	1.00
45 (113)	0.91
50 (122)	0.82
55 (131)	0.71
60 (140)	0.58

Note:

The correction factors were taken from IEC 60364-5-523, Table 52-D1.

Signal cables

Overview



The encoders of synchronous and asynchronous motors can be connected to the converter system via the MOTION-CONNECT signal cables.

The preassembled MOTION-CONNECT signal cables offer excellent quality and ensure safety and perfect functioning. Depending on the design, the MOTION-CONNECT signal cables are either preassembled at one end or both ends.

Note:

The maximum length of the cables (basic cables and extensions) must be observed. The total maximum permissible length is reduced by 2 m (6.6 ft) for each interruption point. All signal cables are also available on request with crimped contacts and with the connector housing supplied separately.

Enclosed connector housing for motor side
Order No.: 6FX 042-2....-....
Enclosed connector housing on module side
Order No.: 6FX 012-2....-....

Selection and ordering data

Signal cables – extensions

Extensions Order No.	Basic cables Order No.
6FX ■ 002-2AD04-....	6FX ■ 002-2AD00-....
6FX ■ 002-2CB54-....	6FX ■ 002-2CA11-....
6FX ■ 002-2CA34-....	6FX ■ 002-2CA31-....
6FX ■ 002-2CB54-....	6FX ■ 002-2CC11-....
6FX ■ 002-2CB54-....	6FX 5 002-2CD01-....
6FX ■ 002-2CB54-....	6FX 8 002-2CD01-....
6FX ■ 002-2CF04-....	6FX ■ 002-2CF02-....
6FX ■ 002-2CB54-....	6FX ■ 002-2CG00-....
6FX ■ 002-2AD04-....	6FX ■ 002-2CH00-....
6FX ■ 002-2EQ14-....	6FX ■ 002-2EQ10-....
5 MOTION-CONNECT 500	5
7 MOTION-CONNECT 700	7
8 MOTION-CONNECT 800	8

Extension Order No.	Basic cable Order No.
6FX 8 002-2CA41-....	6FX 8 002-2CA21-....

The combinations of signal cable extensions shown are only provided by way of example.

Signal cables Flanges/grounding

Overview

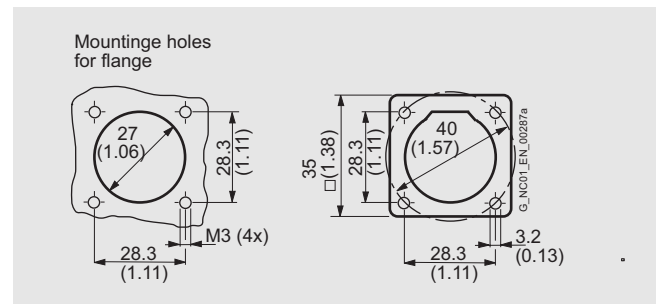
Flange mounting

Flanges are used to route or fix connectors, e.g. in control cabinets. A flange can be subsequently mounted to connectors with union nuts or connectors with external threads, except for angled connectors.

HF (high-frequency) clamp

To ensure correct grounding, a ground clamp is optionally available together with the flanges for large-area discharging of high-frequency interferences.

Dimension drawings



Dimensions in mm (in)

Selection and ordering data

Designation	Order No.
Flange for signal connector	6FX2 003-7DX00
HF clamp for all signal connectors	6FX2 003-7FX00

Selection and ordering data

Designation	Order No.	
Preassembled MPI bus cable with variable length l_2 (not for PCU 50/PCU 70) with 3 connectors • Trailing possible • Trailing not possible Length l_1: 1 m (3.3 ft) Length l_2: variable	6FX2 002-4EA02-.... 6FX2 002-4EA01-....	
Preassembled MPI bus cable with variable length l_2 (not for PCU 50/PCU 70) with 3 connectors • Trailing possible Length l_1: 3 m (9.8 ft) Length l_2: variable	6FX2 002-4EA06-....	
Preassembled MPI bus cable with fixed length $l_2 = 1$ m (3.3 ft) (not for PCU 50/PCU 70) with 3 connectors • Trailing not possible Length l_1: 5 m (16.4 ft) 10 m (32.8 ft) Length l_2: 1 m (3.3 ft)	6FX2 002-4EA04-1AF0 6FX2 002-4EA04-1BA0	
Preassembled MPI bus cable with variable length l_2 with 3 connectors • Trailing possible • Trailing not possible Length l_1: 1 m (3.3 ft) Length l_2: variable	6FX2 002-4EA80-.... 6FX2 002-4EA00-....	
Preassembled MPI bus cable with variable length l_2 with 3 connectors • Trailing possible Length l_1: 1 m (3.3 ft) Length l_2: variable	6FX2 002-4EA70-....	

MCP Machine control panel

PP Pushbutton panel

Terminators can be disconnected

1) Connection socket for programming device or other devices.

MOTION-CONNECT cables and connections

MPI cables – preassembled

Selection and ordering data (continued)

Designation	Order No.	
Preassembled MPI bus cable with variable length l with 2 connectors • Trailing possible • Trailing not possible	6FX2 002-4EA88-.... 6FX2 002-4EA08-....	
Preassembled MPI bus cable with variable length l with 2 connectors • Trailing possible • Trailing not possible	6FX2 002-4EA87-.... 6FX2 002-4EA17-....	
Preassembled MPI bus cable with variable length l with 2 connectors • Trailing not possible	6FX2 002-4EA07-....	

MCP Machine control panel
 PP Pushbutton panel
 OFF ON Terminators can be disconnected

MPI/PROFIBUS cables sold by the meter and connectors

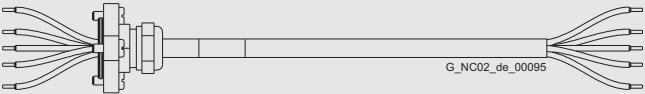
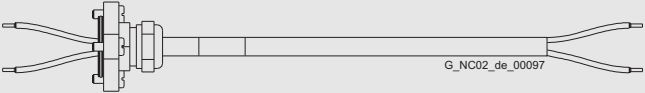
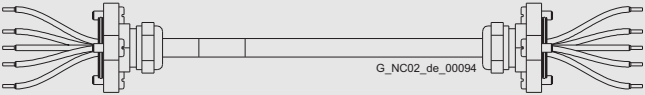
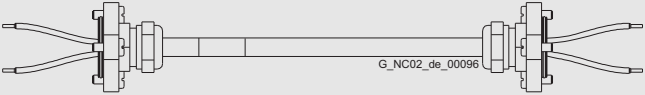
Selection and ordering data

Designation	Order No.
Connector without programming device connection For preassembled MPI cables only 6FX2 002-4.... • Cable outlet 35°	6FX2 003-0AA02
Connector with programming device connection For preassembled MPI cables only 6FX2 002-4.... • Cable outlet 35°	6FX2 003-0AA03

Further information

For further information on PROFIBUS cables, see Catalog IK PI "Industrial Communication and Field Devices" in the PROFIBUS section under electrical networks.

1) Connection socket for programming device or other devices.

Selection and ordering data	
Designation	Order No.
PROFIBUS DP-IN	
• 5-core with flange on the motor side	6FX1 002-1AA01-....
• 2-core with flange on the motor side	6FX1 002-4EA01-....
PROFIBUS DP-OUT	
• 5-core with flange at both ends	6FX1 002-1AA00-....
• 2-core with flange at both ends	6FX1 002-4EA00-....

MOTION-CONNECT cables and connections

Length code

Selection and ordering data

Designation	Order No.
Preamsembled cables	6FX.-..... ■ ■ ■ 0
Length code:	
0 m (0 ft)	1
100 m (328 ft)	2
200 m (656 ft)	3
300 m (984 ft)	4
0 m (0 ft)	A
10 m (32.8 ft)	B
20 m (65.6 ft)	C
30 m (98.4 ft)	D
40 m (131 ft)	E
50 m (164 ft)	F
60 m (197 ft)	G
70 m (230 ft)	H
80 m (262 ft)	J
90 m (295 ft)	K
0 m (0 ft)	A
1 m (3.3 ft)	B
2 m (6.6 ft)	C
3 m (9.8 ft)	D
4 m (13.1 ft)	E
5 m (16.4 ft)	F
6 m (19.7 ft)	G
7 m (23 ft)	H
8 m (26.2 ft)	J
9 m (29.5 ft)	K
Examples:	
1.0 m: (3.3 ft)	1 A B 0
2.0 m: (7.2 ft)	1 A C 0
8.0 m: (26.3 ft)	1 A J 0
299.0 m: (981 ft)	3 K K 0

Selection and ordering data

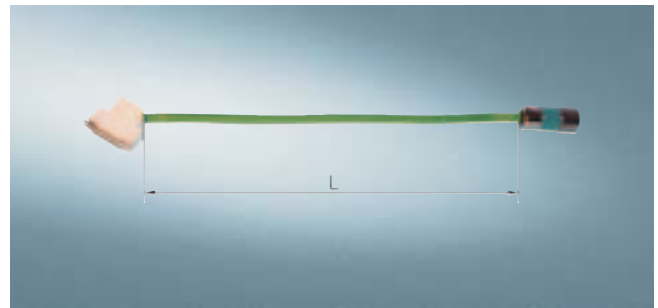
Designation	Order No.
Power/signal cables sold by the meter ¹⁾	
• 50 m (164 ft)	6FX. 008-.....-1FA0
• 100 m (328 ft)	6FX. 008-.....-2AA0
• 200 m (984 ft)	6FX. 008-.....-3AA0
• 500 m (1641 ft)	6FX. 008-.....-6AA0

Further information

Fixed length for signal cables 6FX. 002-.....-1...

Order No.	Length in m (ft)						
	1 (3.3)	1.5 (4.9)	2 (6.6)	3 (9.8)	5 (16.4)	7 (23)	10 (32.8)
6FX2 002-1CA01-1	AB		AC		AF	AH	
6FX2 002-1CB01-1	AB		AC		AF	AH	
6FX2 002-1CC00-1		AB5	AC0		AF0		
6FX2 002-4EA04-1					AF		BA
6FX5 002-1AA00-1				AD	AF		BA
6FX8 002-2CA41-1					AF		BA

Length definition for preassembled cables

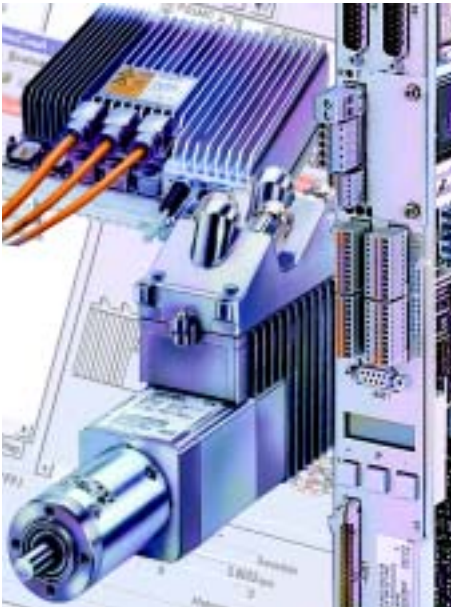


L = Length in m (ft)

Tolerance:

- up to 10 m (32.8 ft): $\pm 2\%$
- above 10 m (32.8 ft): $\pm 1\%$

1) Power cables from 4 mm² can be ordered as specified in meters up to a length of 100 m (328 ft). Power cables of 1.5 mm² and 2.5 mm² are supplied as 50 m (164 ft), 100 m (328 ft), 200 m (656 ft) and 500 m (1641 ft) rings or on disposable drums.



8/2	SIMODRIVE converter systems
8/2	Overview
8/4	Dimensioning of the power section and drive
8/14	SINUMERIK & SIMODRIVE Configurator
8/15	Supply system types
8/19	Electromagnetic compatibility (EMC)
8/20	Line-side components
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8/55	Integration of SIMODRIVE 611 universal HR with PROFIBUS DP in the world of automation
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8/60	Overview
8/62	SIMODRIVE POSMO CD/CA, SI
8/62	System overview and requirements
8/84	SIMODRIVE POSMO A
8/84	System overview and requirements
8/94	Communication
8/96	Tools
8/96	Start-up, parameterization and diagnostics with SimoCom U
8/97	"SimoCom A" parameterizing and start-up tool

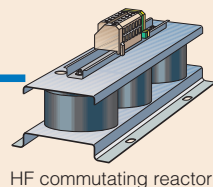
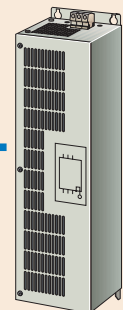
SIMODRIVE 611 universal and POSMO

Planning guide

SIMODRIVE converter system Overview

Supply system interfaces

TN supply system
3 AC 400 V
3 AC 415 V

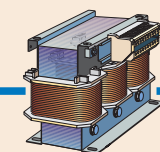


HF commutating reactor

TN supply system
3 AC 400 V
3 AC 415 V
3 AC 480 V



Mains filter

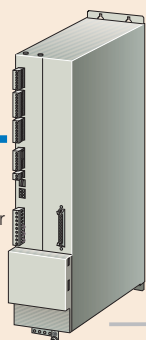
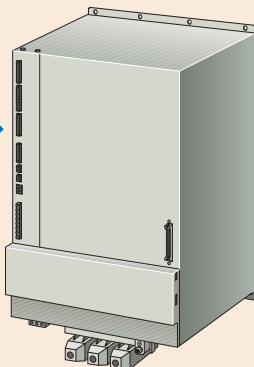


HF commutating reactor
with OI module 28 kW
(38 HP)

TN supply system
3 AC 400 V
3 AC 415 V
3 AC 480 V

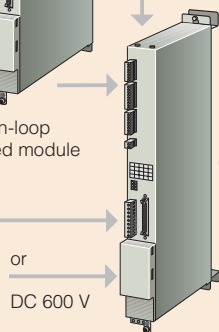
Infeed modules

Infeed/regenerative
feedback module ¹⁾
Internal cooling



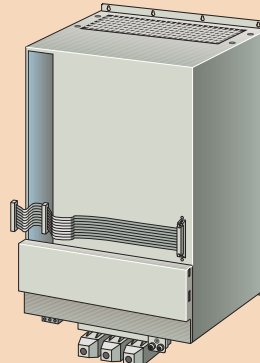
Open-loop
infeed module

or
DC 600 V
Monitoring module

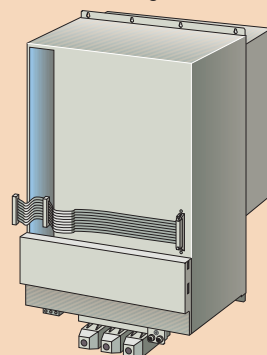


Power modules

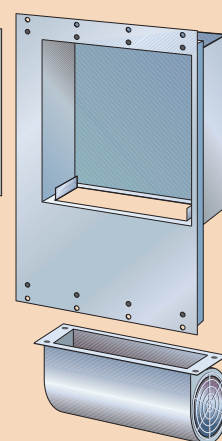
Power module
Internal cooling
with internal fan



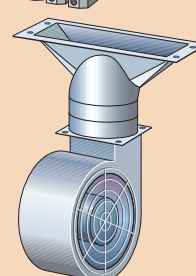
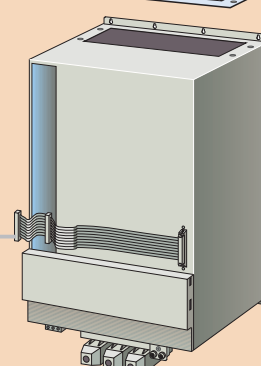
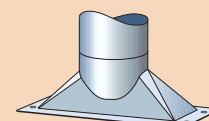
Power modul
External cooling



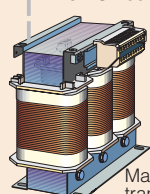
Mounting frame
with built-on fan



Power module with
hose cooling

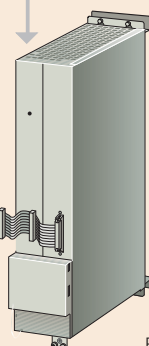


3 AC 400 V

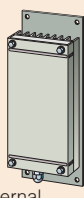


Types grades
from 3 AC 200 V
to 3 AC 575 V for:
• IT supply system
• TT supply systems
• Residual-current
protective devices
• Installation altitude
>2000 m (6563 ft)

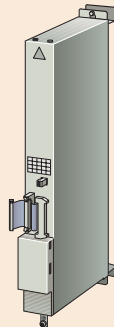
Matching
transformer



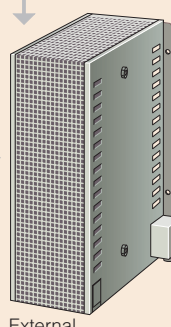
Capacitor
module



External
pulsed resistor ²⁾
0.3 kW/25 kW

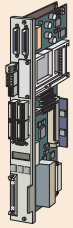


Pulsed
resistor
module

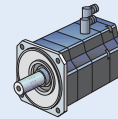


External
pulsed resistor
1.5 kW/25 kW

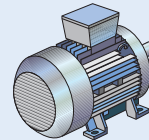
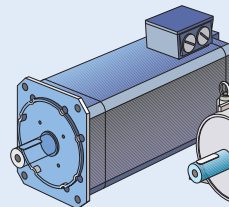
¹⁾ Alternatively external
cooling and hose cooling
are possible. Versions as
for the power modules.
²⁾ Only for 28 kW (38 HP)
OI module.

Control unit with universal setpoint interface

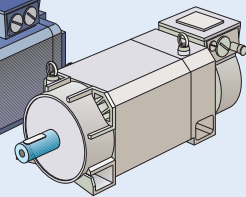
- One-axis version (only with resolver)
 - Two-axis version (resolver and motor encoder)
 - Standard: analog setpoint interface
 - Optional PROFIBUS
- SIMODRIVE 611 universal HR
- Optional CAN Bus

Motors

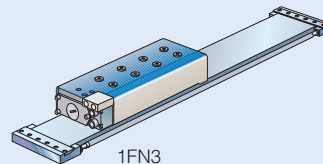
1FK7

Asynchronous motor
e.g. 1LA

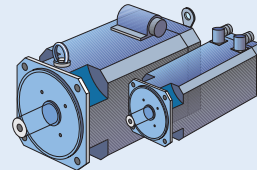
1PH4



1PH7



1FN3



1FT6

Planning instructions

The planning guide is an excerpt from the SIMODRIVE 611 Planning Guide and from the SIMODRIVE 611 universal HR Description of Functions and is intended to provide support for dimensioning the system components. For further details, refer to the above-mentioned Planning Guide or Description of Functions.

Motion Control

Servo drives are mostly cycle-type drives, i.e. drives which perform particular sequences of movement within a fixed cycle of motion. These movements can be linear or rotational. In addition, the motion sequence usually involves approaching a predefined position. All movements must be carried out in the shortest possible time. As a consequence, drives have to meet specific requirements. They must

- be dynamic, i.e. have short rise times and move to the desired position without overshoot
- have high overload capability, i.e. a high acceleration reserve
- and must have a large control range, i.e. a high resolution for precise positioning

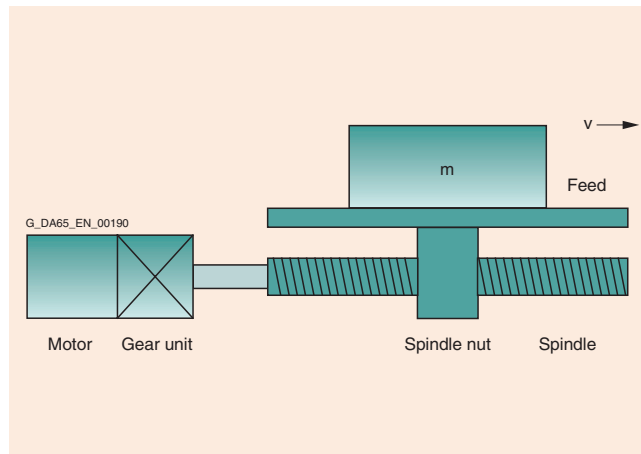
The planning notes below refer to servo drives with 1FK7/1FT6 synchronous motors with 1PH7/1PH4 asynchronous motors or 1FN3 linear motors. Synchronous motors are preferred where a compact motor volume, low rotor inertia and fast response levels are important. Asynchronous motors can be used to increase maximum speeds in the field weakening range. They have a somewhat larger motor volume.

The drives can be operated individually as single-axis drives or together as multi-axis drives. For connecting the drives to a PLC via PROFIBUS, a supplementary board is necessary. Decentralized provision of positioning functions within the Motion Control system is possible with the software or the functions can be provided centrally using a higher level controller.

A typical planning sequence

The basis for planning is the sketch and the description of how the machine functions.

1. Clarification of the type of drive, technical data and other boundary conditions such as technological functions and integration into an automation system
2. Specification of the motion curve
3. Calculation of the maximum load torque, selection of the gearbox
4. Motor selection
5. Cooling methods
6. Configuration of the drive module
7. Dimensioning of the infeed module
8. Selection of the braking unit and the braking resistor
9. Selection of other components.



Example of spindle drive

1. Clarification of the type of drive, technical data and other boundary conditions

The procedure for calculating the load torque depends on the type of drive. It may be a traction drive, a lifting drive or a turntable drive. In the case of linear motion, for example, power can be transmitted via a toothed belt, gear rack or a spindle. Normally a gearbox is also needed for adapting the motor speed and the motor torque to the load conditions.

For this calculation, the following technical data must be available:

- The moving masses
- The diameter of the drive wheel or the diameter and pitch of the spindle
- Details of the frictional losses
- Mechanical efficiency
- The travel distances
- The maximum speed
- The maximum acceleration and the maximum deceleration
- The cycle time
- Accuracy levels for positioning

Further conditions are the integration into a system (PLC), the technology to be used (central or distributed) and the coupling between the drives (e.g. with PROFIBUS).

2. Specification of the motion curve

The motion curve - namely the $V \cdot t$ diagram when a linear drive is being used - is determined from the information relating to travel distances, speed, acceleration, deceleration and the cycle time. If multi-axis drives are used, the interdependence of the individual motion curves must be taken into account. The motion curve is also required for thermally dimensioning the motor and selecting the braking resistor. It should therefore represent the "worst-case scenario" for the task.

3. Calculation of the load speed and the maximum load torque, selection of the gearbox

Information on the mechanical equipment involved is used to calculate the load speed and the maximum load torque. If the deceleration is equal to the acceleration, the load torque is at a maximum during the acceleration phase. For selecting the gearbox, there are various other variables in addition to the maximum load torque which are

- Frame size
- Efficiency
- Torsional play
- Torsional rigidity
- Moment of inertia
- Noise.

Planetary gearboxes are especially suitable for positioning tasks due to their low torsional play and high torsional strength. These gearboxes also have a high power density, are highly efficient and produce a low amount of noise. When the gear transmission ratio is being selected, it should be borne in mind that higher motor speeds generally result in smaller motors. This must, however, be checked for each individual case.

A higher gear transmission ratio has a favorable effect on positioning accuracy in relation to the encoder resolution. The angle of rotation α_G of the gearboxes, the number of pulses z per rotation of the encoder, the drive-wheel diameter D or the spindle pitch h and the gear transmission ratio i give the positioning accuracy as follows:

$$\Delta S_{\text{gearbox}} = \frac{D \cdot \pi}{360^\circ} \cdot \alpha_G$$

$$\Delta S_{\text{encoder}} = \frac{D \cdot \pi}{i \cdot z}$$

or with spindle drives

$$\Delta S_{\text{gearbox}} = \frac{h}{i \cdot z} \text{ for spindle drives}$$

$$\Delta S_{\text{total}} = \Delta S_{\text{gearbox}} + \Delta S_{\text{encoder}} + \Delta S_{\text{mech}} \quad (\text{static})$$

ΔS_{mech} is the inaccuracy of the mechanical system such as that due to expansion of the toothed belt.

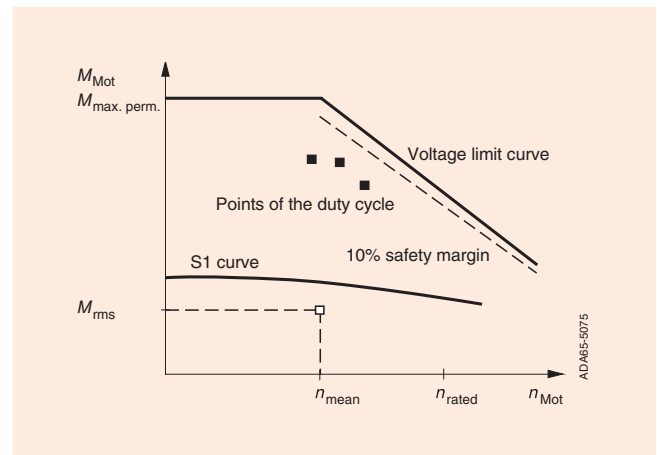
4. Motor selection

The motor is selected according to the following criteria:

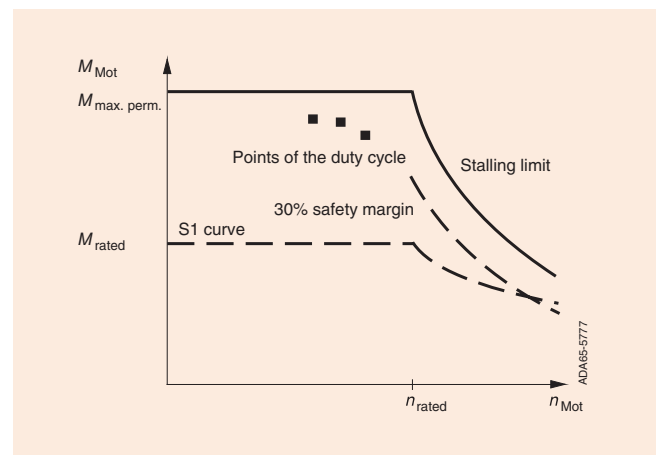
- The dynamic limits must be observed, i.e. all torque-speed points of the duty cycle must be below the limit curve.
- The motor speed must be smaller than $n_{\text{max, perm.}}$. With synchronous motors, the maximum motor speed must not be greater than the rated speed.
- Maintaining the thermal limits, i.e. with synchronous motors, the rms motor torque at the average motor speed, resulting from the duty cycle, must be below the S1 curve. On asynchronous motors, the rms value of the motor current within a duty cycle must be less than the rated motor current.

When synchronous motors are used, it must be borne in mind that the maximum permissible motor torque at high speeds is reduced by the voltage limit curve. In addition, a margin of about 10% from the voltage limit curve should be maintained as a protection against voltage fluctuations.

When using asynchronous motors, the permissible motor torque in the field weakening range is reduced as a result of the stalling limit. Here a clearance of approximately 30% should be maintained.



Limit curves for 1FK7/1FT6 motors
(synchronous motors)



Limit curves for 1PH7 motors
(asynchronous motors)

Planning guide

SIMODRIVE converter system

Dimensioning of the power section and drive

The maximum motor torque must be calculated in order to check the dynamic limit. In general, the maximum motor torque occurs during the acceleration phase. In addition to the maximum torque specified by the load, the torque required $M_{b\text{ Mot}}$ to accelerate the rotor moment of inertia must also be taken into consideration. The following formula is therefore used to calculate the maximum motor torque:

$$M_{\text{Mot max}} = M_{b\text{ Mot}} + M_{\text{Load max}}^*$$

$M_{b\text{ Mot}}$ Acceleration torque for the motor rotor

$M_{\text{Load max}}^*$ The maximum load torque converted to the motor speed during the acceleration phase, including the contribution of the gearbox

with

$$M_{b\text{ Mot}} = J_{\text{Mot}} \cdot \alpha_{b\text{ Mot}}$$

$\alpha_{b\text{ Mot}}$ Angular acceleration of the motor

Now a motor can be chosen, which fulfills the condition for the maximum motor torque in the required speed range. The proportion of the acceleration torque for the motor rotor in relation to the maximum motor torque depends not only on the moment of inertia of the motor and the angular acceleration but also on the moment of inertia of the load, the gear transmission ratio and the static load torque.

A second point to be checked is whether the thermal limits are adhered to.

Synchronous motors

In order to calculate the rms torque, the motor torque must be determined in all parts of the motion curve. The following formula is used to calculate the rms torque and the mean motor speed:

$$M_{\text{eff}} = \sqrt{\frac{\sum M_{\text{Mot } i}^2 \cdot \Delta t_i}{T}}$$

$$n_{\text{mean}} = \frac{\sum \frac{n_{\text{Mot A}} + n_{\text{Mot E}}}{2} \cdot \Delta t_i}{T}$$

T Cycle time, clock cycle time

$M_{\text{Mot } i}$ Motor torque in the time segment Δt_i

$$\frac{n_{\text{Mot A}} + n_{\text{Mot E}}}{2} \quad \text{average motor speed in the time segment } \Delta t_i \quad (\text{A: Initial value, E: Final value})$$

If the rms torque at the mean motor speed is below the S1 curve and the dynamic limits are being adhered to, the selected synchronous motor can be used.

Asynchronous motors

In order to calculate the rms motor current, the motor torque must first be determined in all parts of the motion curve. The motor current is therefore calculated as follows:

$$I_{\text{Mot}} = I_{\text{rated}} \cdot \sqrt{\left(\frac{M_{\text{Mot}}}{M_{\text{rated}}}\right)^2 \cdot \left(1 - \left(\frac{I_{\mu\text{rated}}}{I_{\text{rated}}}\right)^2\right) \cdot k_{\text{rated}}^2 + \left(\frac{I_{\mu\text{rated}}}{I_{\text{rated}}}\right)^2 \cdot \frac{1}{k_{\text{rated}}^2}}$$

I_{rated} Rated current

$I_{\mu\text{rated}}$ Rated magnetizing current

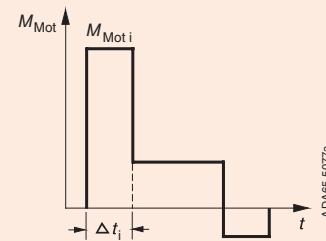
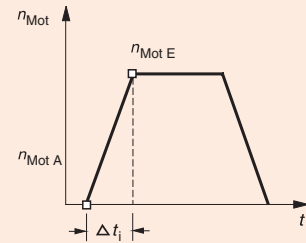
$k_{\text{rated}} = 1$ In the constant flux range

$k_{\text{rated}} = \frac{n}{n_{\text{rated}}}$ In the field weakening range

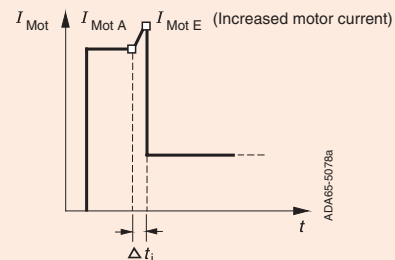
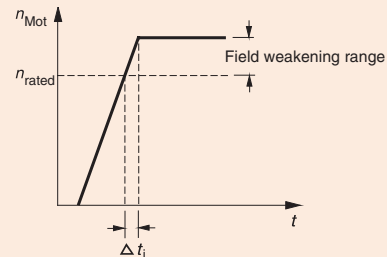
Formula for the rms value of the motor current:

$$I_{\text{rms}} = \sqrt{\frac{\sum \left(\frac{I_{\text{Mot A}} + I_{\text{Mot E}}}{2}\right)^2 \cdot \Delta t_i}{T}}$$

$\frac{I_{\text{Mot A}} + I_{\text{Mot E}}}{2}$ Average motor current in the time segment Δt_i (A: Initial value, E: Final value)



Example of motor speed and motor torque in a time segment Δt_i



Example of motor speed and motor current in a time segment Δt_i

If the dynamic limits are adhered to and the rms value of the motor current is smaller than the rated current for the motor, the selected asynchronous motor can be used.

Which encoder is selected, depends on the requirements.

Encoders provide high resolution and extremely true running at the lowest speeds. They are therefore especially suitable for highly accurate positioning tasks. Resolvers are rugged and inexpensive and provide good resolution.

SIMODRIVE converter system Dimensioning of the power section and drive

5. Cooling methods

Different cooling methods are available for the infeed and power modules:

- Internal cooling
- External cooling
- Hose cooling

Internal cooling

In this standard solution, the power loss of the converter components from the electronic equipment and the power section is dissipated to the control cabinet interior.

External cooling

Because the heat sinks of the modules pass through the mounting surface in the control cabinet, the power loss of the power section can be dissipated to an external ventilation circuit. Only the power loss of the electronic equipment remains in the control cabinet. The IP54 degree of protection can be achieved at the "mechanical interface" which is the external heat sink.

Hose cooling

Hose cooling is designed for control cabinets that do not have a separate ventilation channel for the power sections. Flexible tubes are used to remove the heat arising from the power loss of the power sections from the cabinet. The IP54 degree of protection can be achieved at the "mechanical interface" to the external air.

6. Configuration of the drive module

The drive modules comprise the power module, control unit, device bus cable and, in some cases, the option module.

Depending on the cooling method employed or the size of the power module, ventilation components have to be ordered additionally or provided by the user.

Control units for one axis (with resolver evaluation) and two axes (with rotary encoder or sin/cos encoder evaluation) and power modules for one or two axes are available. Both analog setpoint specification and serial communication via PROFIBUS DP are possible.

Considerations for the power module with asynchronous motors

The drive module with asynchronous motor control allows the use of converter-fed asynchronous motors with a rated DC link voltage of 600 V. The maximum motor stator frequency is 1400 Hz for the SIMODRIVE 611 universal HR. With motor frequencies above 300 Hz or motor rated currents above 85 A, it may be necessary to provide a series inductor or to increase the converter operating frequency. Please note the rating guidelines in Part 7 of the Planning Guide.

To determine the motor current at a given motor torque, the following formula is used:

- For synchronous motors

$$I_{\text{Mot}} = \frac{M_{\text{Mot}}}{kTn}$$

kTn Torque constant

In general, the highest motor current occurs during the acceleration phase. At high motor torques, the motor current may be greater than that calculated with kTn due to saturation effects. This must be taken into account when selecting the motor.

- For asynchronous motors

The motor current is calculated as described in Step 4. Acceleration into the field-weakening range with a constant motor torque results in the maximum motor current in the field-weakening range at maximum speed.

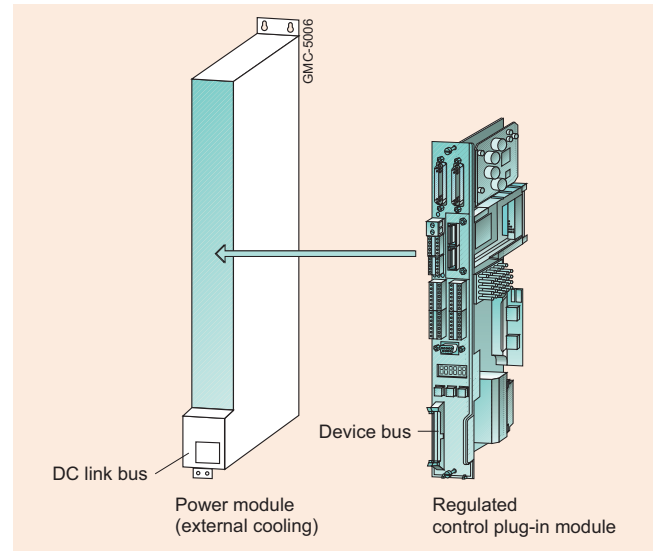
The arithmetic mean of the motor current is calculated as follows:

- For synchronous motors

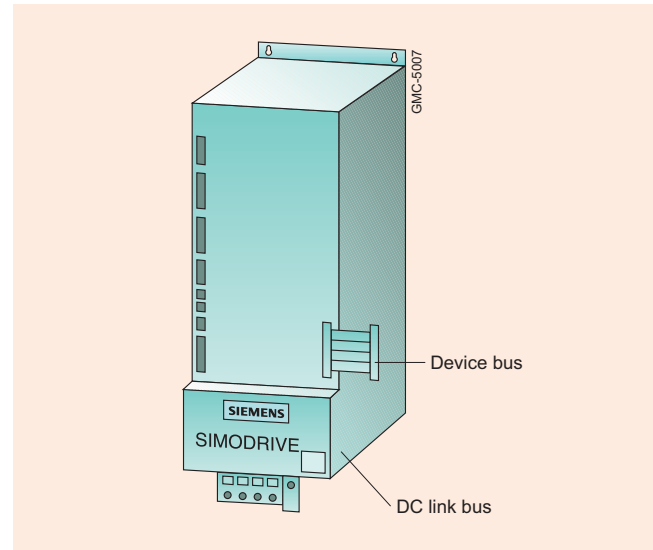
$$I_{\text{Mot mean}} = \frac{\sum |M_{\text{Mot } i}| \cdot \Delta t_i}{kTn \cdot T}$$

$M_{\text{Mot } i}$ Motor torque in the time segment Δt_i

T Cycle time, clock cycle time



Drive module



Infeed module

- For asynchronous motors

$$I_{\text{Mot mean}} = \frac{\sum \frac{I_{\text{Mot A}} + I_{\text{Mot E}}}{2} \cdot \Delta t_i}{T}$$

$\frac{I_{\text{Mot A}} + I_{\text{Mot E}}}{2}$ Average motor current in the time segment Δt_i
(A: Initial value, E: Final value)

7. Selection of the infeed module

The infeed module must always be located on the left as the first module. Power modules must be located next to the infeed module in descending order of rated current from left to right (highest rating on left, lowest on right). Infeed modules can only be used separately from each other, i.e. two infeed modules cannot be connected together.

Calculating the DC link power for the infeed module

Motor data for open-loop infeed (OI) modules and closed-loop infeed/regenerative feedback (I/RF) modules for 400/480 V AC

The rated data for asynchronous motors depends on the rated motor voltage. The infeed module needs to provide the motor voltage, which corresponds to the motor data.

For the 1P. Series of Siemens high-performance motors, please use the applicable data tables.

For any other motor type, please note that the maximum output voltage to the motor varies in accordance with the combination of infeed module and supply voltage. The following table states the maximum output voltage to the motor.

Mains voltage	400 V AC	480 V AC
OI	350 V AC	415 V AC
I/RF	385 V AC	415 V AC

Infeed module: Selection and size optimization

When multi-axis drives are used, several power sections are supplied with power by an infeed module. When the infeed module is being selected, it must be determined whether it is able to supply enough peak and continuous power to the power section during a regular duty cycle. The criteria are as follows:

- The maximum DC link power must be less than the maximum permissible output power (see Technical data) of the infeed module. In the worst case, provided that the maximum power of each drive module occurs simultaneously, the infeed module must be dimensioned as follows:

$$P_{\text{infeed max.}} > \sum P_{\text{DC link pos. max.}}$$

$$P_{\text{DC link pos. max.}} = \text{maximum DC link power for motoring}$$

If this is not the case, the infeed module can be selected by determining the maximum power of all axes combined. This takes into consideration that the maximum power requirement of each axis does not occur simultaneously.

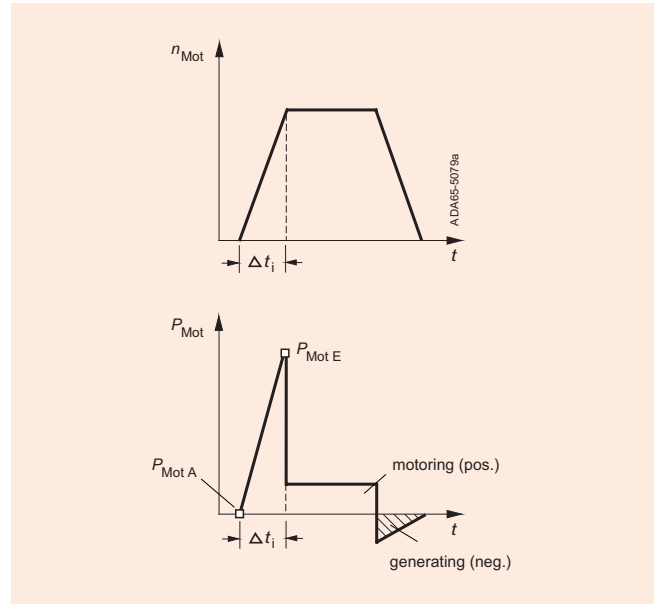
The DC link power (motoring) for each power section is calculated as follows:

$$P_{\text{DC link pos.}} = \frac{P_{\text{Mot pos.}}}{\eta_{\text{power module}} \cdot \eta_{\text{Mot}}}$$

The motor power is calculated according to the following equations:

$$P_{\text{mot}} [\text{kW}] = \frac{M_{\text{Mot}} [\text{Nm}] \cdot n_{\text{Mot}} [\text{rpm}]}{9550}$$

$$P_{\text{mot}} [\text{HP}] = \frac{M_{\text{Mot}} [\text{lb}_f \cdot \text{ft}] \cdot n_{\text{Mot}} [\text{rpm}]}{5250}$$



Example of motor speed and motor power in a time segment Δt_i

- After selecting an infeed module which is able to satisfy the maximum supply power demand of the drive axis, it must be checked whether the rated power of the infeed module is sufficient as well. For one or more axes, the rated power of the infeed module must fulfill the following condition:

$$P_{\text{rated pos. infeed}} > \frac{\sum \left(\frac{P_{\text{Mot pos. rms}}}{\eta_{\text{power module}} \cdot \eta_{\text{Mot}}} \right)}{X}$$

$$X = 1.03 \text{ for } T \leq 10 \text{ s}$$

$$X = 0.90 \text{ for } 10 \text{ s} < T \leq 1 \text{ min}$$

$$X = 0.89 \text{ for } 1 \text{ min} < T \leq 10 \text{ min}$$

T Cycle time, clock cycle time

$$P_{\text{Mot pos. rms}} > \sqrt{\frac{\sum \left(\frac{P_{\text{Mot A}} + P_{\text{Mot E}}}{2} \right)^2 \cdot \Delta t_i}{T}}$$

$P_{\text{Mot A}}$ Initial motor power in the time segment Δt_i

$P_{\text{Mot E}}$ Final motor power in time segment Δt_i

For open-loop OI infeed modules, only positive motor power has to be evaluated to determine the correctly dimensioned infeed module.

For closed-loop I/RF infeed modules, both positive (motoring) and negative (regenerative) power values must be separately evaluated.

The energy fed back to the DC link must not exceed the continuous and peak load capability of the I/RF infeed module. To determine the DC link peak and continuous power during regeneration (braking) the equations below can be used.

$$P_{\text{DC link neg.}} = P_{\text{Mot neg.}} \cdot \eta_{\text{power module}} \cdot \eta_{\text{Mot}}$$

$$P_{\text{rated infeed}} > \frac{\sum (P_{\text{Mot neg. rms}} \cdot \eta_{\text{power module}} \cdot \eta_{\text{Mot}})}{X}$$

$P_{\text{Mot neg.}}$ Max. power during braking

Checking the power supply rating and braking calculations

In addition to the DC link power requirement, it is also necessary to check the power supply rating of the infeed module in order to determine whether or not a monitoring module (supplementary 24 V DC supply) is necessary.

The required power supply rating depends on the:

- Size of the infeed/regenerative feedback module
- Size of the drive modules
- Number of modules

The infeed or monitoring module offers a basic power supply rating for the electronics points (EP) and gating points (AP).

The power supply requirement of a drive grouping is calculated by summing all of the electronic points (EP) and gating points (AP) of a drive system. These values are listed in Table 1, Assessment factors.

If only one of these values is exceeded, an (additional) monitoring module must be provided.

The monitoring module must be mounted on the left upstream of the modules to be monitored.

DC link capacitance

Every infeed module has a maximum value which restricts expansion of the DC link capacitors. It must be ensured that the DC link capacitance of the various units in a drive system is not exceeded. Therefore all of the DC link capacitance of the various units in a drive system must be summed and compared to the available charging limit of the infeed module. The DC link capacitance of all available modules and accessories, including the charging limit of the infeed modules, is listed in Table 1, Assessment factors.

Table 2, Assessment and configuration sheet must be used to check the electronics power supply. The frequency of precharging the DC link by the infeed module is given by the following formula:

Number of precharging procedures within 8 min =

$$\frac{\text{Charging limit for infeed module } [\mu\text{F}]}{\Sigma \text{ DC link capacitance for the engineered drive system } [\mu\text{F}]}$$

Only one infeed/regenerative feedback module or one open-loop infeed module is permitted per SIMODRIVE 611 universal system configuration.

8. Selection of the braking unit and braking resistor

For the OI non-regenerative infeed modules, the braking chopper is included along with the resistor for the 5 kW (6.5 HP) and 10 kW (13.5 HP) ratings. The available ratings for the pulsed resistors of the OI non-regenerative infeed modules are as follows:

- Infeed module 5 kW (6.5 HP) (with internal resistor) ¹⁾
 - 200 W continuous rating
 - 10 kW short-time rating for 120 ms once per 10 s cycle without previous load
- Infeed module 10 kW (13.5 HP) (with internal resistor) ¹⁾
 - 300 W continuous rating
 - 25 kW short-time rating for 120 ms once per 10 s cycle without previous load
- Infeed module 28 kW (38 HP) (external resistor needed)
 - Max. 2 x 300 W continuous rating
 - Max. 2 x 25 kW short-time rating for 120 ms once per 10 s cycle without previous load

- Max. 2 x 1.5 kW continuous power
- Max. 2 x 25 kW short-time rating for 12 ms once per 10 s cycle without previous load

For the 28 kW (38 HP) OI module, the pulsed resistors must be ordered separately and installed externally.

With greater energy feedback values, a separate pulsed resistor module must be provided or the feedback power must be reduced by prolonging the braking time.

Subject to certain conditions, several pulsed resistor modules can be connected in parallel.

The maximum number of pulsed resistor modules depends on the DC link capacitance of the drive configuration implemented.

One pulsed resistor module can be installed for every full 500 μF of DC link regenerative capacitance.

Only the DC link capacitance of the coupled power modules or special modules need to be taken into consideration for those OI modules that already contain a pulsed resistor unit. If the pulsed resistor unit can be switched off, the internal DC capacitance can be included in determining the dimensions of the pulsed resistor module.

As regards the braking operation of the motors, check that the energy fed back to the DC link does not exceed the permissible peak load capability of the feedback converter.

Braking resistor selection

The selection of the braking resistor for one or more axes depends on the following criteria:

$$\bullet P_{\text{max br resistor}} \geq \sum (P_{\text{Mot br max}} \cdot \eta_{\text{Mot}} \cdot \eta_{\text{power module}})$$

$$\bullet E_{\text{br max}} \geq \frac{1}{2} \cdot \sum (P_{\text{Mot br max}} \cdot t_{\text{br}})$$

$$\bullet P_{\text{rated resistor}} \geq \sum (P_{\text{Mot br mean}} \cdot \eta_{\text{Mot}} \cdot \eta_{\text{power module}})$$

$$P_{\text{Mot br mean}} = \frac{\sum \frac{P_{\text{Mot br A}} + P_{\text{Mot br E}}}{2} \cdot \Delta t_i}{T}$$

$E_{\text{br max}}$ Maximum braking energy [Ws]

T Cycle time, clock cycle time

If several axes are braked simultaneously, then the summation sign has to be used. In cases in which only one axis is operated at a time, only the highest value for the peak power, peak energy and continuous power have to be considered.

For regenerative infeed modules, it is possible to connect a pulsed resistor module and external braking resistor for emergency braking (i.e. in the event of a power failure).

9. Selection of other componentsTransformers

It is possible to connect the drive converter directly to a grounded (TN) supply system for 3 AC 400 V, 415 V und 480 V. For other voltages or other supply systems, a transformer is required.

Commutating reactors

The matched HF/HFD commutating reactors in accordance with the selection table are required for the connection of the 28 kW (38 HP) unregulated infeed modules and the regulated infeed/regenerative feedback modules to the mains.

1) External resistor connection is not possible.

Additional componentsHF/HFD commutating reactor

The HF/HFD commutating reactor should be installed as near as possible to the mains infeed module.

HF noise suppression components (mains filters)

The mains filters are assigned to the mains infeed modules and limit the line-related emitted interference from the drive system. Together with the HF/HFD commutating reactor, the mains filter should also be installed near the mains infeed module with the filter always on the mains side. Because the connecting cables are subject to high interference levels, these cables must be laid with shielding. We recommend the mains filter products listed in the selection and ordering data.

Mains filter package

The mains filter and the HF/HFD commutating reactors are combined into one logistical unit in the form of a mains filter package.

Overvoltage limiter module (surge arrestor)

The overvoltage limiter module limits the overvoltages that occur, for example, as the result of switching operations on inductive loads and on network matching transformers to values acceptable for the mains infeed modules above 10 kW (13.5 HP).

The overvoltage limiter module is used for upstream transformers or networks that do not meet IEC requirements.

For UL compliance of the mains infeed module, the overvoltage limiter module must be used.

An appropriate protective circuit is integrated as standard in the 5 kW (6.5 HP) OI module.

Built-on fan

A built-on fan (6SN11 62-0BA02-0AA1) is required for the 80 kW (109 HP) and 120 kW (160 HP) infeed modules.

Shield terminal plates

Add-on shield terminal plates are available for the infeed and power modules. The plates also accommodate mounting points for terminals for the brake connection.

Option modules

An optional communication module is available to communicate via PROFIBUS DP. This module also takes into account motion control with PROFIBUS DP functions.

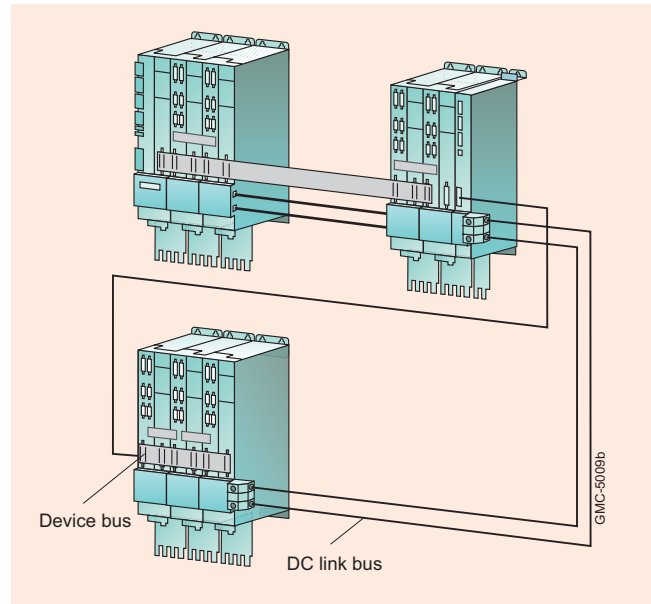
An optional terminal expansion board is available to expand the I/O capability of the plug-in module (axis A only).

2-tier configuration

If space is limited, the SIMODRIVE 611 converter system modules can also be arranged on top of each other in two tiers.

The distance between the tiers must be not less than 200 mm (7.9 in). The location of the unit bus cable determines the maximum distance.

The modules with higher ratings and the infeed module must be located in the upper tier.



2-tier configuration

A connecting cable for the unit bus is required for two-tier configurations of the SIMODRIVE 611 converter system.

The DC link connection in two-tier configurations must be made with parallel cables (max. length 5 m). In the case of 300 mm (11.8 in) wide modules connected in series, the cross-section of the copper conductor must be 70 mm² and for narrower modules, 50 mm². The cable must be laid short-circuit proof and earth-fault proof. A bonding conductor of the same cross-section must also be laid and connected to the housings of both interconnected modules.

The maximum configuration of a drive grouping is limited by the capacity of the infeed module. Only one device bus extension is permissible: either to the left, e.g. for a second tier; or to the right, e.g. to bypass a cabinet panel.

The device bus cable of a drive grouping to an infeed or monitoring module must not be longer than 2.1 m (6.9 ft) (from the infeed point). Two device bus junctions each a maximum length of 2.1 m (6.9 ft) from the junction point are possible at the infeed for the 2-tier configuration.

For 2-tier configurations, adapter terminals for the DC link are required along with a device bus extension cable.

Cables

The cable cross-section of the DC link connection depends on the actual configuration of the SIMODRIVE 611 converter system and must be dimensioned according to EN 60204.

All power cables, including the mains lead, the connection between the I/RF module, the HF commutating reactor and the mains filter, and the motor leads must be laid with shielding and make contact over a large area.

The mounting surfaces for the mains infeed modules and drive modules and the commutating reactors and mains filters must be installed on mounting plates with low-resistance conducting surface (e.g. galvanized mounting plates).

Table 1, Assessment factors

Module	EP and AP for the rated voltage and power supply rating						Limit for DC link μF	Capaci- tance DC link μF	Brake util. μF
	Provides	Requires	Provides	Requires	Provides	Requires			
Power modules with the following plug-in units									
	Single-axis resolver		Two-axis resolver		2-axis sin/cos absolute encoder 1 V _{pp}				
	6SN11 18-□NJ01-0AA0		6SN11 18-□NK01-0AA0		6SN11 18-□NH01-0AA0				
	0: Speed/torque setpoint, 1: Positioning and speed/torque setpoint								
Single-axis version									
6SN11 2□-1AA00-0HA1	0 0	EP 1.1 AP 1.7	0 0	EP 1.4 AP 2.0	0 0	EP 1.5 AP 2.0	0 0	75	75
6SN11 2□-1AA00-0AA1	0 0	EP 1.1 AP 1.7	0 0	EP 1.4 AP 2.0	0 0	EP 1.5 AP 2.0	0 0	75	75
6SN11 2□-1AA00-0BA1	0 0	EP 1.1 AP 1.7	0 0	EP 1.4 AP 2.0	0 0	EP 1.6 AP 2.0	0 0	110	110
6SN11 2□-1AA00-0CA1	0 0	EP 1.1 AP 1.7	0 0	EP 1.4 AP 2.0	0 0	EP 1.6 AP 2.0	0 0	330	330
6SN11 2□-1AA00-0DA1	0 0	EP 1.2 AP 1.7	0 0	EP 1.4 AP 2.0	0 0	EP 1.7 AP 2.0	0 0	495	495
6SN11 2□-1AA00-0LA1	0 0	EP 1.7 AP 1.8	0 0	EP 1.7 AP 2.1	0 0	EP 1.7 AP 2.1	0 0	495	495
6SN11 2□-1AA00-0EA1	0 0	EP 2.7 AP 1.8	0 0	EP 2.7 AP 2.1	0 0	EP 2.7 AP 2.1	0 0	990	990
6SN11 2□-1AA01-0FA1	0 0	EP 2.7 AP 1.9	0 0	EP 2.7 AP 2.1	0 0	EP 2.7 AP 2.1	0 0	2145	2145
6SN11 2□-1AA00-0JA1 ①	0 0	EP 1.3 AP 1.9	0 0	EP 1.5 AP 2.1	0 0	EP 1.7 AP 2.1	0 0	2145	2145
6SN11 2□-1AA00-0KA1 ①	0 0	EP 1.4 AP 1.9	0 0	EP 1.6 AP 2.1	0 0	EP 1.8 AP 2.1	0 0	4290	4290
6SN11 23-1AA02-0FA1 ①		EP 1.3 AP 1.9	0 0	EP 1.5 AP 2.1	0 0	EP 1.7 AP 2.1	0 0	2145	2145
Two-axis version									
6SN11 2□-1AB00-0HA1	0 0	EP 1.3 AP 2.1	0 0	EP 1.5 AP 2.4	0 0	EP 1.6 AP 2.4	0 0	150	150
6SN11 2□-1AB00-0AA1	0 0	EP 1.4 AP 2.1	0 0	EP 1.7 AP 2.4	0 0	EP 1.7 AP 2.4	0 0	150	150
6SN11 2□-1AB00-0BA1	0 0	EP 1.6 AP 2.1	0 0	EP 1.8 AP 2.4	0 0	EP 1.8 AP 2.4	0 0	220	220
6SN11 2□-1AB00-0CA1	0 0	EP 1.7 AP 2.1	0 0	EP 1.8 AP 2.4	0 0	EP 1.8 AP 2.4	0 0	660	660
	3: Internal cooling, 4: External cooling				① With built-on fan for hose cooling				
Infeed modules									
OI 5 kW (6.5 HP)/10 kW (13.5 HP) 6SN11 4□-1AB00-0BA1	EP 3.5 AP 7	EP 0.3 AP –	EP 3.5 AP 7	EP 0.3 AP –	EP 3.5 AP 7	EP 0.3 AP –	1200	150	0
10 kW (13.5 HP)/25 kW (34 HP) 6SN11 4□-1AA01-0AA1	EP 8 AP 17	EP 0.5 AP 0.5	EP 8 AP 17	EP 0.5 AP 0.5	EP 8 AP 17	EP 0.5 AP 0.5	6000	440	0
28 kW (38 HP)/50 kW (67 HP) 6SN11 4□-1AA00-0CA0	EP 8 AP 17	EP 0.5 AP 0.5	EP 8 AP 17	EP 0.5 AP 0.5	EP 8 AP 17	EP 0.5 AP 0.5	20000	990	0
I/R 16 kW (22 HP)/21 kW (28 HP) 6SN11 4□-1BA01-0BA1	EP 8 AP 17	EP 0.5 AP 0.5	EP 8 AP 17	EP 0.5 AP 0.5	EP 8 AP 17	EP 0.5 AP 0.5	6000	495	0
36 kW (49 HP)/47 kW (63 HP) 6SN11 4□-1BA02-0CA1	EP 8 AP 17	EP 0.5 AP 0.5	EP 8 AP 17	EP 0.5 AP 0.5	EP 8 AP 17	EP 0.5 AP 0.5	20000	990	0
55 kW (75 HP)/71 kW (95 HP) 6SN11 4□-1BA01-0DA1	EP 8 AP 17	EP 0.5 AP 0.5	EP 8 AP 17	EP 0.5 AP 0.5	EP 8 AP 17	EP 0.5 AP 0.5	20000	2145	0
80 kW (109 HP)/131 kW (175 HP) 6SN11 4□-1BB00-0EA1	EP 8 AP 17	EP 1 AP 0.75	EP 8 AP 17	EP 1 AP 0.75	EP 8 AP 17	EP 1 AP 0.75	20000	2145	0
120 kW (160 HP)/175 kW (235 HP) 6SN11 4□-1BB00-0FA1	EP 8 AP 17	EP 1 AP 0.75	EP 8 AP 17	EP 1 AP 0.75	EP 8 AP 17	EP 1 AP 0.75	20000	4290	0
Monitoring module 6SN11 12-1AC01-0AA1	EP 8 AP 17	EP 0 AP 0	EP 8 AP 17	EP 0 AP 0	EP 8 AP 17	EP 0 AP 0	0	1000	75
Pulsed resistor module 6SN11 13-1AB01-0BA1	0 0	EP 0.2 AP 0.1	0 0	EP 0.2 AP 0.1	0 0	EP 0.2 AP 0.1	0	75	75
	5 or 6, (see selection and ordering data)								

Assessment factors of single modules for electronics points (EP) and gating points (AP) as well as permissible combinations of power modules and control units (digital). The details for the EP and AP assessment factors refer to the approved encoder cable lengths.

- PROFIBUS DP
An additional 0.6 gating points must be taken into account when the option is used.
- Terminal module
No additional electronics points or gating points have to be taken into consideration in this case.

Assessment and configuration sheet example

Module type	Electronics points			Gating points			DC link capacitance			Brake utilization (μF)
	Provides	Requires	Resultant	Provides	Requires	Resultant	Capacitance limit for infeed module (μF)	Capacitance used by DC link (μF)		
I/RF module 6SN11 45-1BB00-0FA1	8	1	$0 + 8 - 1 = 7$	17	0.75	16.25	20000	4290	0	
Single-axis drive module 6SN11 23-1AA00-0EA1	0	2.7	$7 + 0 - 2.7 = 4.3$	0	2.1	14.15		990	990	
Single-axis drive module 6SN11 23-1AA00-0EA1	0	2.7	1.6	0	2.1	12.05		990	990	
Single-axis drive module 6SN11 23-1AA00-0EA1	0	2.7	-1.1	0	2.1	9.95		990	990	
Note: Since the value of the resultant was negative, a monitoring module is required and must be physically located in this position. The current drive module and all subsequent modules must now be physically located to the right of the monitoring module.										
Note: When a monitoring module is used, the resultant calculation is continued with the value provided by the monitoring module. Any remaining resultant from above is ignored.										
Monitoring module 6SN11 12-1AC01-0AA1	8	0	8	17	0	17		1000	75	
Single-axis drive module 6SN11 23-1AA00-0EA1	0	2.7	5.3	0	2.1	14.9		990	990	
Single-axis drive module 6SN11 23-1AA00-0EA1	0	2.7	2.6	0	2.1	12.8		990	990	
Pulsed resistor module 6SN 11 13-1AB01-0BA1	0	0.2	2.4	0	0.1	12.7		75	75	
Pulsed resistor module 6SN11 13-1AB01-0BA1	0	0.2	2.2	0	0.1	12.6		75	75	
Result of the electronic points ¹⁾ (must be > 0)			2.2	Result of the electronic points ¹⁾ (must be > 0)			Σ DC link utilization < Limit of infeed module			
			2.2 > 0 Therefore: OK				Σ Braking utilization ²⁾			
							9400 < 20,000 Therefore: OK			
							4185			

The required values can all be found in Table 1!

1) If resultant goes negative during calculation, a monitoring module must be added.

Start with the 8 electronic points and 17 gating points provided by the monitoring module.

2) Max. number of permissible braking resistors is equal to the integer value of Σ Braking utilization/500 μF: Example

$$n: \frac{4185}{500} = 8.37$$

Therefore: max. 8 braking resistors

- 1) 1200 μF/500 μF = 2.4 = > max. 2
- 2) 1900 μF/500 μF = 3.8 = > max. 3

Resultant = Previous resultant + Provides - Requires

Actual physical configuration of drive system from left to right

Left

Right

Table 2, Assessment and configuration sheet

Module type	Electronics points			Gating points			DC link capacitance		
	Provides	Requires	Resultant	Provides	Requires	Resultant	Capacitance limit for infeed module (μF)	Capacitance used by DC link (μF)	Brake utilization (μF)
	Result of the electronic points ¹⁾ (must be > 0)	Result of the electronic points ¹⁾ (must be > 0)		Result of the electronic points ¹⁾ (must be > 0)			Σ DC link utilization < Limit of infeed module		
							Σ Braking utilization ²⁾		

The required values can all be found in Table 1!

1) If resultant goes negative during calculation, a monitoring module must be added.

Start with the 8 electronic points and 17 gating points provided by the monitoring module.

2) Max. number of permissible braking resistors is equal to the integer value of Σ Braking utilization/500 μF. Example

1) 1200 μF/500 μF = 2.4 = > max. 2
2) 1900 μF/500 μF = 3.8 = > max. 3

Planning guide

SIMODRIVE converter system SINUMERIK & SIMODRIVE Configurator

NCSD Configurator SINUMERIK & SIMODRIVE – Intelligent selection guide for configuring SINUMERIK and SIMODRIVE components

Customized systems can be built up easily and quickly starting from the selection of the CNC control through the assignment of operating components as far as the drive system configuration.

Benefits:

- Simple tree structure and easy navigation
- Flexible module selection and sequence
- Configuration of subsystems and complete installations
- Optimization of ordering due to immediate recalculation following changes to the configuration
- Continuous testing of the interoperation of all selected components with regard to consistency and reliability.
- Generated parts lists can be loaded into the interactive Catalog CA 01.
- Completion of the parts list by entering the order numbers required
- Languages: English, German, French, Italian and Spanish included

The CNC control, operating components, HMI software, SIMATIC S7-300 I/O, converter system, motors and measuring system are selected consistently. Motors can be selected via the Order No. or using a motor wizard (with reference to speed, torque or output). The appropriate power section as well as the cables are automatically assigned to the motor. The cable lengths can then be specified to suit the application.

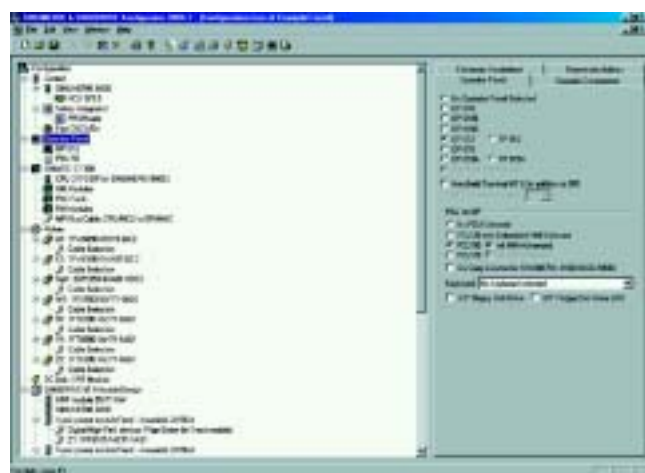
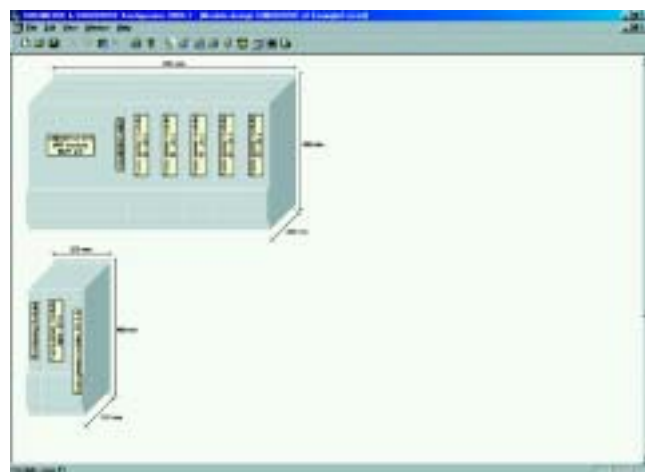
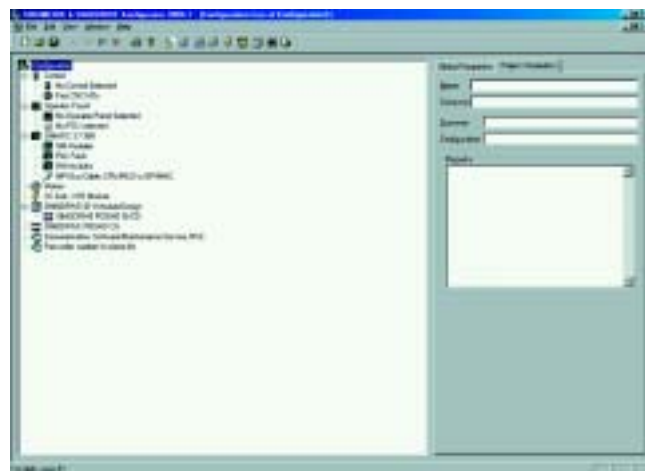
The NCSD Configurator provides information concerning:

- Structure of the SINUMERIK components
- Arrangement of the SIMODRIVE group
- Motor data and options for core motor types
- DC link power and capacitance
- Assessment points (electronic and gating points)
- Power loss calculation for control cabinet components

Software update service, repair service contract, documentation and maintenance contracts for the separate components are also implemented in the NCSD Configurator.

You can obtain the NCSD Configurator:

- Enclosed with the interactive Catalog CA01 or
- Continuously updated on the Internet at:
<http://support.automation.siemens.com>



General information

The SIMODRIVE 611 converter system is designed for a rated voltage of DC 600 V (± 300 V between the phase and the grounded neutral point).

This voltage must not be exceeded, otherwise the drive converter insulation system could be damaged which can result in inadmissably high touch voltages.

Important!

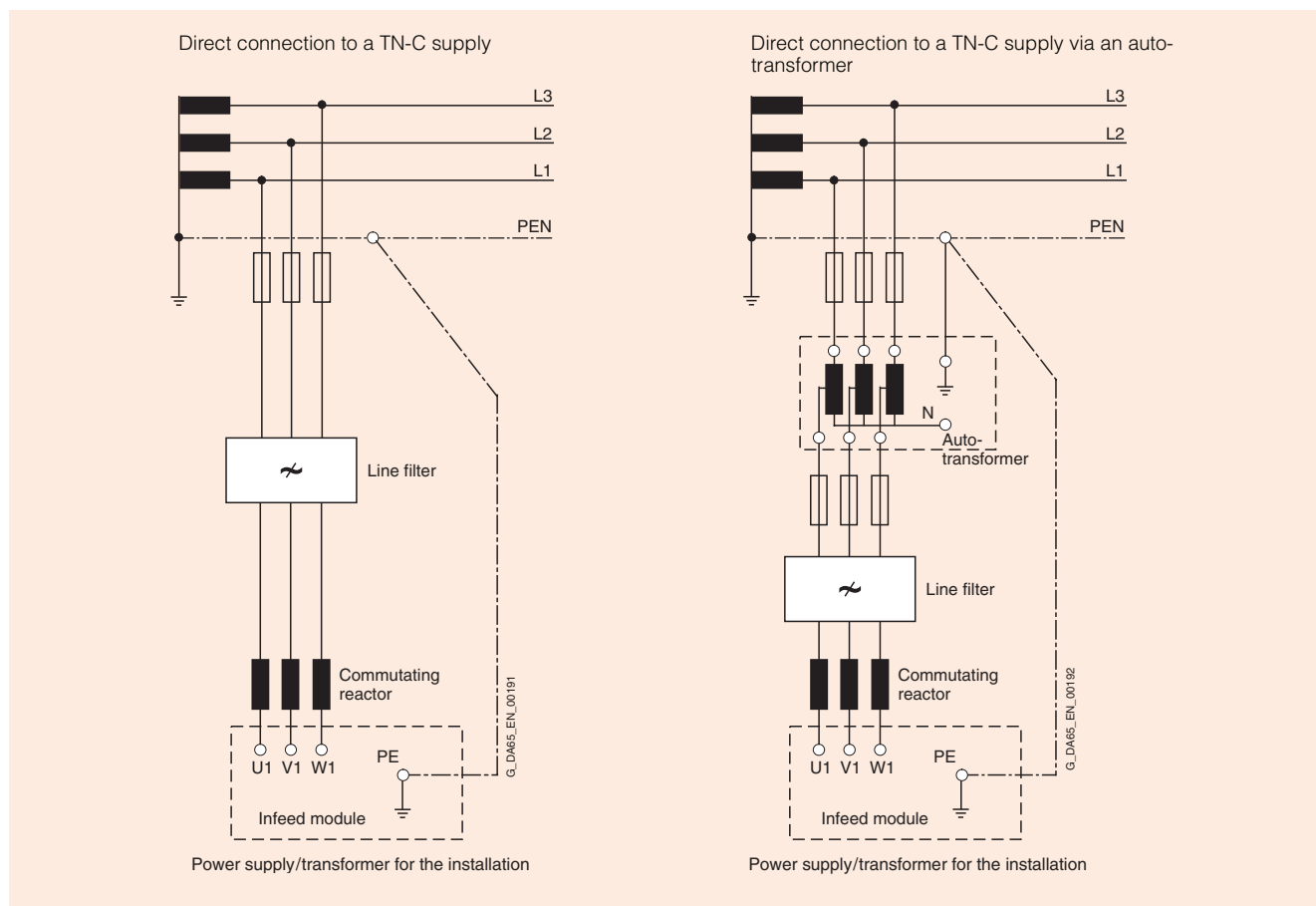
The drive converters can only be connected directly or via an auto-transformer to TN supply systems.
For all other supply system types, an isolating transformer must be connected in series, whereby the star point of the secondary

side must be grounded such that another TN supply system is created for the infeed.

UL requirement for the maximum short-circuit current

Infeed units up to a rated output of:

- 37.3 kW (50 HP) may only be connected to supply systems with a maximum short-circuit current of 5 kA_{rms}, symmetrical, for a supply voltage of AC 480 V.
- 39 kW (52 HP) may only be connected to supply systems with a maximum short-circuit current of 10 kA_{rms}, symmetrical, for a supply voltage of AC 480 V.

Example for TN-C supply system

Connection to TN-C supply systems

Connection types

It is possible to connect the drive converter directly to a TN supply system for 3 AC 400 V, 3 AC 415 V, 3 AC 480 V¹⁾. For other voltage levels, it is possible to connect the drive converter through an auto-transformer.

Note

When using auto-transformers or isolating transformers upstream of infeed modules (module width ≥ 100 mm (3.9 in)), an overvoltage limiting module or an external voltage limiting circuit must be used.

Description of TN-C supply, TN-S supply and TN-C-S supply

Symmetrical 4-conductor or 5-conductor three-phase supply system with grounded neutral point which can be loaded, with a protective conductor and neutral conductor connected to the neutral point – depending on the type of supply system and whether one or several phases are used.

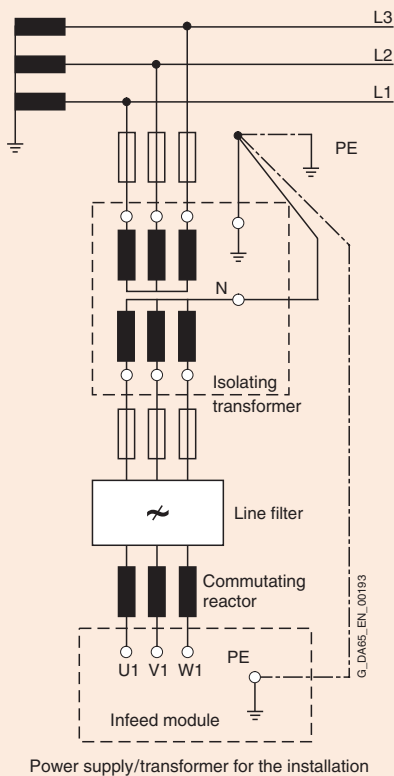
For other types of supply system, the infeed module must be connected via an insulating transformer as shown in the examples on these pages.

1) Direct connection to 480 V is only possible in combination with the following power modules: (Order No.: 6SN11 2□-1□□□□-0□□1) and with I/RF modules, Order No.: 6SN11 4□-1□□□□-0□□1.

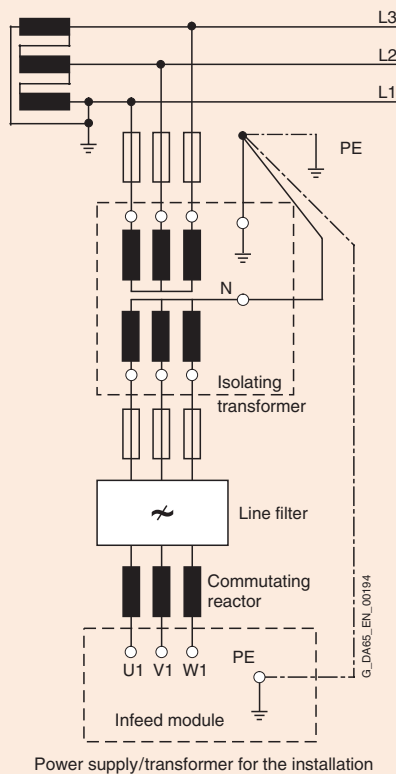
For motors with a shaft height < 100: Can be used in temperatures of up to 60 K in accordance with the selection and ordering data for the motors. Please observe the operating instructions for the motors.

Example of TT supply system

TT supply system with grounded star point and isolating transformer



TT supply system with grounded phase and isolating transformer



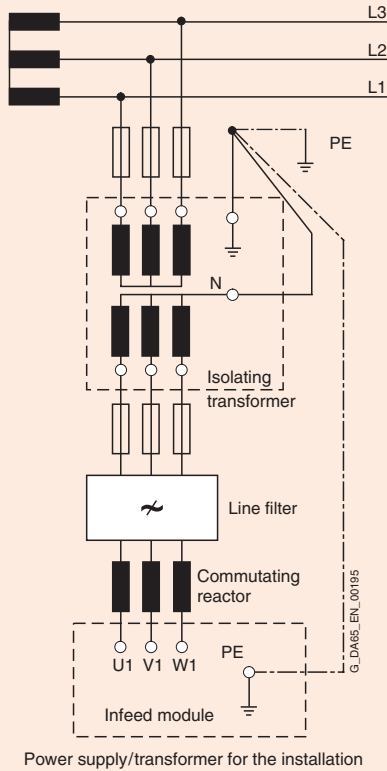
Connection to TT supply systems

Description of a TT supply

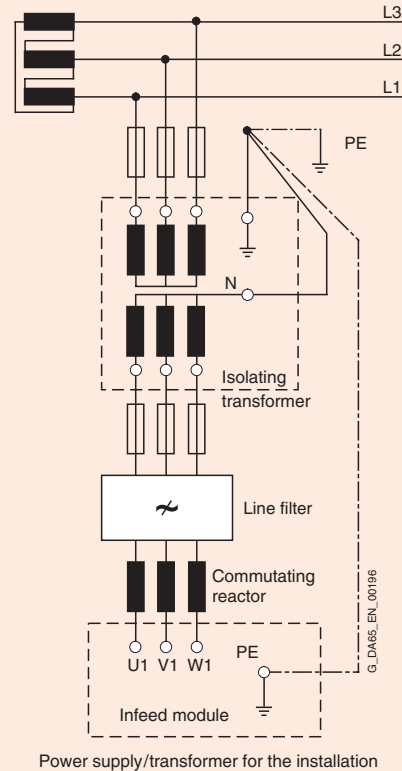
Symmetrical 3-conductor or 4-conductor three-phase supply system with a directly grounded point. The loads are, for example, connected to ground when they are not electrically connected with the directly grounded point of the supply system.

Example of IT supply system

Single-pole circuit diagram with IT supply system and isolating transformer



Single-pole circuit diagram with IT supply system and isolating transformer



Connection to IT supply systems

Description of an IT supply

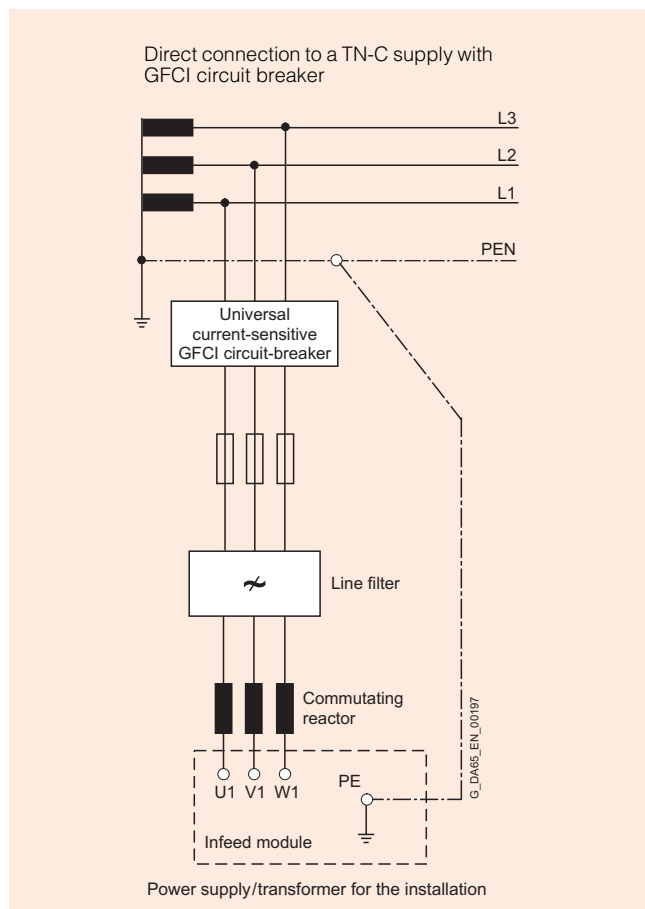
Symmetrical 3-conductor or 4-conductor three-phase supply system without a directly grounded point. The loads are, for example, connected with ground connections.

Note

When using isolating transformers upstream of I/RF and OI infeed modules (module width ≥ 100 mm (3.9 in)), an overvoltage limiting module or an external voltage limiting circuit must be used.

For the 5 kW (6.5 HP) OI module, a voltage limiting circuit is included.

Example of TN-C supply system and GFCI circuit breaker



Direct connection to supply systems with GFCI circuit breakers

Upstream devices providing protection against hazardous leakage currents or for fire protection (such as ground fault circuit interrupting devices) must be universal current-sensitive in accordance with the requirements of EN 50178. In the case of other ground fault circuit interrupting devices, a transformer with separate windings must be connected upstream of the converter for purposes of decoupling.

Due to the 6-pulse three-phase bridge circuit in the mains infeed module, any fault currents will contain DC components. This must be taken into account when selecting or dimensioning an GFCI circuit breaker.

The SIMODRIVE device can be directly connected to a TN supply system with selectively tripping universal current-sensitive GFCI protective devices.

Note

Direct connection to an GFCI system is only possible using the I/RF modules with 16 kW (22 HP) and 36 kW (49 HP) power.

Delayed selectively tripping AC/DC-sensitive ground fault circuit interrupters can be used without restriction as a protective measure against hazardous shock currents.

Electromagnetic compatibility describes, according to the definition of the EMC guideline, the "ability of a device to function satisfactorily in an electromagnetic environment without itself causing electromagnetic interference which is unacceptable for other devices in this environment". In order to ensure compliance with the relevant EMC standards, the devices must demonstrate a sufficiently high immunity to interference, on the one hand, and interference emission must be limited to compatible values, on the other.

The **product standard EN 61800-3** relevant to "variable-speed drives" describes the requirements for domestic and industrial environments.

Immunity to interference

The devices satisfy the requirements of the EMC product standard EN 61800-3 for industrial environments and thus the lower values regarding interference to immunity required by the domestic environment.

Interference emission and radio-interference suppression

If converters are used in a domestic environment, conducted interference or radiated interference must not exceed the limit values of Class B1 in accordance with the European standard EN 55011.

Type of interference	Degree of immunity	Remarks
Discharge of static electricity (ESD)	up to 12 kV	
Fast transient disturbances (burst)	up to 4 kV	for power module
	up to 2 kV	for signal lines

A domestic environment refers in this context to an outgoing connection of a transformer to which private households are also connected.

The EMC guideline requires that an industrial system as a whole is electromagnetically compatible with its environment.

In the case of devices for use in industrial environments, no limit values are defined for emitted interference.

If the SIMODRIVE units are to comply with limit values, the following must be provided:

- Radio-interference suppression filters, including line commutating reactors for reducing conducted interference
- Shielded cables for motor supply lines and signal lines for reducing electromagnetically emitted interference
- Compliance with the installation guidelines.

In systems with SIMODRIVE units and other components, e.g. contactors, switches, evaluation units, programmable controllers, etc., it must be ensured that no interference is emitted to the outside and also that the individual units do not cause mutual interference. In this respect, the measures described in the document "EMC Installation Guideline SINUMERIK, SIROTEC, SIMODRIVE, SIMOTION, SINAMICS S120" (Order No.: 6FC5297-0AD30-0BP2) should be followed. This document is available as PDF on the CD enclosed in this catalog.

The most important of these measures are summarized here:

- The components of a system must be housed in a cabinet which acts like a Faraday cage.
- Signal lines and motor supply cables must be shielded. The shields must be grounded at both ends.
- Signal cables should be physically separated (at least 20 cm (7.9 in)) from the power cables; isolation plates should be implemented if necessary.

Mains supply interfaces for voltage matching

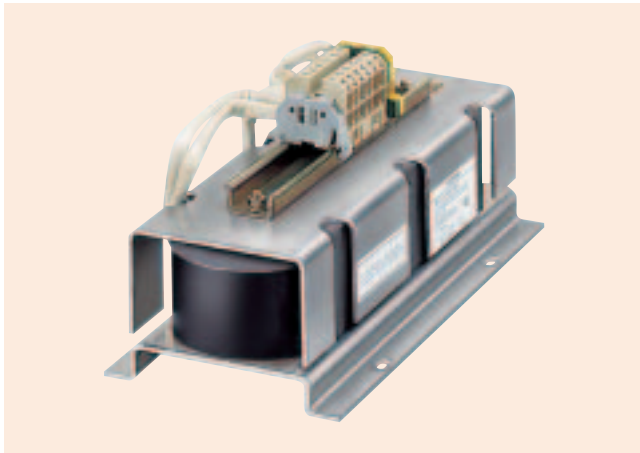
The SIMODRIVE 611 converter system is designed for direct operation on TN supply systems with rated voltages of 3 AC 400 V, 3 AC 415 V and 3 AC 480 V. Matching transformers tailor-made for the system are available to adapt the system for use with other supply system types, such as for operation on IT or TT supplies. The wide range covers the mains voltages prevalent in industrial regions.

TN supply systems are characterized by a low-resistance galvanic connection between the reference potentials to ground of the power source and the protective conductor potential of the electrical equipment. If they are not satisfied, these connection conditions must be simulated by means of a transformer with separate windings whose secondary side star point is grounded on the protective conductor potential and connected to the protective conductor of the converter (TN island network).

Thus, within the pulsed transistor converter, the voltage loading upon the leakage paths between the power circuits fed by the mains potential and the control and closed-loop circuits of the protective conductors complies with a rated voltage of 300 V, in accordance with EN 50178.

Upstream devices providing protection against hazardous leakage currents or for fire protection (such as residual-current protective devices) must be universal current-sensitive in accordance with the requirements of EN 50178. In the case of other residual-current protective devices, a transformer must be connected upstream of the converter for the purposes of decoupling.

If a TN supply system requires only a single voltage level adjustment, one of the matching transformers in economy circuit can be used.

HF/HFD commutating reactor

HF commutating reactor

The matched HF/HFD commutating reactors are required for the connection of the 28 kW (38 HP) unregulated infeed modules and the regulated infeed/regenerative feedback modules to the mains.

The HFD commutating reactors and the pulsed resistor Plus are necessary when direct drives such as linear motors, torque motors, spindle motors and non-Siemens motors are located in the drive group or when resonance effects have been detected.

Benefits

- Limitation of mains and HF feedback
- Store energy for stepping up the voltage for step-up controller operation of the infeed/regenerative feedback modules.

Application

HF/HFD commutating reactors can be used for supply systems of 3 AC 400 V -10% to 3 AC 480 V +6%; 50 Hz/60 Hz $\pm 10\%$.

Mains filter

Mains filter for 16 kW (22 HP)

The mains filters limit the conducted interference emitted from converter units to the permissible EMC values for industrial environments.

Provided the installation is configured in accordance with the Planning Guide and the EMC Installation Guideline SINUMERIK, SIROTEC, SIMODRIVE, SIMOTION, SINAMICS S120, under application of all installation guidelines, compliance with the limit values stipulated by the EU EMC Directive is ensured at the installation site. A prerequisite for compliance with this guideline is, however, that the customer observes the EMC guidelines specific to the installation site and performs subsequent tests.

Application

The mains filters and mains filter packages for the I/RF modules may be used both in sinusoidal current mode and block current mode.

Function

Other functions of the mains filters in combination with the I/RF modules in sinusoidal current mode are:

- Provided the mains short-circuit rating is adequate, the low-frequency mains harmonic voltages remain within the limits set down by the VDEW (German Electricity Association) requirements.
- Damping of resonance circuits (resonance circuits that are formed from the largely unknown mains impedances and impedances of the drive system),
- Designed for low leakage current
For the use of universal current-sensitive residual-current protection devices with rated fault currents ≥ 300 mA (applies to mains filter types 16 kW (22 HP) and 36 kW (49 HP)).

Mains filter package

Mains filter packages can be supplied for the I/RF modules. These mains filter packages that must be installed by the customer comprise a mains filter and an HF/HFD commutating reactor.

Note:

Radio interference suppression is required in accordance with EMC standards (product standard IEC 61800-3, EN 61800-3; VDE 0160 T 100).

In the EU this is mandatory by law. The mains filter packages consisting of commutating reactor and mains filter are required.

The filter with the commutating reactor forms a unit specially matched to the set-up converter mode of the I/RF modules. Use of other filters can lead to exceeding of limit values, resonances, overvoltages and motor or device faults.

Overvoltage limiter module



Overvoltage limiter module

The overvoltage limiter module limits the overvoltages that occur, for example, as the result of switching operations on inductive loads and on network matching transformers to acceptable values. For mains infeed modules of or above 10 kW (13.5 HP) (100 mm (3.9 in) in width), the overvoltage limiter module can be plugged into the X181 interface.

The overvoltage limiter module is used for upstream transformers or networks that do not meet IEC requirements (unstable networks).

For UL compliance of the mains infeed module, the overvoltage limiter module must be used.

An appropriate protective circuit is already integrated in the 5 kW (6.5 HP) OI module.

SIMODRIVE converter system Infeed modules

Infeed and infeed/regenerative feedback modules



Regulated 36 kW (49 HP) infeed/regenerative feedback module, internal cooling and unregulated 10 kW (13.5 HP) infeed module, internal/external cooling

The infeed and infeed/regenerative feedback modules are used to connect the drive system to the electricity supply system. The infeed modules generate the DC voltage for the DC link from the mains voltage of 3 AC 400 V $\pm 10\%$ 50/60 Hz, 3 AC 415 V $\pm 10\%$ 50/60 Hz or 3 AC 480 V $\pm 6/-10\%$ 50/60 Hz. In addition, the electronics voltages (± 24 V, ± 15 V, ± 5 V, etc.) are made available centrally over the device bus, the drive modules as well as the SINUMERIK 840D powerline or SINUMERIK 810D powerline which can be arranged in a group.

A transformer with separate windings (connected in star on the secondary side with a star point connected to the outside in the Yn circuit group) is required if the infeed modules are connected to a network that deviates from the TN form or a network without direct-current-sensitive residual-current devices. The HF/HFD commutating reactor is also required for the regulated infeed/regenerative feedback module when there are upstream transformers for setting up the voltage.

For mains voltages of 3 AC 200/220/240/440/500/575 V $\pm 10\%$ 50/60 Hz, an appropriate transformer must be selected for voltage matching.

The required cooling components, such as separate fan and/or air baffles to carry air are included in the scope of supply for modules with width ≤ 200 mm (7.9 in) for both the internally cooled and externally cooled versions. Please observe the relevant instructions for the 300 mm (11.8 in) modules.

Application

Unregulated infeed modules

- Drive systems with limited dynamic requirements
- Machines with few or short braking cycles, low braking energy
- Operation on supply systems $S_{KMains}/P_{ratedOI} \geq 30$

S_{KMains} : Short-circuit power of the network

$P_{ratedOI}$: Rated power of OI module

The unregulated infeed modules (OI modules) 5 kW (6.5 HP) and 10 kW (13.5 HP) contain the commutating reactor and a pulsed resistor that reduces the excess braking energy of the drives. If the pulsed resistor >200 W is used, a thermally conductive cover is required in order to keep the heat away from the components located above.

For the 28 kW (38 HP) OI module, the commutating reactor and the pulsed resistors must be ordered separately.

Regulated infeed/regenerative feedback modules

- Drive systems with high dynamic requirements
- Machines with frequent braking cycles and high braking energies
- Operation on supply systems from $S_{KMains}/P_{ratedOI} \geq 60 \dots 100$ (depending on the power level and operating mode)

With the help of the associated HF/HFD commutating reactor, the regulated infeed/regenerative feedback modules (I/RF modules) stabilize the DC link voltage at the constant value assigned to the mains voltage (600/625/680 V). Excess DC link energy that arises during braking is fed back into the mains through the I/RF module. This results in an optimization of the switching cabinet cooling and thus allows the operator to cut energy costs. To satisfy the EU EMC Directive, the mains filter specially matched to the step-up function must be used.

Function

Integrated functions of the line infeed modules

Functions integrated into the infeed and infeed/regenerative feedback modules reduce the external connections for the drive systems:

- Line contactor integrated, can be controlled through input terminal
- Galvanic isolation using line contactor
- The power infeed to the line contactor coil can be interrupted over an external interlock input (hardware contact).
- Automatic DC link precharging on connection to the network.

- Maintenance of the electronics power supply from the DC link energy to bring the coupled drive axes to a controlled stop if possible should the power fail (activation of this function through appropriate external wiring). A pulsed resistor module is required to ensure that braking is also possible in this operating state.
- Central monitoring of the mains voltage, DC link voltage and electronic voltages ± 24 V, ± 15 V, ± 5 V

Further functions of unregulated infeed modules

- Rectification of the line voltage for creating the DC link voltage (490 ... 680 V DC depending on the line voltage)
- Pulsed resistor control can be selected via a coding switch; for reducing excess braking energy with pulsed resistor(s)

Additional functions of regulated infeed/regenerative feedback modules

Coding switches are used to select the various operating functions for the I/RF modules:

- Regulated operation with DC link voltage of 600 V DC or 625 V DC with sinusoidal current loading of the supply system with $\lambda \geq 0.97$ (delivery status)
- Regulated control with DC link voltage of 600 V DC or 625 V DC with block current loading of the supply system.
- Direct operation on TN systems of 3 AC 480 V $\pm 6\%$ -10%; 50/60 Hz with unregulated DC link voltage of 680 V DC with regenerative feedback.



Power module, internal cooling with internal fan, module width 100 mm (3.9 in)

The power modules are designed to operate the following:

- Synchronous motors
1FT6/1FK7/1FN3
- Asynchronous motors
1PH/asynchronous low-voltage motors
- Non-Siemens motors provided that they are suitable

A wide range of single-axis and two-axis power modules with three different cooling methods are available that are graded according to current rating.

The current-related data refer to the series-preset values. At higher cycle frequencies, derating occurs (see Planning Guide for SIMODRIVE 611 converter).

Shield terminal plates and a shield connection element are available to meet EMC requirements for wiring with shielded power cables.

The device bus cable (electronics power supply) is included in the scope of supply of the power module. The drive bus cables for the digital system with SINUMERIK 840D powerline must be ordered separately.

Pulsed resistor module

The pulsed resistor module is used to reduce excess energy in the DC link, e.g. with OI or I/RF modules, that can occur as a result of mains failure or braking.

Benefits

The pulsed resistor module's universal housing design can be used in both internally cooled and externally cooled module groups.

Function

The braking power of the overall system can be increased by using the external pulsed resistor Plus and through several parallel pulsed resistor modules (max. number $n = C_{DC\ link}/500\ \mu F$). If the electronics power supply was implemented with a 3-phase AC supply system, the pulsed resistor module can be used to cause rapid discharge of the DC link. The energy is converted to heat loss in a controlled manner in the resistor.

External pulsed resistors

The external pulsed resistors are used to conduct the generated heat out of the control cabinet.

Application

- 28 kW unregulated infeed module

The external pulsed resistors are generally required for the 28 kW OI module.

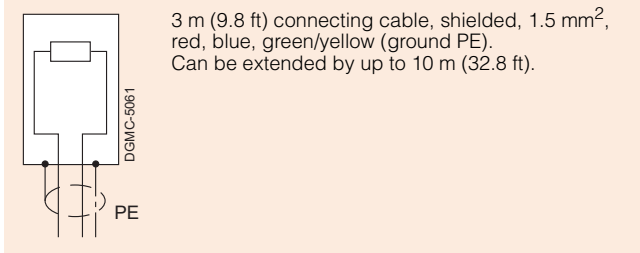
Depending on the power requirement, up to two equal pulsed resistors can be connected in the case of the 28 kW OI module. The protection function is parameterized via the connecting terminals.

- HFD commutating reactor

The external pulsed resistor Plus must be used in combination with the HFD commutating reactor.

Connection of the external pulsed resistor

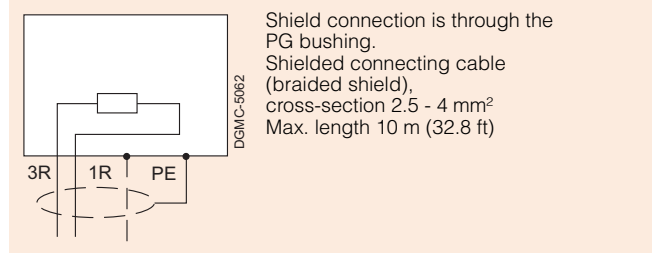
This can be installed vertically or horizontally.



Connection of an external 0.3 kW/25 kW pulsed resistor

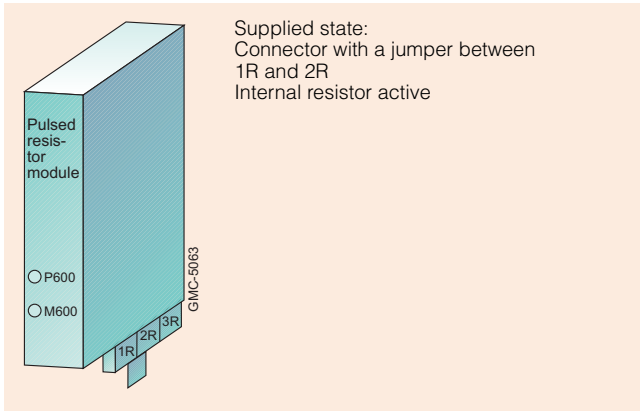
Note:

The unused cores of multi-core cables must generally be connected to protective earth (PE) at both ends.



Connection of an external pulsed resistor, 1.5 kW/25 kW

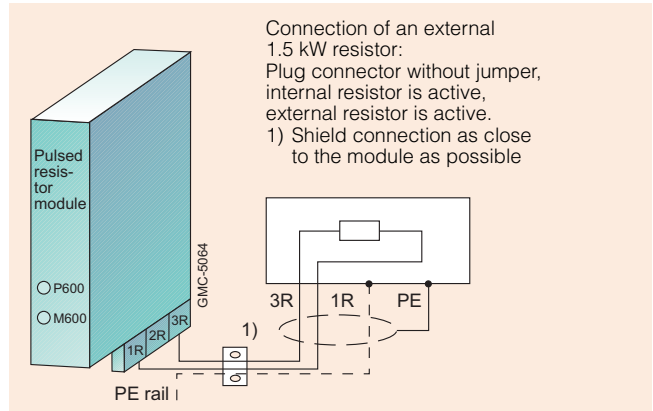
Circuit types for the pulsed resistor modules



Supplied state of the pulsed resistor module

Note:

Only one external 1.5 kW/25 kW pulsed resistor is permitted to be connected to pulsed resistor modules.



Connection of an external pulsed resistor module, 1.5 kW

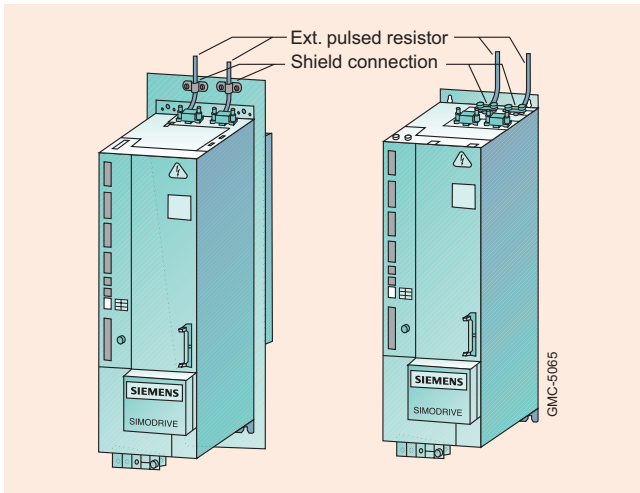
For the number of pulsed resistor modules that are connected to the same DC link: See the calculations for dimensioning the power modules and the drives.

$$N \leq C/500 \mu F$$

N Max. number of pulsed resistor modules (must always be rounded down)

C Capacitance of the DC link of the drive system in μF

Typical connections for external pulsed resistors to the 28 kW (38 HP) module



Connection of an external pulsed resistor with shield attachment

Pulsed resistor (PR)	Terminal strip TR1	Terminal strip TR2
0.3 kW/25 kW	1R 2R 3R	1R 2R 3R
2 x 0.3 kW/25 kW = 0.6 kW/50 kW	1R 2R 3R	1R 2R 3R
1.5 kW/25 kW	1R 2R 3R	1R 2R 3R
2 x 1.5 kW/25 kW = 3 kW/50 kW	1R 2R 3R	1R 2R 3R

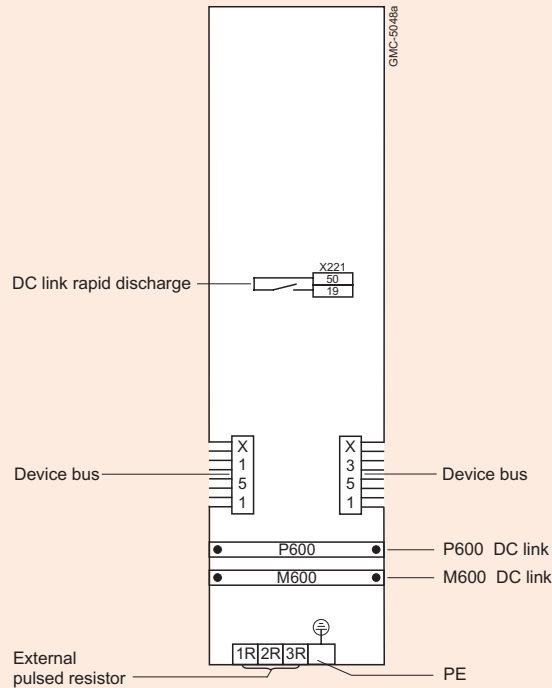
Rules for connecting an external pulsed resistor to the 28 kW (38 HP) OI module

* Jumper for coding the thermal limit characteristic.

Note:

The 28 kW (38 HP) OI module does not contain a pulsed resistor. The brake chopper is however installed.

Pulsed resistor module – Power and control terminals



Terminal No.	Designation	Function	Type ¹⁾	Typical voltage/ limit values	Max. cross-section
	X151	Device bus	I/O	Various	Ribbon cable
19	X221	Enable voltage, reference potential	O	0 V	1.5 mm ²
50	X221	Control contact for rapid discharge	I	0 V	1.5 mm ²
GND		Protective conductor	I	0 V	Bolt
P 600		DC link	I/O	+300 V	Busbar
M 600		DC link	I/O	-300 V	Busbar
1 R 2 R 3 R	TR1 TR2 ²⁾	External resistance connection	I/O	300 V	6 mm ² /4 mm ² ³⁾

1) I = Input; O = Output.

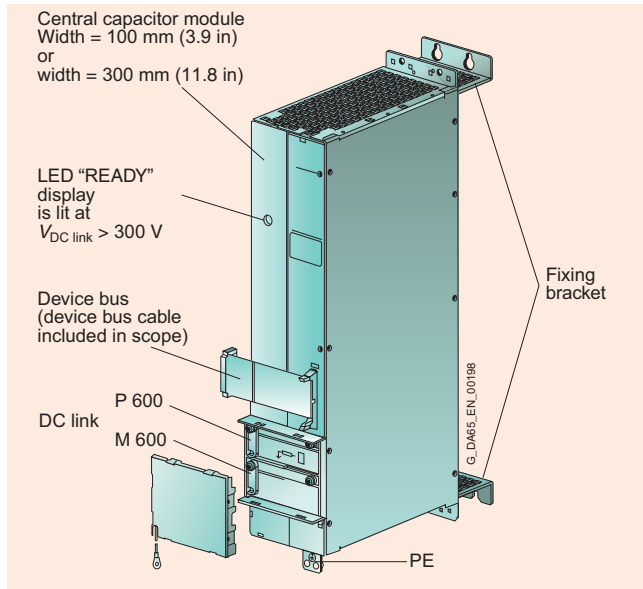
2) For 28 kW (38 HP) OI module only.

3) 6 mm² applies to cable lugs, 4 mm² for finely-stranded conductors without connecting sleeve.

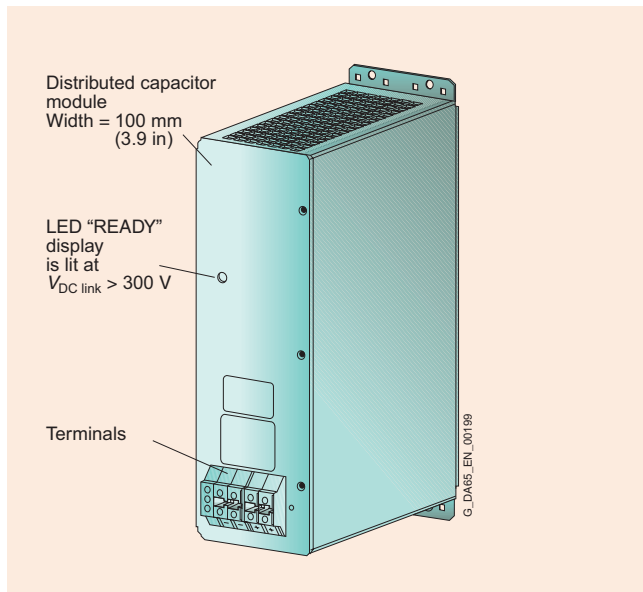
Planning guide

SIMODRIVE converter system System components

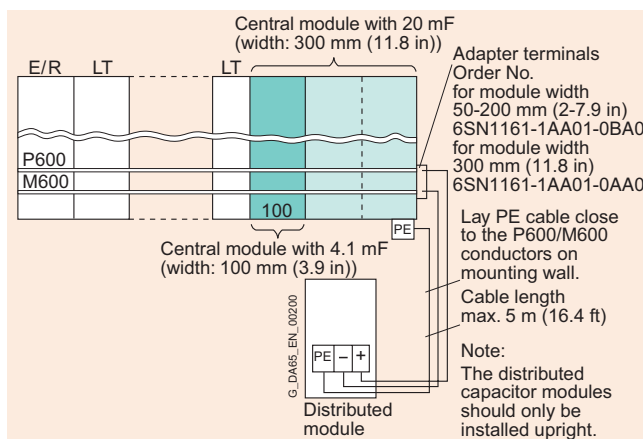
Capacitor module with 2.8 mF, 4.1 mF or 20 mF



Central capacitor module 4.1 mF



Distributed capacitor module 2.8 mF/4.1 mF



Mounting location of the capacitor modules

Description

The capacitor modules serve to increase the capacitance of the DC link. In this way, it not only compensates a short-time power failure but also allows the braking energy to be buffered.

The following module types are available:

- Modules with 2.8 mF and 4.1 mF → serve as dynamic energy memories
- Module with 20 mF → serves to bridge mains failures

The modules are available in the following versions:

- Central modules: 4.1 mF and 20 mF
SIMODRIVE housing type, integrated in system network.
- Distributed modules: 2.8 mF and 4.1 mF
new housing type, mounted decentrally in the control cabinet and is connected to the SIMODRIVE DC link over adapter terminals and cables.

The capacitor modules have a READY display that is lit at a DC link voltage of approximately 300 V. This also ensures that an internal fuse rupture can be detected. This does not provide reliable monitoring of the charging status.

The module with 2.8 mF or 4.1 mF is designed without a pre-charging circuit and because it is directly connected to the DC link, it can store dynamic energy. With these modules, the charging limits of the power supply modules must be taken into account.

Precharging for the module with 20 mF is performed over an internal precharging resistor to limit the charging current and to decouple the module from the central precharging circuit. In the case of this module, energy cannot be stored dynamically because the precharging resistor limits the charging current. In the event of a mains failure, a diode connects this capacitor battery to the DC link of the system and provides it with back-up.

Note

The capacitor modules are only permitted to be used in combination with the mains infeed of SIMODRIVE 611. Central modules are suitable for internal and external cooling.

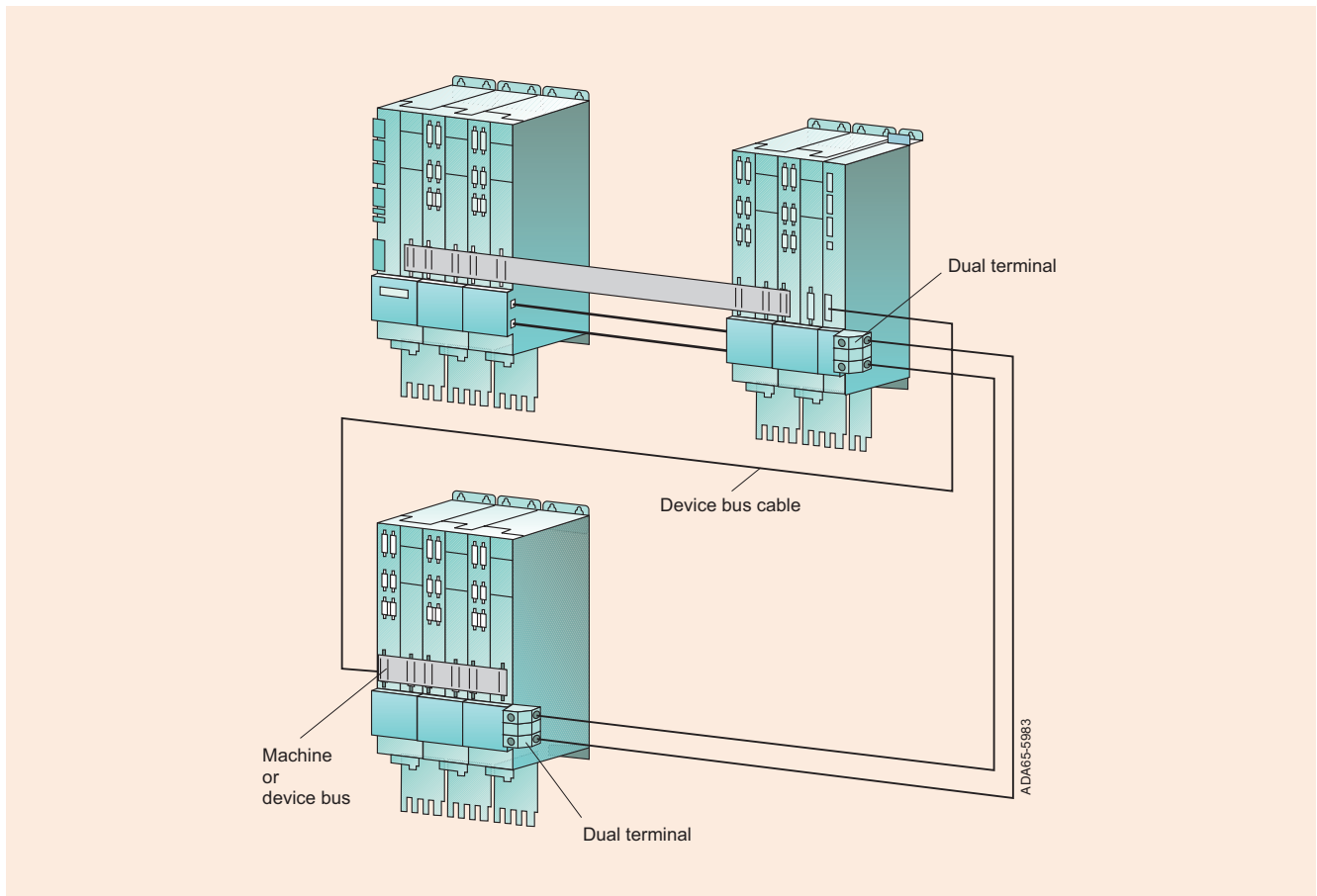
Design

- Central modules are suitable for internal and external cooling. A display signals operational readiness above a charging voltage of approx. 300 V.
- Distributed modules can be used at any position.

Capacitor module 20 mF	Max. perm. number
OI 5 kW (6.5 HP)	1
OI 10 kW (13.5 HP)/I/RF 16 kW (22 HP)	3
OI 28 kW (34 HP)/I/RF 36 ... 120 kW (48 ... 160 HP)	5

For more information about planning, see the SIMODRIVE 611 Planning Guide.

2-tier configuration

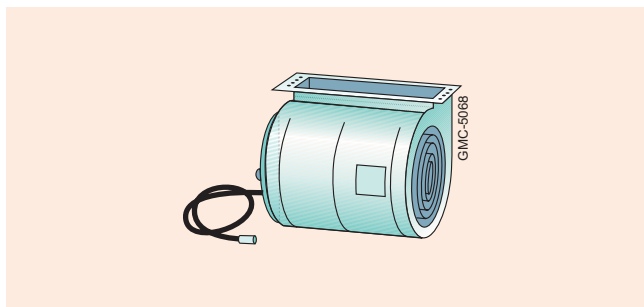


1. The longest line of the device bus measured from the bus output of the infeed module must not exceed 2.1 m (6.9 ft).
2. In the case of downstream modules of 300 mm (11.8 in) in width, the copper conductor cross-section must be 70 mm² and for smaller modules, it must be 50 mm².
The cable must be laid short-circuit proof and earth-fault proof. A bonding conductor of the same cross-section must also be laid and connected to the housings of both interconnected modules.
3. Extension of the device bus by 1.5 m (4.9 ft).

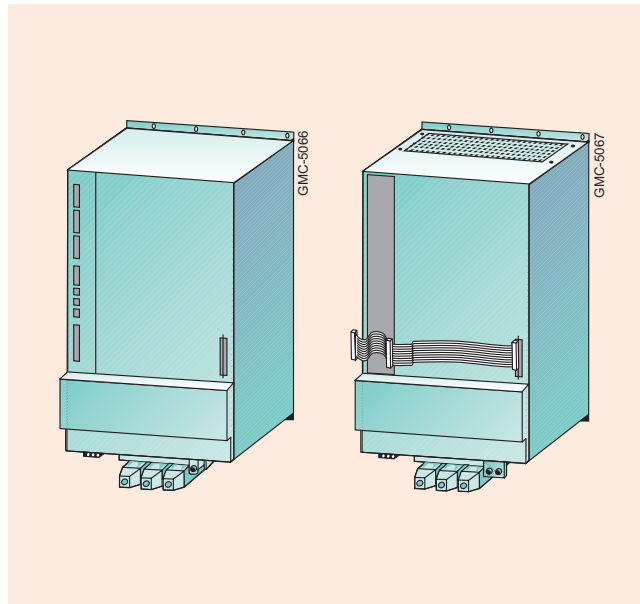
Internal cooling

In this standard solution, the power loss of the converter components from the electronic equipment and the power section is dissipated to the switching cabinet interior by means of natural cooling or separate ventilation.

For the infeed/regenerative feedback modules of 80 kW (109 HP) and 120 kW (160 HP) and for the 300 mm (11.8 in) wide power modules (with the exception of the 85 A power module), a built-on fan is required for internal cooling.



Built-on fan

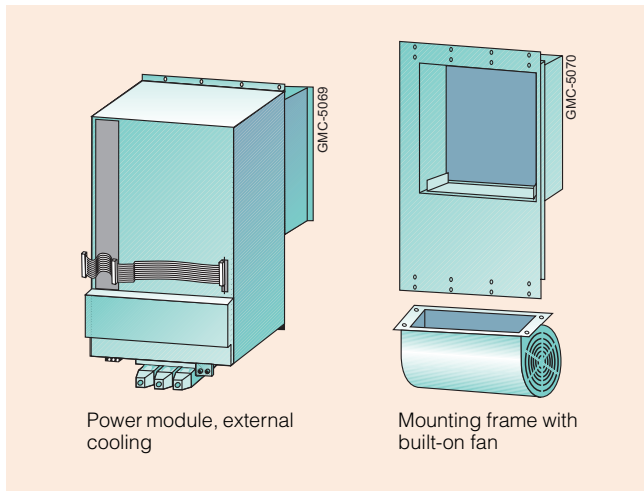


Infeed/regenerative feedback module, internal cooling (left)
Power module, internal cooling with internal fan (right)

External cooling

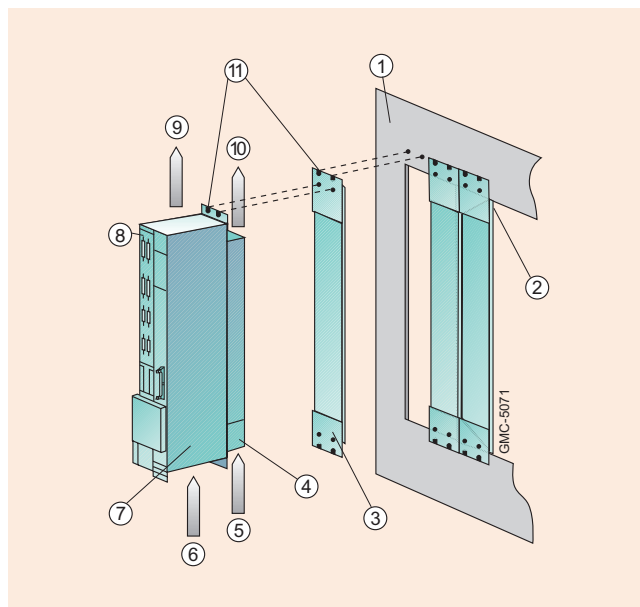
The power module heat sinks of the modules pass through the mounting surface in the control cabinet, so the power losses of the power section can be dissipated to an external separate ventilation circuit. Only the power loss of the electronic equipment remains in the control cabinet. The IP54 degree of protection can be achieved at the "mechanical interface" which is the external heat sink.

- For the order numbers for the infeed and power modules for external cooling, see the selection and ordering data.
- When a monitoring module or a pulsed resistor module is used, a blanking cover can be ordered for mounting the module and for sealing the prepared opening.



External cooling of the power module and mounting frame with built-on fan

For external cooling, the fan box is included in the scope of supply of the mounting frame for 300 mm (11.8 in) module widths. The built-on fan required must be ordered separately.



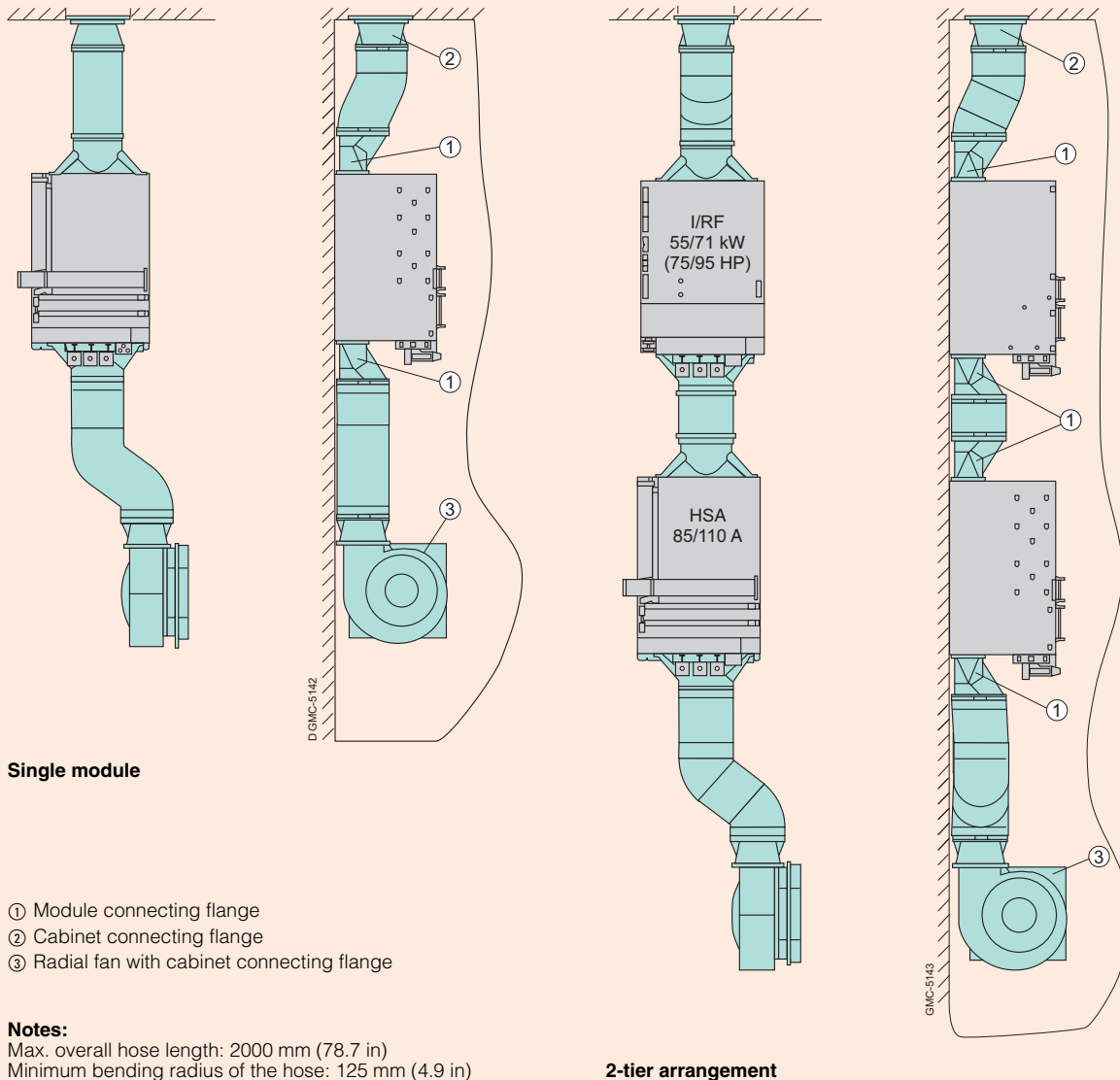
- ① Control cabinet rear panel (bare metal surface)
- ② Mounting frames sealed off from each other and from the control cabinet rear panel (e.g. with Terostat-91 from the company Teroson). The sealant must be applied all around the edge in compliance with the IP54 degree of protection.
- ③ Mounting frame
- ④ Fan box
- ⑤ Air inlet for heat sink, $T \leq 40^\circ\text{C}$ (104 °F)
- ⑥ Air inlet for electronics, $T \leq 40^\circ\text{C}$ (104 °F)
- ⑦ Power module with external cooling and heat sink seal
- ⑧ Closed-loop control
- ⑨ Air outlet for electronics
- ⑩ Air outlet for heat sink
- ⑪ M5 bolt

Hose cooling

Hose cooling is designed for control cabinets that do not have a separate ventilation channel for the power sections.

Flexible tubes are used to remove the heat arising from the power loss of the power sections from the cabinet.

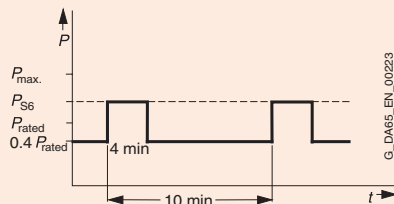
The IP54 degree of protection can be achieved at the "mechanical interface".



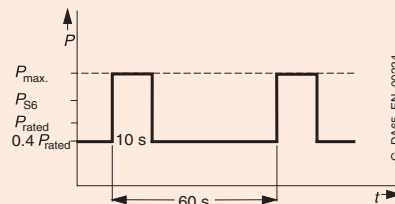
Hose cooling for 300 mm (11.8 in) modules without shield terminal plates

Overload capability

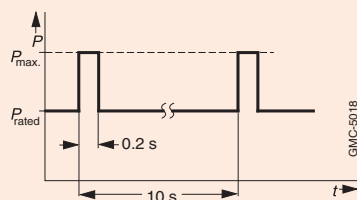
Rated load duty cycles for infeed modules



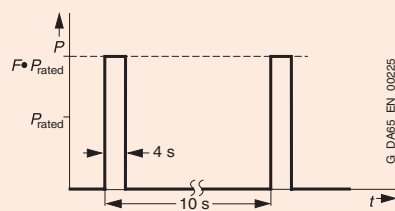
S6 duty cycle with preloading condition



Peak output duty cycle with preloading condition



Peak output duty cycle with preloading condition



For all infeed modules with $P_{rated} \leq 80$ kW (109 HP), $F = 1.6$
For $P_{rated} = 120$ kW (160 HP), $F = 1.4$

Peak output duty cycle without preloading condition

Derating as a function of the installation altitude

All of the specified outputs are valid up to an installation altitude of 1000 m (3282 ft). For an installation altitude > 1000 m (3282 ft), the specified outputs should be reduced according to the diagram. For installation altitudes > 2000 m (6563 ft), an isolating transformer must be used.

Example:

Infeed module 16 kW (22 HP)
Installation altitude 2000 m (6563 ft):
from the diagram: $X_H = 83\%$

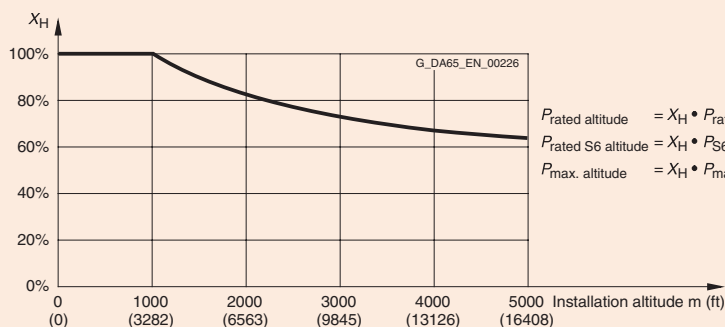
Caution:

Derating must be performed in the same manner for P_{rated} , P_{S6} and $P_{max.}$.

$$P_{rated \text{ altitude}} = X_H \cdot P_{rated \text{ 1000 m (3282 ft)}} / 100\% = 83\% \cdot 16 \text{ kW (22 HP)} / 100\% = 13.28 \text{ kW (17.8 HP)}$$

$$P_{rated \text{ S6 alt.}} = X_H \cdot P_{rated \text{ S6 1000 m (3282 ft)}} / 100\% = 83\% \cdot 21 \text{ kW (28 HP)} / 100\% = 17.43 \text{ kW (23.4 HP)}$$

$$P_{max. \text{ alt.}} = X_H \cdot P_{max. \text{ 1000 m (3282 ft)}} / 100\% = 83\% \cdot 35 \text{ kW (47 HP)} / 100\% = 29.05 \text{ kW (39 HP)}$$



$$P_{rated \text{ altitude}} = X_H \cdot P_{rated \text{ 1000 m (3282 ft)}} / 100\%$$

$$P_{rated \text{ S6 altitude}} = X_H \cdot P_{S6 \text{ 1000 m (3282 ft)}} / 100\%$$

$$P_{max. \text{ altitude}} = X_H \cdot P_{max. \text{ 1000 m (3282 ft)}} / 100\%$$

The power modules can be overloaded for a short time up to $I_{\max}$. The duration of the overload is dependent on the operational state of the module. The necessary times are obtained from the overload diagrams.

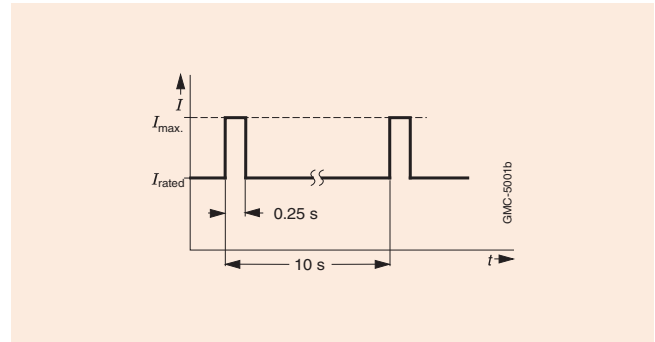
Definition of the currents

The sinusoidal currents are rms values.

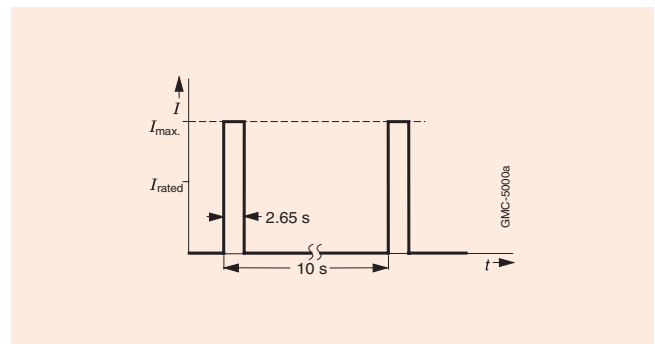
I_{rated}	Continuous current
I_{S6}	Current for max. 4 min for S6 duty cycle
$I_{\max}$	Peak current

Rated load duty cycles

Example of synchronous motors

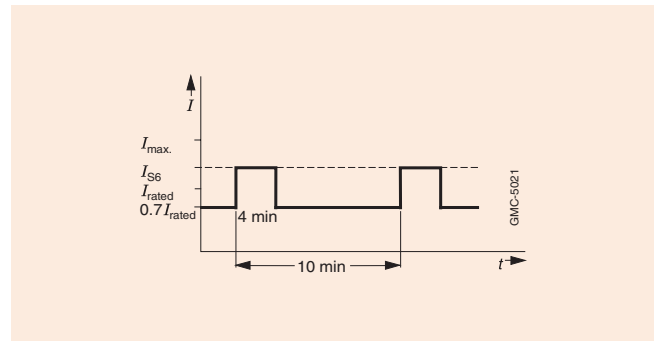


Peak current duty cycle with preloading condition

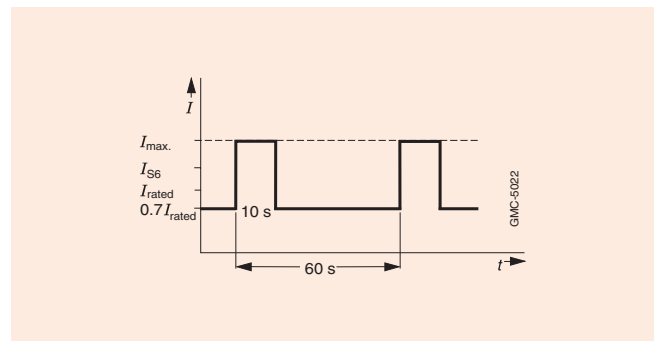


Peak current duty cycle without preloading condition

Example of asynchronous motors



S6 duty cycle with preloading condition



S6 peak current duty cycle with preloading condition

Current reduction curves

Current reduction dependent on the inverter clock frequency

X_1 = Current reduction factor, current reduction from the inverter clock frequency f_0 of the power transistors (see Technical data).

$$X = 100\% - \frac{(100\% - X_1) \cdot (f_T - f_0)}{8 \text{ kHz} - f_0}$$

X = the resultant reduction factor [in %] for I_{rated} , I_{S6} , I_{max} .

f_T = selected inverter clock frequency

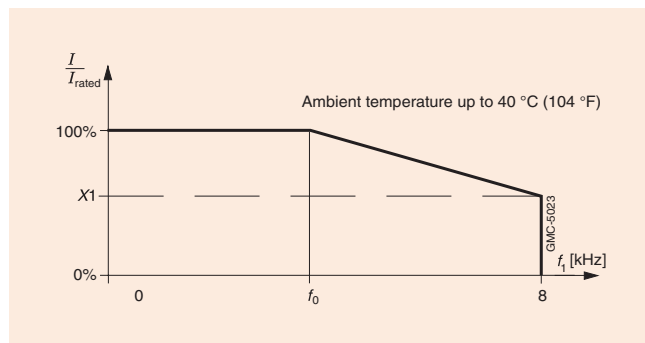
Caution:

The currents I_{rated} , I_{S6} and I_{max} must be reduced in a similar manner.

$$\rightarrow I_{\text{rated}, f_T} = X \cdot I_{\text{rated}, f_0} / 100\%$$

$$\rightarrow I_{S6, f_T} = X \cdot I_{S6, f_0} / 100\%$$

$$\rightarrow I_{\text{max}, f_T} = X \cdot I_{\text{max}, f_0} / 100\%$$



Current reduction factor X_1

Power module Order No.	$I_{\text{rated}}/I_{\text{max}}$ Asynchronous motors	Clock frequency f_0	Current reduction factors in % for asynchronous motors	$I_{\text{rated}}/I_{\text{max}}$ Synchronous motors	Clock frequency f_0	Current reduction factors in % for synchronous motors
	A	kHz		A	kHz	
6SN11 23-1AA00-OHA1	3/3	3.2	50	3/6	4	55
6SN11 23-1AA00-OAA1	5/8	3.2	50	5/10	4	55
6SN11 23-1AA00-OBA1	8/16	3.2	55	9/18	4	55
6SN11 23-1AA00-OCA1	24/32	3.2	40	18/36	4	40
6SN11 23-1AB00-OHA1	2 x 3/3	3.2	50	2 x 3/6	4	55
6SN11 23-1AB00-OAA1	2 x 5/8	3.2	50	2 x 5/10	4	55
6SN11 23-1AB00-OBA1	2 x 8/16	3.2	55	2 x 9/18	4	55
6SN11 23-1AB00-OCA1	2 x 24/32	3.2	40	2 x 18/36	4	40
6SN11 23-1AA00-ODA1	30/51	3.2	55	28/56	4	50
6SN11 23-1AA00-OLA1	45/76	3.2	55	42/64		55
6SN11 23-1AA00-OEA1	60/102	3.2	50	56/112	4	55
6SN11 23-1AA00-OFA1	85/127	3.2	55	70/140	4	55
6SN11 23-1AA00-OJA1	120/193	3.2	50	100/100		55
6SN11 23-1AA00-OKA1	200/257	3.2	50	140/210	4	50

Current reduction as a function of the installation altitude

All of the specified load currents are valid up to an installation altitude of 1000 m (3282 ft). For installation altitudes >1000 m (3282 ft), the load currents must be derated according to the diagram below.

Caution:

The currents I_{rated} , I_{S6} and I_{max} must be reduced in a similar manner.

$$\rightarrow I_{\text{rated altitude}} = X_H \cdot I_{\text{rated 1000 m (3282 ft)}} / 100\%$$

$$\rightarrow I_{S6 \text{ altitude}} = X_H \cdot I_{S6 \text{ 1000 m (3282 ft)}} / 100\%$$

$$\rightarrow I_{\text{max altitude}} = X_H \cdot I_{\text{max 1000 m (3282 ft)}} / 100\%$$

Example:

50 A power module; selected inverter clock frequency 6.3 kHz; installation altitude 2000 m (6563 ft).

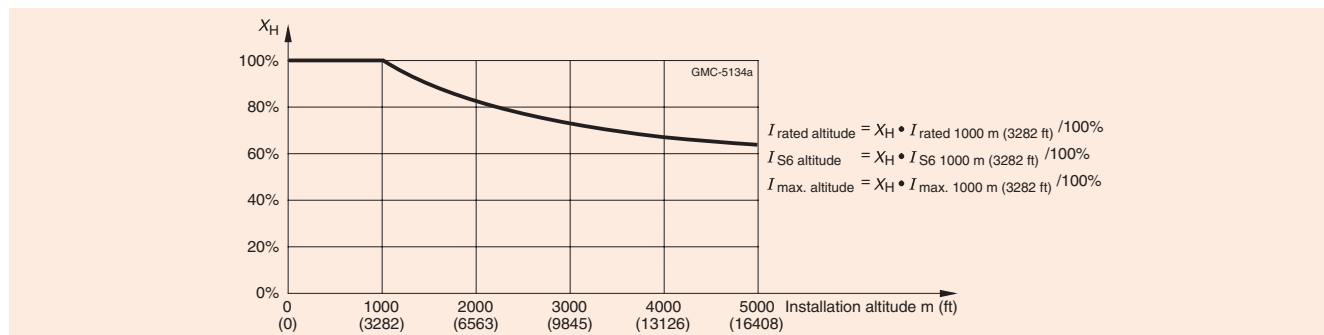
$$X = 100\% - \frac{(100\% - 40\%) \cdot (6.3 \text{ kHz} - 3.2 \text{ kHz})}{8 \text{ kHz} - 3.2 \text{ kHz}} = 61.25\%; X_H = 83\%$$

$$\rightarrow I_{\text{rated 6.3 kHz, 2000 m (6563 ft)}} = (X \cdot I_{\text{rated}, f_0} / 100\%) \cdot X_H / 100\% = 12 \text{ A}$$

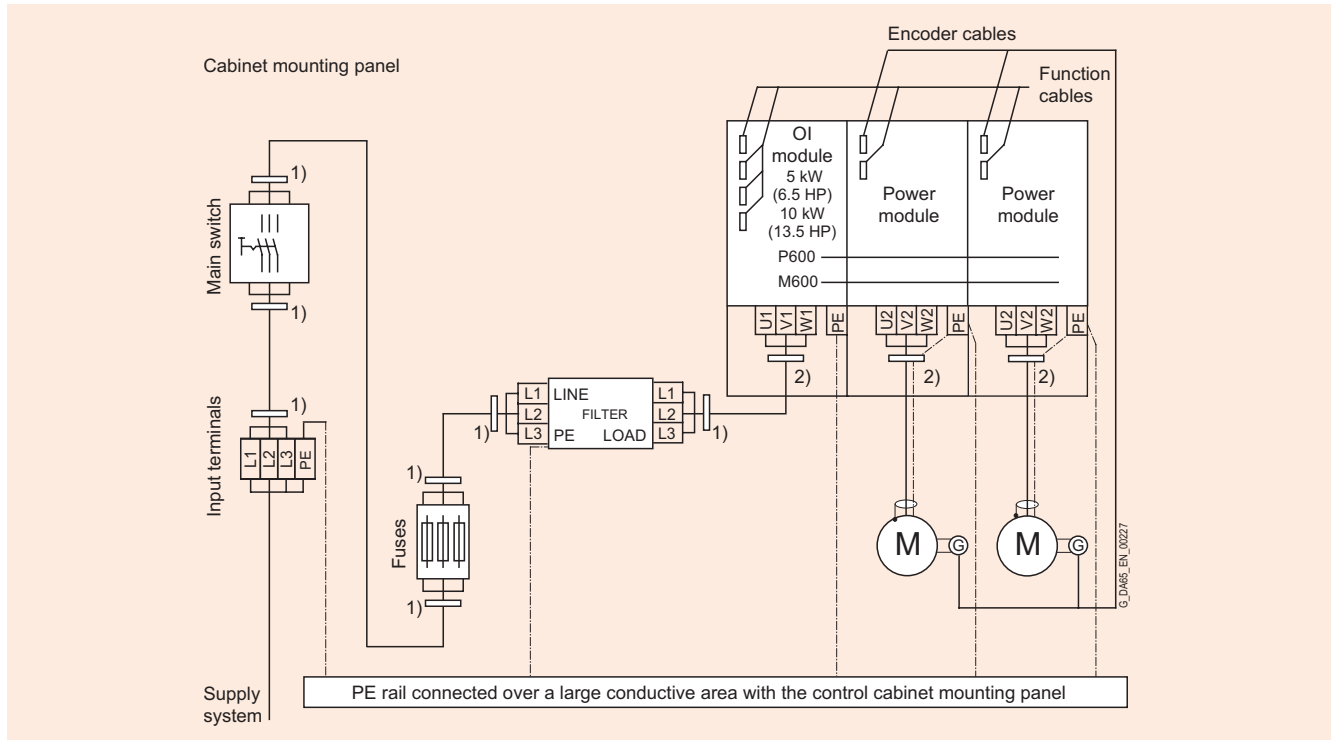
$$\rightarrow I_{S6 \text{ 6.3 kHz, 2000 m (6563 ft)}} = (X \cdot I_{S6, f_0} / 100\%) \cdot X_H / 100\% = 16 \text{ A}$$

$$\rightarrow I_{\text{max 6.3 kHz, 2000 m (6563 ft)}} = (X \cdot I_{\text{max}, f_0} / 100\%) \cdot X_H / 100\% = 16 \text{ A}$$

Permissible currents of the SIMODRIVE power modules for asynchronous motors and drive applications (various S6 load duty cycles, defined for example as S6-25% → 2.5 min/7.5 min).

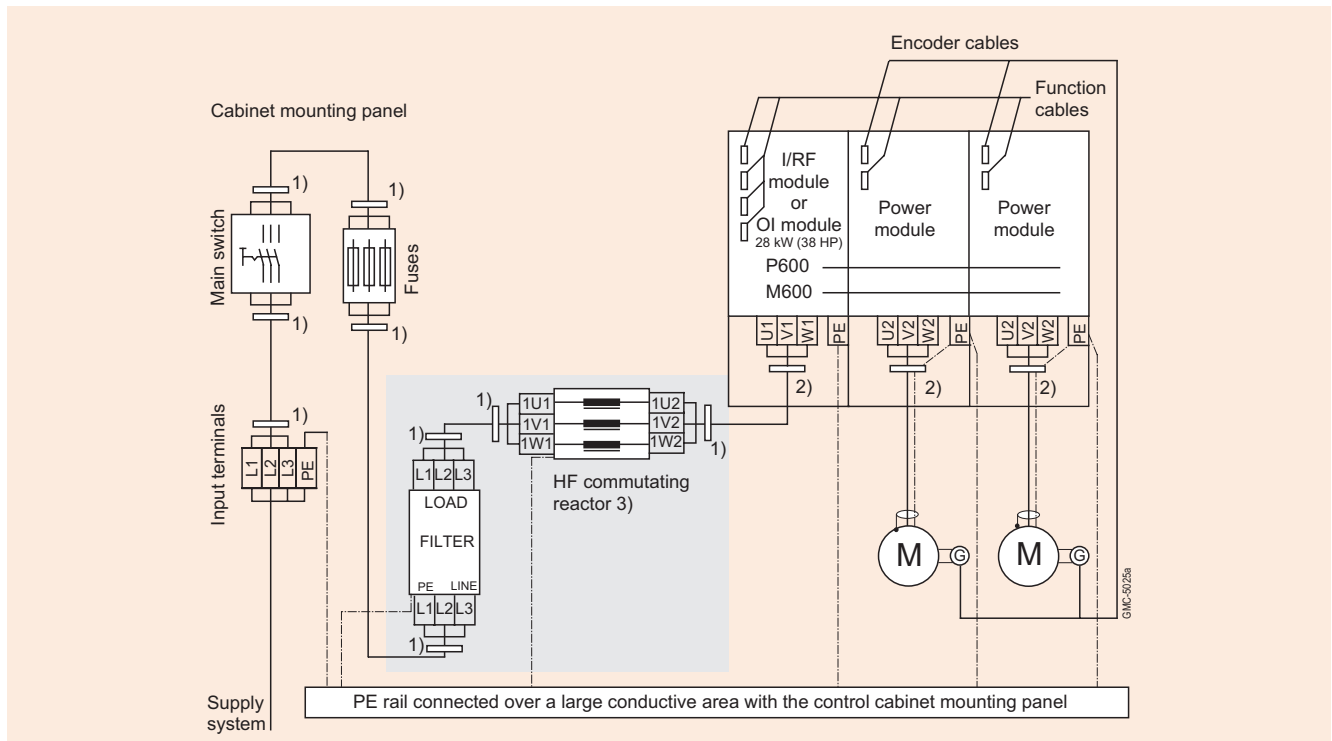


OI modules with mains filter



Connection diagram for mains filters for 5 kW (6.5 HP) to 10 kW (13.5 HP) OI modules

28 kW (38 HP) OI module and I/RF modules with mains filters

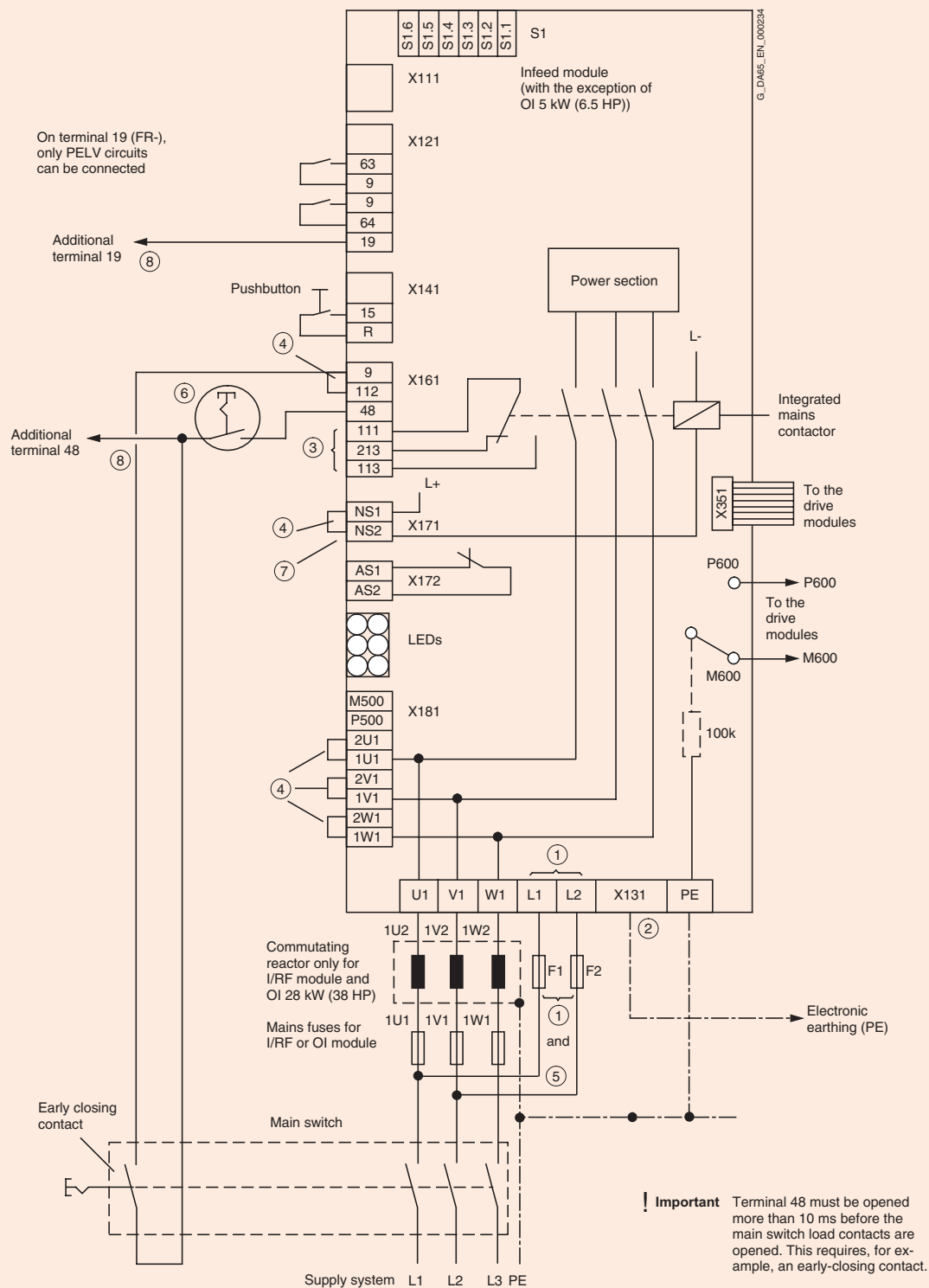


Connection diagram for mains filters for 16 kW (22 HP) to 120 kW (160 HP) I/RF modules. The connection diagram is also valid for OI 28 kW (38 HP).

- 1) Shield connection, connected to the cabinet mounting unit over the largest possible surface area.
- 2) Shield connection to the module-specific connection plate.

- 3) When routing cables in the cabinet, a clearance of >100 mm (3.9 in) must be maintained around the HF reactor.

Infeed module - Standard circuit connections



Legend on Page 8/37.

SIMODRIVE converter system Overview of the circuit configurations

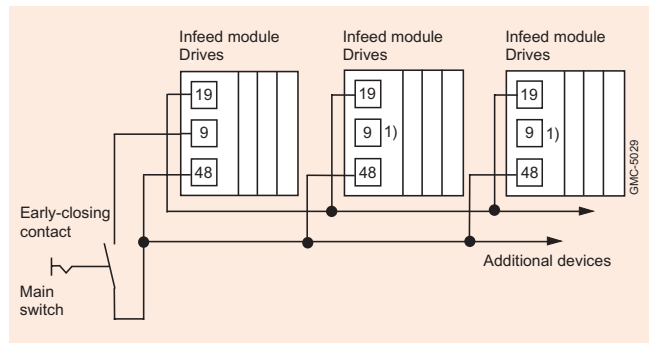
Legend for Figure on Page 8/36

- ① Terminals L1, L2 are only available for the 80 kW (109 HP)/104 kW (139 HP) and 120 kW (160 HP)/156 kW (209 HP) I/RF modules.
In this case, the rated fuse current $I_{\text{rated fuse}}$ must be greater than 4 A, Version: gL
- ② For coupling to a numerical control, X131 must be connected with the NC reference potential. This cable is routed in parallel to the speed setpoint cable.
- ③ Signaling contact of the internal line contactor
Terminals 111/113: NO
Terminals 111/213: NC
Terminals 111/213: Positively driven to the load contacts. See Infeed Modules (NE).
- ④ Jumpers inserted in the equipment when supplied.

Caution

- ⑤ With the 80 kW (109 HP)/104 kW (139 kHP) or 120 kW (160 HP)/156 kW (209 HP) I/RF modules, if the mains voltage on terminals L1 and L2 fails or fuses F1 and F2 trip, the pulses of the I/RF module are inhibited and the integral line contactor opens. This is indicated by the supply failure LED, the Ready relay and via the signaling contacts of the contactor. In this case, before the built-in line contactor is re-installed, terminal 48 must be disconnected from the supply and reconnected after ≥ 1 s or the complete drive must be switched off and on again.
- ⑥ When an 80 kW (109 HP)/104 kW (139 HP) module or a 120 kW (160 HP)/156 kW (209 HP) I/RF module is used, the jumper connected between terminals 9 and 48 must be removed and (due to Point 5 above), a switch must be used. The switch is not necessary when the drive converter is switched off and on again via the main switch (power switch).

- ⑦ Max. cable length for 1.5 mm² cross-section: 50 m (164 ft) (2-conductor cable). This should be linearly decreased for lower cross-sections.
- ⑧ A maximum of 6 x 48 terminals can be connected in parallel to shut down up to 6 infeed modules (NE) using a leading contact of the main switch. Max. cable length for 1.5 mm² cross-section: 150 m (492 ft) (2-conductor cable). This should be linearly decreased for lower cross-sections.



Connection diagram

If more than 6 infeed modules (NE) are to be connected to a main switch, then an external 24 V supply must be provided. Current input at terminal 48 = 35 mA; the minimum input voltage of terminal 48 must be observed (13 V). Additional loads connected to the external 24 V power supply must be provided with an overvoltage limiting circuit (e.g. free-wheeling diode).

1) Terminal 9 is not permitted to be connected to terminal 48.

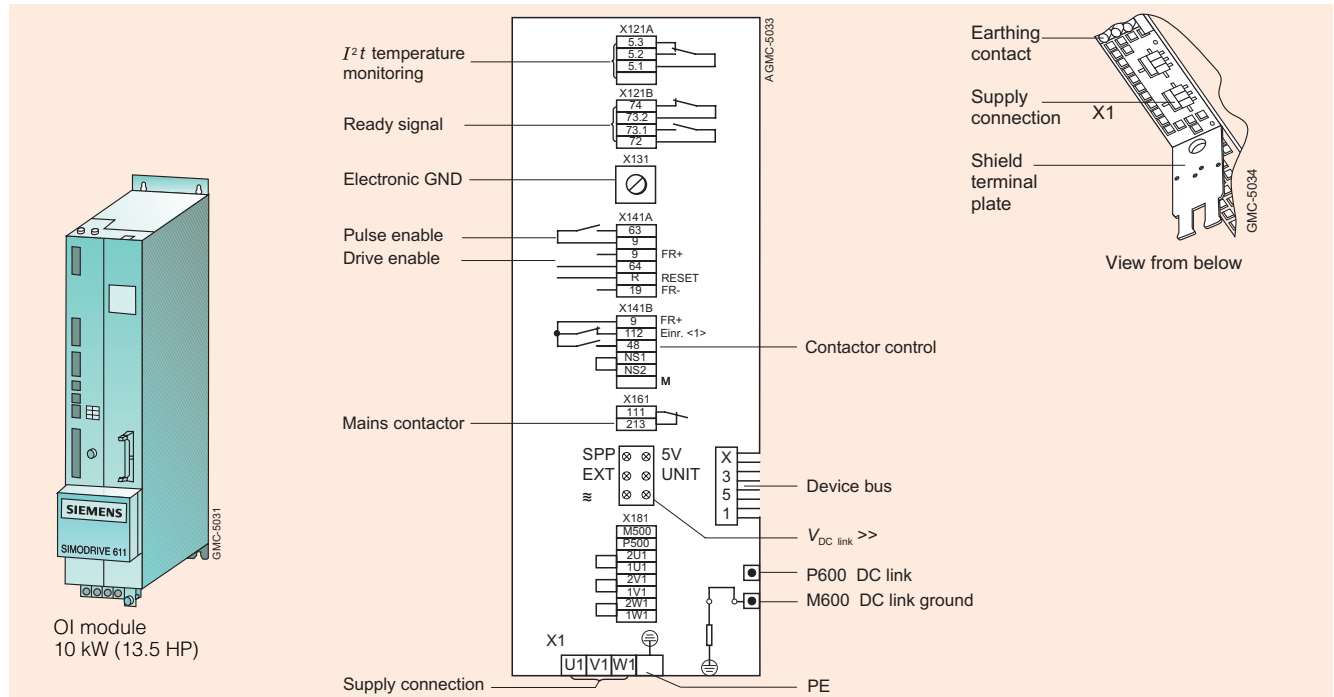
SIMODRIVE 611 universal and POSMO

Planning guide

SIMODRIVE converter system

Unit design, power terminals and control terminals

OI module 5 kW (6.5 HP)/10 kW (13.5 HP)



Terminal No.	Designation	Function	Type ¹⁾	Typical voltage limit values	Max. cross-section ⁶⁾	Note
U1 V1 W1	X1	Supply connection	I	3 AC 480 V	4 mm² finely-stranded without connector sleeve, 6 mm² with cable lug	For the 5 kW (6.5 HP) OI module, the DC link is precharged through two phases. If a DC link voltage is not established, in spite of the fact that all of the enable signals are present (there is no ready signal), it must be checked that all of the three phases are connected to terminals U1, V1, W1. Caution: Terminals 7, 45, 44 and 10 are not available for the 5 kW (6.5 HP)/10 kW (13.5 HP) OI module.
GND (PE)	X131	Protective conductor	I	0 V	M5 thread	
	X351	Electronics GND	I	0 V	M4 thread	
		Device bus	I/O	Various	34-core ribbon cable	
		Grounding bar ³⁾	I/O	-300 V	Busbar	
P600 M600		DC link	I/O	+300 V -300 V	Busbar	1) I = Input; O = Output; NC = NC contact; NO = NO contact
M500	X181	DC link power supply	I	-300 V	1.5 mm²	2) Terminal 19 is the reference terminal (connected in the module via 10 kΩ to general reference ground X131). It is not permitted to connect terminal 15 to PE or to terminal 19. Furthermore, no external voltage sources are permitted to be connected to terminal 15. Terminal 19 may be connected to X131. The terminal may only be used to enable the associated drive group.
P500	X181	DC link power supply	I	+300 V	1.5 mm²	
1U1	X181	Output L1	O	3 AC 400 V	1.5 mm²	
2U1	X181	Input L1	I	3 AC 400 V	1.5 mm²	
1V1	X181	Output L2	O	3 AC 400 V	1.5 mm²	3) The grounding clip is used to ground the DC link GND rail through 100 kΩ (it is recommended that this is inserted; if a high voltage test is to be performed in the system, the grounding clip should be opened).
2V1	X181	Input L2	I	3 AC 400 V	1.5 mm²	
1W1	X181	Output L3	O	3 AC 400 V	1.5 mm²	
2W1	X181	Input L3	I	3 AC 400 V	1.5 mm²	
5.3 5.2 5.1 nc	X121A	Relay contact Group signal I²t/Motor temp.	NC	DC 50 V/0.5 A/12 VA max	1.5 mm²	4) Max. current load of terminals 9 to 19 ≤ 1 A. Important: Terminals 7, 45, 44 and 10 are not available for the 5 kW (6.5 HP)/10 kW (13.5 HP) OI module.
	X121A		NO	DC 5 V/3 mA min	1.5 mm²	
	X121A		I		1.5 mm²	
	X121A		I		1.5 mm²	
74 73.2 73.1 72	X121B	Relay signal Ready/Fault	NC	1 AC 250 V/DC 50 V/2 A max	1.5 mm²	5) RESET = Resets the fault memory, edge triggered for the complete drive system (terminal "R" → terminal 19 = RESET).
	X121B		I	DC 5 V/3 mA min	1.5 mm²	
	X121B		I		1.5 mm²	
	X121B		NO		1.5 mm²	
63 ²⁾ 9 ²⁾ 9 ²⁾ 9 ²⁾ 64 ²⁾ R ⁵⁾ 19	X141A	Pulse enable	I	+13 V ... 30 V/R _E = 1.5 kΩ	1.5 mm²	6) For UL certification: only use copper cables which are designed for an operating temperature of ≥ 60 °C (140 °F).
	X141A	FR+	O	+24 V	1.5 mm²	
	X141A	FR+	O	+24 V	1.5 mm²	
	X141A	Drive enable	I	+13 V ... 30 V/R _E = 1.5 kΩ	1.5 mm²	
	X141A	RESET	I	Terminal 19/R _E = 10 kΩ	1.5 mm²	
	X141A	FR-, reference ground	O		1.5 mm²	
111 213	X161	Signaling contact	I	1 AC 250 V/DC 50 V/2 A	1.5 mm²	
	X161	Line contactor	NC	DC 17 V/3 mA min	1.5 mm²	
9 ²⁾ 112 48	X141B	FR+	O	+24 V	1.5 mm²	
	X141B	Setting-up/standard mode	I	+13 V ... 30 V/R _E = 1.5 kΩ	1.5 mm²	
	X141B	Contactor control	I	+13 V ... 30 V/R _E = 1.5 kΩ	1.5 mm²	
NS1	X141B	Coil contact for mains,	O	+24 V	1.5 mm²	
NS2	X141B	precharging contactor	I	0/+24 V	1.5 mm²	
15	X141B	M	O	0 V	1.5 mm²	

Terminal No.	Designation	Function	Type ¹⁾	Typical voltage limit values	Max. cross-section ²⁾	Terminals available in ³⁾
U1 V1 W1		Supply connection	I	3 AC 400 V 3 AC 415 V 3 AC 480 V	see Part 3	I/RF, OI
L1 L2		Contactor supply	I I	2 AC 400 V, directly on supply L1, L2, L3	16 mm ² /10 mm ² ⁴⁾ 16 mm ² /10 mm ² ⁴⁾	I/RF 80 kW (109 HP)/ 104 kW (140 HP), 120 kW (160 HP)/ 156 kW (209 HP)
PE P600 M600		Protective conductor DC link DC link	I I/O I/O	0 V +300 V -300 V	Bolt Busbar Busbar	I/RF, OI, mon.
		Grounding clip ⁵⁾	I/O	-300 V	Busbar	I/RF, OI
P600 M600		DC link DC link	I/O I/O	+300 V -300 V	16 mm ² /10 mm ² ⁴⁾ 16 mm ² /10 mm ² ⁴⁾	Monitor
1R, 2R, 3R	TR1, TR2 ⁷⁾	External resistor connection	I/O	300 V	6 mm ² /4 mm ² ⁴⁾	OI 28 kW (38 HP)
	X131	Electronics GND	I/O	0 V	16 mm ² /10 mm ² ⁴⁾	I/RF, OI, mon.
	X151	Device bus	I/O	Various	Ribbon cable	I/RF, OI, mon.
M500 P500	X181 X181	DC link power supply DC link power supply	I I	DC -300 V DC +300 V	1.5 mm ² 1.5 mm ²	I/RF, OI, mon.
1U1	X181	Output L1	O	3 AC 400 V	1.5 mm ²	
2U1	X181	Input L1	I	3 AC 400 V	1.5 mm ²	
1V1	X181	Output L2	O	3 AC 400 V	1.5 mm ²	
2V1	X181	Input L2	I	3 AC 400 V	1.5 mm ²	
1W1	X181	Output L3	O	3 AC 400 V	1.5 mm ²	
2W1	X181	Input L3	I	3 AC 400 V	1.5 mm ²	
7 45 44 10 15 ⁸⁾ R ⁹⁾	X141 X141 X141 X141 X141 X141	P24 P15 N15 N24 M RESET	O O O O O I	+20.4 ... 28.8 V/50 mA +15 V/10 mA -15 V/10 mA -20.4 ... 28.8 V/50 mA 0 V Terminal 15/R _E = 10 kΩ	1.5 mm ² 1.5 mm ² 1.5 mm ² 1.5 mm ² 1.5 mm ² 1.5 mm ²	I/RF, OI, mon.
5.3 5.2 5.1 63 ⁸⁾ 9 ⁸⁾ ¹⁰⁾ 9 ⁸⁾ ¹⁰⁾ 64 ⁸⁾ 19	X121 X121 X121 X121 X121 X121 X121 X121	Relay contact Group signal I ² t/Motor temp. Pulse enable Enable voltage Enable voltage Drive enable Enable voltage, reference potential	NC NO I I O O I I	DC 50 V/0.5 A/12 VA max DC 5 V/3 mA min +13 V ... 30 V/R _E = 1.5 kΩ +24 V +24 V +13 V ... 30 V/R _E = 1.5 kΩ 0 V	1.5 mm ² 1.5 mm ² 1.5 mm ² 1.5 mm ² 1.5 mm ² 1.5 mm ² 1.5 mm ² 1.5 mm ²	I/RF, OI, mon.
74 nc 73.2 73.1 nc 72	X111 X111 X111 X111 X111 X111	Relay contact Ready to brake signal	NC I I NO	1 AC 250 V/DC 50 V/2 A max DC 5 V/3 mA min	1.5 mm ² 1.5 mm ² 1.5 mm ² 1.5 mm ² 1.5 mm ² 1.5 mm ²	I/RF, OI, mon.
9 ⁸⁾ ¹⁰⁾ 112 ⁸⁾	X161 X161	Enable voltage Setting-up mode/normal mode	O I	+24 V +21 V ... 30 V/R _E = 1.5 kΩ	1.5 mm ² 1.5 mm ²	I/RF, OI, mon.
48 ⁸⁾ 111 ¹¹⁾ 213 ¹¹⁾ 113 ¹¹⁾	X161 X161 X161 X161	Contactor control Signaling contacts Mains contactor	I I NC NO	+13 V ... 30 V/R _E = 1.5 kΩ +30 V/1 A (111-113) 1 AC 250 V/DC 50 V/2 A max DC 17 V/3 mA min	1.5 mm ² 1.5 mm ² 1.5 mm ² 1.5 mm ²	I/RF, OI
AS1 AS2	X172 X172	Signaling contact Start inhibit (Terminal 112)	I NC	AC 250 V/1 A/DC 50 V/2 A max DC 5 V/10 mA min	1.5 mm ² 1.5 mm ²	I/RF
NS1 NS2	X171 X171	Coil contact for mains, precharging contactor	O I	+24 V	1.5 mm ² 1.5 mm ²	I/RF, OI

1) I = Input; O = Output; NC = NC contact; NO = NO contact;
(for signal NO = High; NC = Low).

2) For UL certification: only use copper cables which are designed for an operating temperature of $\geq 60^\circ\text{C}$ (140°F).

3) I/RF = Infeed/regenerative feedback module;
OI = Open-loop infeed;
mon. = Monitoring module

4) The 1st number is valid for cable lugs. The 2nd number is valid for finely-stranded conductors without connector sleeve.

5) The grounding clip is used to ground the DC link GND rail through 100 kΩ (it is recommended that this is inserted; if a high voltage test is to be performed in the system, the grounding clip should be opened).

6) Max. permissible input power $P_{\text{max}} \leq 43 \text{ kW}$,
max. permissible current loading $I_{\text{max}} \leq 72 \text{ A}$.

7) For 28 kW (38 HP) OI module only.

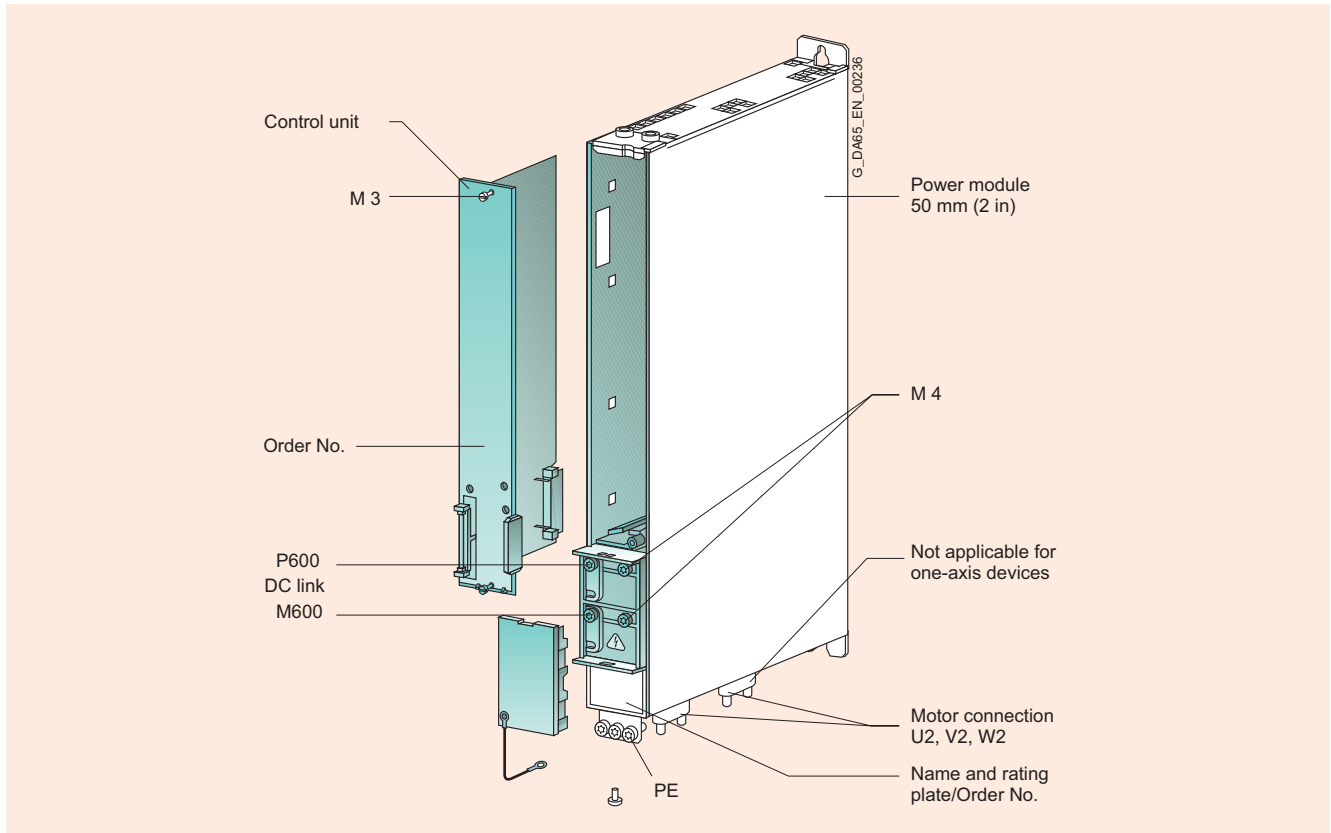
8) Terminal 19 is the reference ground (connected inside the module with 10 kΩ to the general reference ground X131/terminal 15). Terminal 15 is not permitted to be connected to PE or terminal 19. Furthermore, no external voltage sources are permitted to be connected to terminal 15. Terminal 19 may be connected to X131. The terminal may only be used to enable the associated drive group.

9) RESET = Resets the fault memory, edge triggered for the complete drive system (terminal "R" → terminal 15 = RESET).

10) Maximum current load of terminal 9 with respect to terminal 19: 0.5 A.

11) Terminals 111 to 213, positively-driven NC contact (for I/RF 16 kW (22 HP) and OI 10 kW (13.5 HP) only from Order No. 6SN11 4□-1□□01-0□□□), terminals 111 to 113 NO contacts, not positively driven.

Power module (single-axis and two-axis)

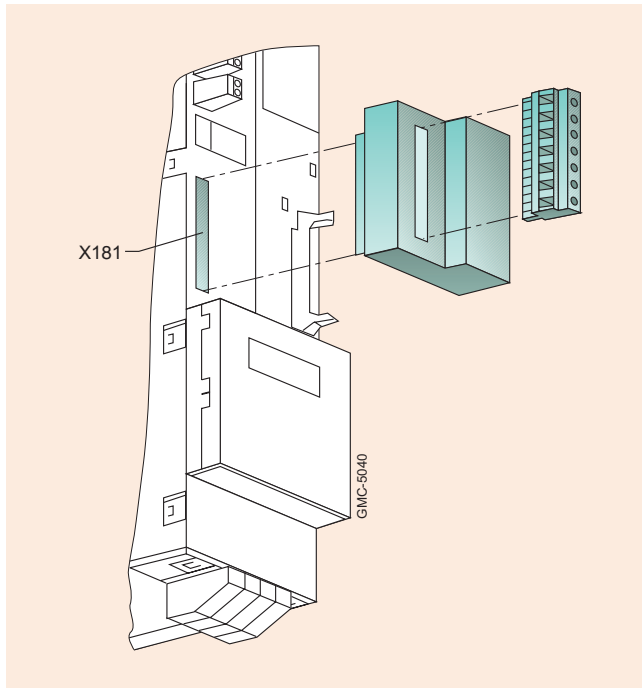


50 mm power module

Terminal No.	Designation	Function	Type ¹⁾	Typ. voltage limit values	Mounting
Single-axis version					
U2 V2 W2	A1	Motor connection	O	3 AC 430 V	Max. cross-section see Part 7
PE	⊕	Protective conductor Protective conductor	I I	0 V 0 V	2 screws
P600 M600		DC link DC link	I/O I/O	+300 V -300 V	Busbar Busbar
Two-axis version					
U2 V2 W2	A1	Motor connection for axis 1	O	3 AC 430 V	Max. cross-section see Part 7
U2 V2 W2	A2	Motor connection for axis 2	O	3 AC 430 V	Max. cross-section see Part 7
PE (GND)		Protective conductor Protective conductor	I I	0 V 0 V	3 screws
P600 M600		DC link DC link	I/O I/O	+300 V -300 V	Busbar Busbar

1) O = Output; I = Input

SIMODRIVE 611 overvoltage limiter module (surge arrestor)



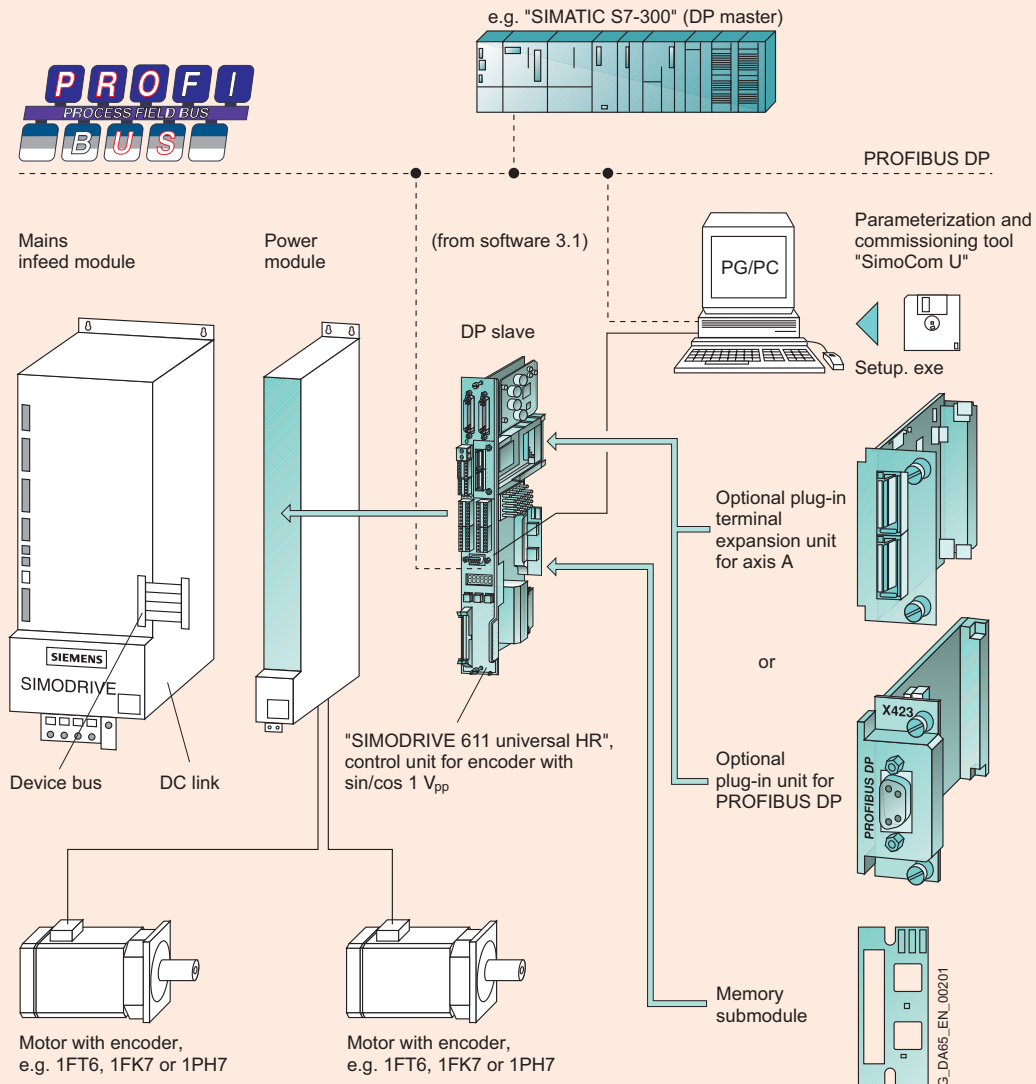
Overvoltage limiter module

The overvoltage limiter module limits the overvoltages that occur, for example, as the result of switching operations on inductive loads and on network matching transformers to values acceptable for the infeed modules above 10 kW (13.5 HP) (width 100 mm (3.9 in)). It is inserted at interface X181.

The overvoltage limiter module is used for upstream transformers or networks that do not meet IEC requirements. For UL compliance of the mains infeed module, the overvoltage limiter module must be used.

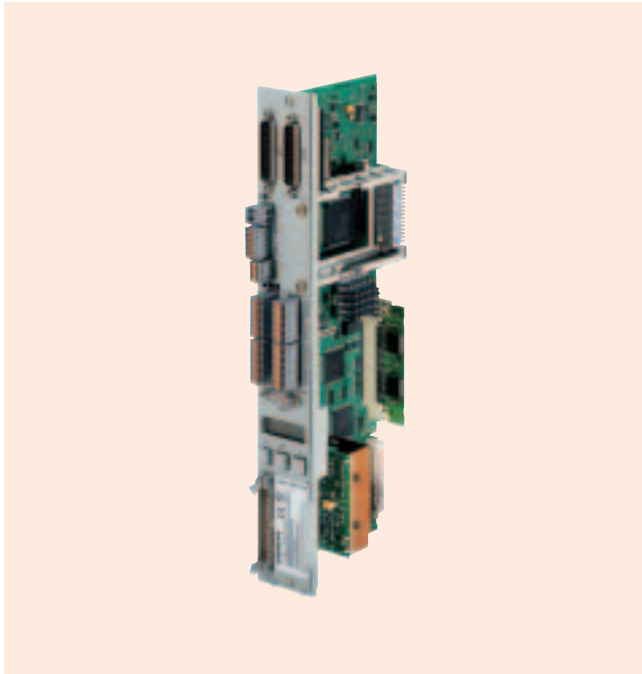
An appropriate protective circuit is integrated as standard in the 5 kW (6.5 HP) OI module.

System overview



System overview

Digital control unit with analog setpoint interface or PROFIBUS DP SIMODRIVE 611 universal HR



SIMODRIVE 611 universal HR control unit

Overview

SIMODRIVE 611 universal HR are control units with analog speed setpoint interface and optional PROFIBUS DP interface as well as a version with positioning functionality for motor frequencies up to 1400 Hz for:

- Synchronous motors: 1FT6/1FK7/1FN3
- Asynchronous motors: 1PH and 1LA with/without encoder
- Non-Siemens motors suitable for converter operation

Both single-axis and two-axis control units can be ordered with options. The two-axis versions can also be used in the single-axis power modules.

The following encoder evaluations are available for various control units:

- Resolver:
Resolution switchable 14/12 bits
1 to 6 pairs of poles; operating frequency f_G max. up to 108/432 Hz
internal pulse multiplication factor 4096/16348 x number of pole pairs
- Incremental encoder with sin/cos $1 V_{pp}$ signals up to 65535 pulses, f_G max. up to 350 kHz,
internal pulse multiplication factor 2048 x pulses
- Absolute encoder with EnDat interface, same as sin/cos $1 V_{pp}$ encoder, plus absolute position via EnDat protocol.
- TTL encoder for asynchronous motors up to 420 kHz (no WSG output)

Variants:

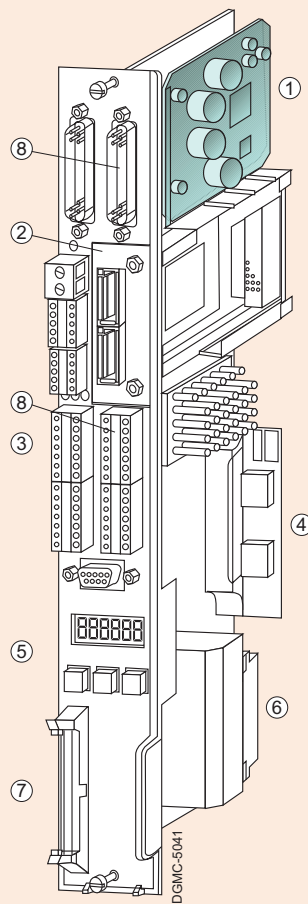
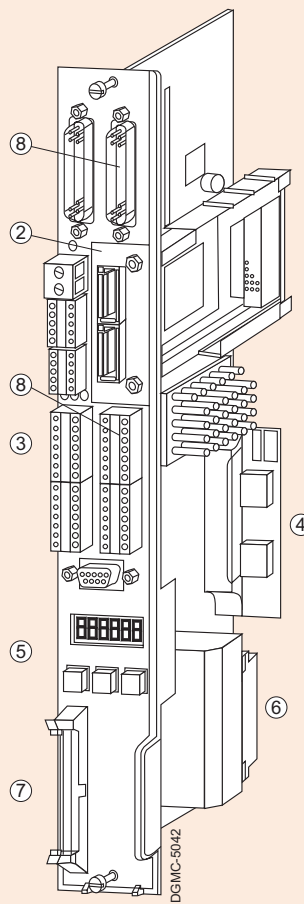
The drive can be started up either via a 7-segment display and keyboard on the front of the module or via the "SimoCom U" commissioning tool for PCs under Windows 98/NT/2000/ME/XP. SimoCom U is also integrated in ADDM from version 5.0 onwards (see A&D DataManagement) and in Drive ES Basic from version 5.1 onwards.

Drive ES can be used to call the commissioning tool via PROFIBUS from the SIMATIC Manager, permitting data saving in the SIMATIC Manager (see Drive ES).

Function

Functions (for each axis, selection):

- 2 analog inputs (14 bit)/outputs (8 bit) $\pm 10 V$
- 4 digital inputs/outputs, freely parameterizable
- Incremental shaft-angle encoder interface (WSG), selectable:
 - Output: incremental square wave or step signals, simulation of the motor encoder through differential quadrature signals A, B, R in accordance with RS 485, RS 422 (TTL).
For sin/cos $1 V_{pp}$ encoders and absolute encoders with EnDat: Pulses = sin/cos per rotation
No. of pulses multipliable 2:1, 1:1, 1:2, 1:4, 1:8
With resolver: 1024 pulses/pole pair
No. of pulses with 12 bit setting multipliable with 1:1, 1:2, 1:4, 1:8, 1:16, 1:32
No. of pulses with 14 bit setting multipliable with 4:1, 2:1, 1:1, 1:2, 1:4, 1:8
 - Input: incremental step setpoint X_{setp}
Quadrature signals, tracks A, B; up to 2.5 MHz
Pulse/directional signal up to 5 MHz
Forward-reverse signal up to 5 MHz
- For the two-axis module, a direct, second measuring system for axis A can be connected via axis B (the module can then only be operated as a single-axis module).
 - Resolver, any number of pole pairs
 - Incremental encoder sin/cos $1 V_{pp}$, 0 to 8388607 pulses
 - Absolute encoder with EnDat interface
- RS 232/RS 485 interface (TTL) for connecting PC/PG for commissioning with the SimoCom U commissioning tool
- Storing of up to 4 motor data records per axis, star/delta changeover possible
- Positioning for linear, modulo, rotary axis, jerk limitation; commands: POSITION, ENDLESS POS/NEG, WAIT, SET/RESET, GOTO, LIMIT STOP, LINK,
Block advance with: END, CONTINUE ON-THE-FLY, CONTINUE WITH HOLD, CONTINUE EXTERNAL
64 data records per axis can be stored as parameters. All records can be called up and edited via the PROFIBUS DP option. Positioning data can be directly transferred into an executing record (HMI).
- The records can also be called BCD-coded using the "Terminal expansion" option module.

Control unit for sin/cos 1 V_{pp} encoder

Control unit for resolver

- ① Module for encoder evaluation
- ② Slot for
 - Optional terminal expansion module or
 - Optional PROFIBUS DP module
- ③ Interfaces
 - Terminals
 - Switches
- ④ Memory module
 - Firmware
 - User data
- ⑤ Display and control unit
- ⑥ Pulse interface
- ⑦ Device bus
- ⑧ No function in single-axis version

Control unit for two-axis version

Start inhibit in the drive modules

Application

The "start inhibit" function is provided in the SIMODRIVE 611 drive modules.

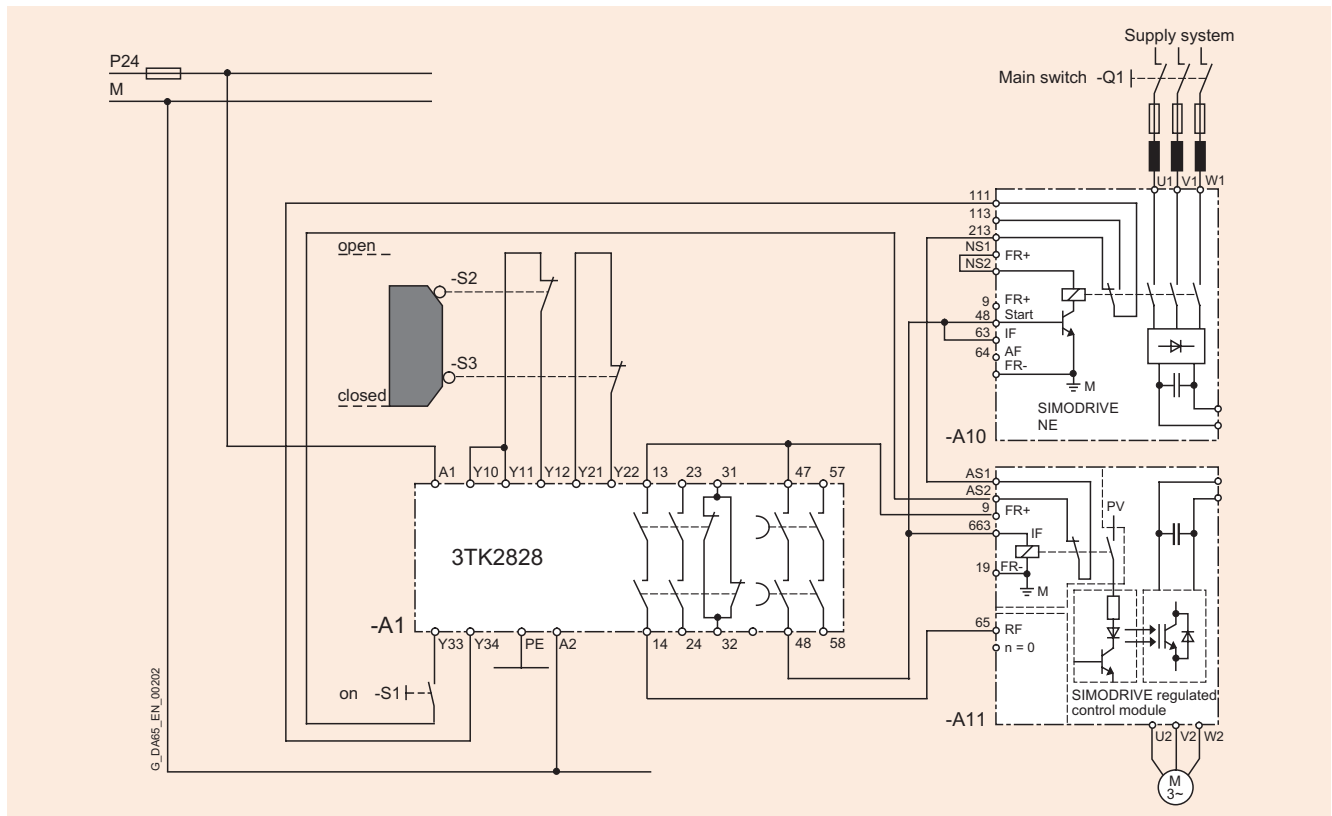
Benefits

The start inhibit function prevents a synchronous or asynchronous motor drive unexpectedly starting from standstill.

Electrical isolation is not provided by the start inhibit function and it does not provide protection against "electric shock".

Example of an application:

Safe standstill with an unlocked protective door, implemented with safety combination.



"Safe standstill" with SIMODRIVE with an unlocked protective door, with safety combination, stop category 1, category 3 to EN 954-1

Function

With a SIGUARD safety combination for the protective door, a configuration according to EN 954-1 control category 3 and EN 1037 can be achieved. The drive is brought to a standstill in accordance with stop function category 1 to EN 60204-1.

- Safety combination for protective door monitoring according to category 4 (instantaneous enabling circuits) or category 3 (delayed enabling circuits).
- Circuit for protective door monitoring is monitored with two channels which are protected against cross-circuiting.
- Switches S2 and S3 are positively driven position switches in accordance with EN 1088.
- The drive is shut down via the internal safety relay and the internal line contactor of the infeed unit.
- One circuit of safety combination A1 monitors whether the internal line contactor of the infeed unit and the internal safety relay of the drive have tripped following opening of the protective door (necessary with regard to control category 3 to EN 954-1!).

Response to open protective door

When the protective door is opened, standstill of the drive is instigated in accordance with stop category 1 of EN 60204-1. It must be ensured that movements that will result in danger are brought to a halt beforehand!

- Via the enable contacts of safety combination A1, the drive signal 0 is input on contact 65 (controller enable CE), the drive is braked to speed 0 immediately and the pulse is reset. At the same time, the time delay for safety combination A1 is activated; the drive must come to a standstill before it elapses.
- The safely delayed enable contacts of safety combination A1 open after the set delay time has elapsed; this ensures that the internal safety relay of the drive (1st shutdown path) and the internal line contactor of the infeed unit (2nd shutdown path) are no longer activated.
- If, due to a fault in the internal safety relay or due to the internal line contactor in the infeed unit not tripping, their feedback contacts in the On circuit of safety combination A1 are not closed: It will not be possible to switch on the safety combination.

Switching the drive on

When the protective door is closed, the drive can be started again.

- When the S1 key ("On") is operated, safety combination A1 is set to Ready mode. The internal line contactor of the infeed unit and the internal safety relay are activated. The drive starts up again.

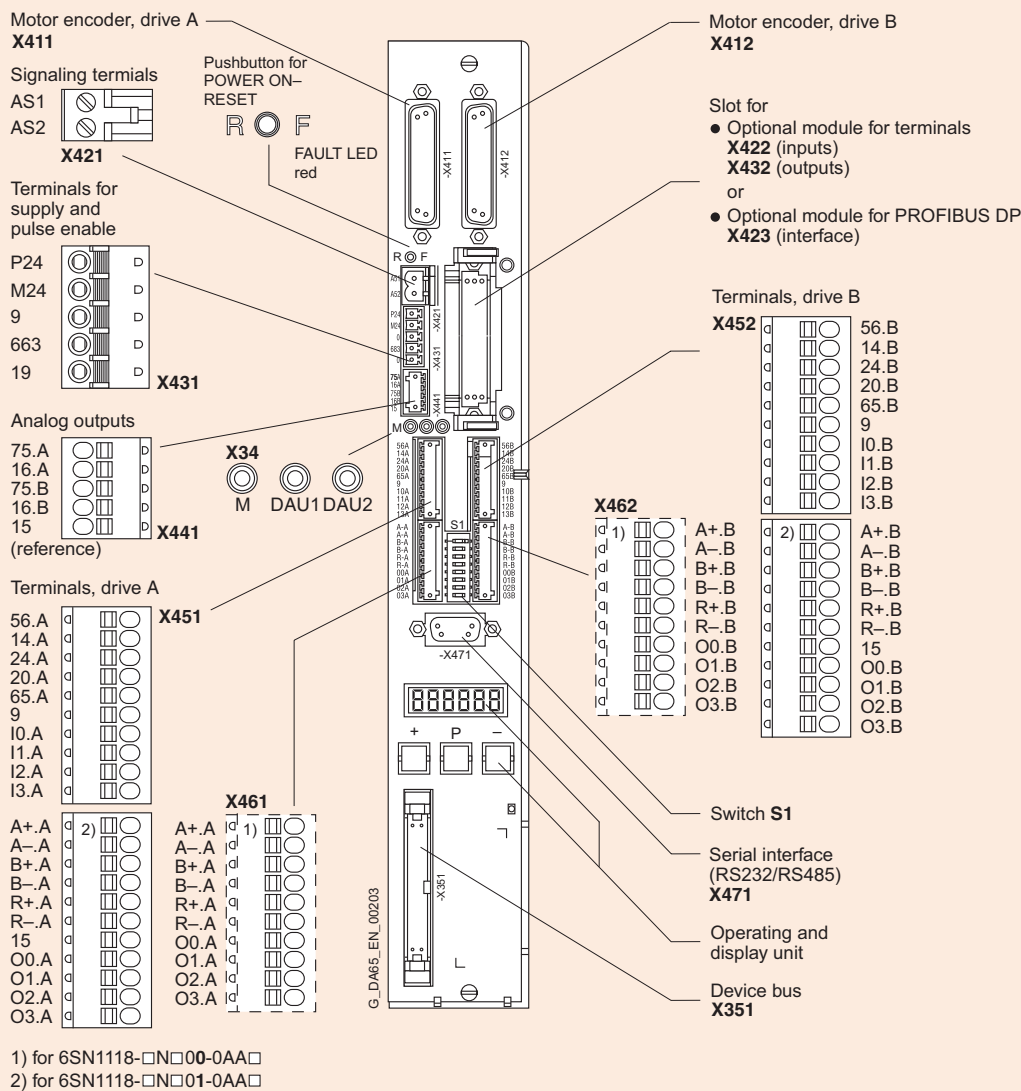
SIMODRIVE 611 universal HR control unit

Control terminal strip

The control terminal strip is located on the front of the control unit.

All the necessary functions for operating and monitoring SIMODRIVE 611 universal HR drives are accessible via the control terminal strip.

- Control commands, e.g. enable signals, ON/OFF, operating status, block selection, setpoint selection, duty types, etc.
- Analog setpoint inputs, e.g. speed setpoint, torque setpoint
- Analog outputs for internally calculated variables, e.g. motor current, speed, motor voltage, frequency
- Status messages, e.g. Run, Fault



Control unit

Planning guide

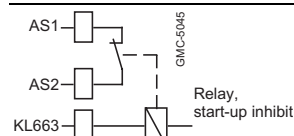
SIMODRIVE 611 universal HR

Unit design, power terminals and control terminals

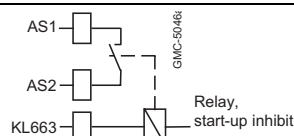
Board-specific terminals and interfaces

The board-specific terminals and interfaces are available for both drive A and drive B.

Terminal No.	Designation	Function	Type ¹⁾	Technical data	
Signaling terminal, start inhibit (X421)					
AS1	X421	Signaling contact Start inhibit	NC	Connector type:	Two-pole, male connector
				Max. conductor cross-section:	2.5 mm ²
AS2	X421	Checkback signal from terminal 663	NC	Contact:	NC, floating
				Contact load:	max. 1 A at AC 250 V max. 2 A at DC 30 V



Pulses not enabled (KL663)
The control pulses for the power transistors are inhibited.



Pulses enabled (KL663)
The control pulses for the power transistors are enabled.

Terminals for supply and pulse enable (X431)

X431				Connector type:	5-pin connector
				Max. conductor cross-section:	1.5 mm ²
P24	X431.1	External power supply for digital outputs (+24 V)	V	Voltage tolerance (including ripple):	10 V ... 30 V
M24	X431.2	Reference for the external supply	V	The external supply is required for the following digital outputs: • 8 outputs for drive-specific terminals (X461, O0.A - O3.A/X462, O0.B - O3.B) • 8 outputs of the optional TERMINAL module (X432.O4 - O11) When dimensioning the external power supply, the total current of all of the digital outputs must be taken into account. Maximum total current: • For the closed-loop control module (all 8 outputs): 2.4 A • For the optional TERMINAL module (all 8 outputs): 480 mA	
9	X431.3	Enable voltage (+24 V)	V	Reference:	Terminal 19
				Max. current (for complete group):	500 mA
				Note: The enable voltage (terminal 9) can be used to provide the enable signals (e.g. pulse enable) as 24 V auxiliary voltage.	
663	X431.4	Pulse enable (+24 V)	I	Voltage tolerance (including ripple):	21 V ... 30 V
				Current input, typical:	25 mA at 24 V
				Note: The pulse enable acts simultaneously on drive A and drive B. When the pulse enable is withdrawn, the drives coast down unbraked.	
19	X431.5	Reference (reference potential for all digital inputs)	V	Note: If the enable signals are to be controlled from an external voltage and not from terminal 9, the reference potential (ground) of the external source must be connected to this terminal.	

Device bus (X351)

–	X351	Device bus	I/O	Ribbon cable:	34-pole
				Voltages:	Various
				Signals:	Various

Test sockets (X34)

DAU1	X34	Test socket 1 ²⁾	MA	Test socket:	Ø 2 mm (0.08 in)
DAU2	X34	Test socket 2 ²⁾	MA	Resolution:	8-bit
M	X34	Reference potential	MA	Voltage range:	0 V ... 5 V
				Maximum current:	3 mA

1) I = Input; V = Supply; I/O = Input/Output;
MA = Analog measuring signal; NC = NC contact

2) Freely parameterizable

Drive-specific terminals

The drive-specific terminals are available for both drive A and drive B.

Terminal		Function		Type ¹⁾	Technical data
Drive A		Drive B			
No.	Designation	No.	Designation		
Encoder connection (X411, X412)					
–	X411	–	–	I	References: SIMODRIVE 611 Planning Guide, Section "Indirect and direct position sensing" Encoder limit frequencies: - Encoder with sin/cos 1 V_{pp}: 350 kHz - Resolver: 12 bits 432 Hz 14 bits 108 Hz - Encoder with TTL signal ²⁾: 420 kHz
–	–	–	X412	I	
					Motor encoder connection, Drive A Motor encoder connection, Drive B Direct measuring system (SW 3.3 and higher)

Pin assignment of X411/X412 for encoders with sin/cos 1 V_{pp}

Connector type: 25-pin male Sub-D connector, pin

Pin	Signal name
1	P_Encoder
2	M_Encoder
3	A
4	*A
5	Internal shield
6	B
7	*B
8	Internal shield
9	Reserved
10	EnDat_CLK
11	Reserved
12	*EnDat_CLK
13	+Temp

Pin	Signal name
14	5 V Sense
15	EnDat_DAT
16	0 V Sense
17	R
18	*R
19	C
20	*C
21	D
22	*D
23	*EnDat_DAT
24	Internal shield
25	–Temp
–	–

Pin assignment of X411/X412 for resolver

Connector type: 25-pin male Sub-D connector, pin

Pin	Signal name
1	Reserved
2	M_Encoder
3	SIN_PLUS
4	SIN_MINUS
5	Internal shield
6	COS_PLUS
7	COS_MINUS
8	Internal shield
9	Excitation_Pos
10	Reserved
11	Excitation_Neg
12	Reserved
13	Temp+

Pin	Signal name
14	Reserved
15	Reserved
16	Reserved
17	Reserved
18	Reserved
19	Reserved
20	Reserved
21	Reserved
22	Reserved
23	Reserved
24	Internal shield
25	Temp–
–	–

1) I = Input

2) Only with closed-loop control module, Order No. 6SN1118-□NH01-0AA□, from SW 8.1

Planning guide

SIMODRIVE 611 universal HR

Unit design, power terminals and control terminals

Drive-specific terminals

The drive-specific terminals are available for both drive A and drive B.

Terminal		Drive B		Function	Type ¹⁾	Technical data	
Drive A	Designation	No.	Designation				
No.		No.					
Analog outputs (X441)							
75.A	X441.1	–	–	Analog output 1 ²⁾	AO	Connector type:	5-pin connector
16.A	X441.2	–	–	Analog output 2 ²⁾	AO	Wiring:	see ⁴⁾
–	–	75.B	X441.3	Analog output 1 ²⁾	AO	Max. conductor cross-section for stranded or solid conductor:	0.5 mm ²
–	–	16.B	X441.4	Analog output 2 ²⁾	AO	Voltage range:	–10 ... +10 V
15	X441.5	15	X441.5	Reference (electronics GND)	–	Max. current:	3 mA
						Resolution:	8-bit
						Update:	in speed controller cycle
						Short-circuit proof	
Terminals for analog inputs and digital inputs/outputs (X451, X452)							
	X451		X452			Connector type:	10-pin connector
						Max. conductor cross-section for stranded or solid conductor:	0.5 mm ²
56.A	X451.1	56.B	X452.1	Analog input 1	AI	Differential input	
14.A	X451.2	14.B	X452.2	Reference potential 1	AI	Voltage range (limit values):	–12.5 V ... +12.5 V
24.A	X451.3	24.B	X452.3	Analog input 2	AI	Input resistance:	100 kΩ
20.A	X451.4	20.B	X452.4	Reference potential 2	AI	Resolution:	14 bits (sign + 13 bits)
						Wiring:	Cable with braided shield, attached at both ends
65.A	X451.5	65.B	X452.5	Controller enable, drive-specific	I	Current input, typical:	6 mA at 24 V
						Level (including ripple)	
						High signal:	15 V ... 30 V
						Low signal:	–3 V ... 5 V
						Electrical isolation:	Reference is terminal 19/terminal M24
9	X451.6	9	X452.6	Enable voltage (+24 V)	V	Reference:	Terminal 19
						Max. current (for complete group):	500 mA
						Note:	The enable voltage (terminal 9) can be used to provide the enable signals (e.g. controller enable).
10.A	X451.7	10.B	X452.7	Digital input 0 ²⁾ High-speed input ³⁾ e.g. for equivalent zero mark, external block change (SW 3.1 and higher)	DI	Voltage:	24 V
						Current input, typical:	8.6 mA at 24 V
						Level (including ripple)	
						High signal:	15 V ... 30 V
						Low signal:	–3 V ... 5 V
						Electrical isolation:	Reference is terminal 19/terminal M24
11.A	X451.8	11.B	X452.8	Digital input 1 ²⁾	DI	Note:	
12.A	X451.9	12.B	X452.9	Digital input 2 ²⁾	DI	• Parameterization of the input terminals as well as the defaults are described in the SIMODRIVE 611 universal HR Description of Functions	
13.A	X451.10	13.B	X452.10	Digital input 3 ²⁾	DI	• An open-circuit input is interpreted as a "0" signal	

1) AO = Analog output; I = Input; DI = Digital input;
AI = Analog input; V = Power supply

2) Freely parameterizable. All digital inputs are debounced using software techniques. This results in a delay of 1 to 2 interpolation cycles in signal recognition (P1010).

3) 10.x is internally hard-wired to the position sensing function where it acts almost instantaneously.

4) The analog outputs (X441) should be wired up through a terminal strip. A shielded cable should be used in common for all analog outputs between X441 and the terminal strip. For this cable, the shield must be connected at both cable ends. The 4 analog cables can be routed away from the terminal strip. The shield of the cables must be connected and the ground cables must be connected to a common ground terminal.

Drive-specific terminals

The drive-specific terminals are available for both drive A and drive B.

Terminal		Drive B		Function	Type ¹⁾	Technical data
Drive A	Designation	No.	Designation			
No.		No.				
Drive-specific terminals (X461, X462)						
	X461		X462			Connector type: 10-pin connector
						Max. conductor cross-section for stranded or solid conductor: 0.5 mm ²
A+.A	X461.1	A+.B	X462.1	Signal A+	I/O	Incremental shaft-angle encoder interface (WSG) Wiring: • Cable with braided shield, attached at both ends • The reference ground of the connected node should be connected to terminal 15.
A-.A	X461.2	A-.B	X462.2	Signal A-	I/O	
B+.A	X461.3	B+.B	X462.3	Signal B+	I/O	
B-.A	X461.4	B-.B	X462.4	Signal B-	I/O	
R+.A	X461.5	R+.B	X462.5	Signal R+	I/O	
R-.A	X461.6	R-.B	X462.6	Signal R-	I/O	
15 ³⁾	X461.7	15	X462.7	Ref. (electronics GND)	-	

Note:

Nodes can be connected that comply with the RS485/RS422 standard. The WSG interface can be parameterized as an input or as an output.

- Input (from SW 3.3) To supply incremental position setpoints
- Output To output incremental actual position values

O0.A	X461.8	O0.B	X462.8	Digital output 0 ²⁾	DO	Rated current per output: 500 mA
O1.A	X461.9	O1.B	X462.9	Digital output 1 ²⁾	DO	Max. current per output: 600 mA
O2.A	X461.10	O2.B	X462.10	Digital output 2 ²⁾	DO	Summation current, max. (valid for these 8 outputs): 2.4 A
O3.A	X461.11	O3.B	X462.11	Digital output 3 ²⁾	DO	Voltage drop, typical: 250 mV at 500 mA
						Short-circuit proof
Note: Parameterization of the output terminals and the SIMODRIVE 611 defaults are described in the Description of Functions. Example: When all 8 outputs are controlled simultaneously, the following applies: Σ current = 240 mA → OK Σ current = 2.8 A → Not OK, because the summation current is greater than 2.4 A.						

Note:

- The power switched via these outputs is supplied from terminals P24/M24 (X431). This must be taken into account when dimensioning the external supply.
- The digital outputs only "function" when an external supply is available (+24 V/0 V, terminal P24/M24).

Terminal No.	Designation	Function	Type ¹⁾	Technical data
Serial interface (X471)				
-	X471	Serial interface for "SimoCom U"	I/O	Connector type: 9-pin Sub-D socket connector
Note: • Online mode via the RS232/RS485 serial interface				

Pin assignment for serial interface X471

Connector type: 9-pin D socket connector

Contact	Signal designation
1	RS485 DATA+
2	RS232 T x D
3	RS232 R x D
4	Reserved
5	GND, 0 V

Contact	Signal designation
6	Reserved
7	RS232 CTS
8	RS232 RTS
9	RS485 DATA-
-	-

Note:

- The serial interface can be declared as an RS232 or as an RS485 interface by setting parameters appropriately.
- If it is parameterized as an RS485 interface, a terminating resistor can be connected/disconnected via switch S1 on the front panel.

1) DO = Digital output; I/O = Input/output

2) Freely parameterizable. The digital outputs are updated in the interpolation clock cycle (P1010). This is supplemented by a hardware-related delay time of approx. 200 µs.

3) "SIMODRIVE 611 universal HR" Order No. 6SN1118-□N□□1-□□□□ (with SW 5.1 or higher).

Power module (single-axis or two-axis)

Control module

DC link bus

DC link bus

GMC-5049

Order No.		
6FX 002-5	1FK7 motor	
≤ 50 m (164 ft)	Power output, see MOTION-CONNECT cables and connections	1FT6 motor
6FX7 002-5E	1FN3 motor up to 3 m/s² (9.8 ft/s²)	
≤ 50 m (164 ft)	Power output, see MOTION-CONNECT cables and connections	others available on request
6FX 008-...	1PH motor	
≤ 50 m (164 ft)	Power output, see MOTION-CONNECT cables and connections	

Control unit for resolver

Two-axis for resolver

GMC-5050a

X411 or X412

X423 ¹⁾

X451 or X452

WSG ³⁾

X471

X351

Order no. Preassembled cable		
6FX 002-2CF02-1	Resolver	
≤ 50 m (164 ft)		
6XV1 830- H10 ²⁾	Sold by the meter	PROFIBUS DP SIMATIC S7 CPU 315-2 DP
or		
6FX2 002-4EA07-1		PROFIBUS DP SINUMERIK 840Di/840D FM 357-2
6FX8 002-3AB01-1	Open	FM 354
≤ 35 m (115 ft)	Core ends	
or		
6FX2 002-3AD01-1	Open	FM 357-2
≤ 35 m (115 ft)	Core ends	4 setpoints
6FX 002-2CJ10-1		FM 357 FM 354
≤ 50 m (164 ft)		
X471	Sub-D extension, 9-pole ⁴⁾	PG/PC
X351	Included in scope of supply	Device bus

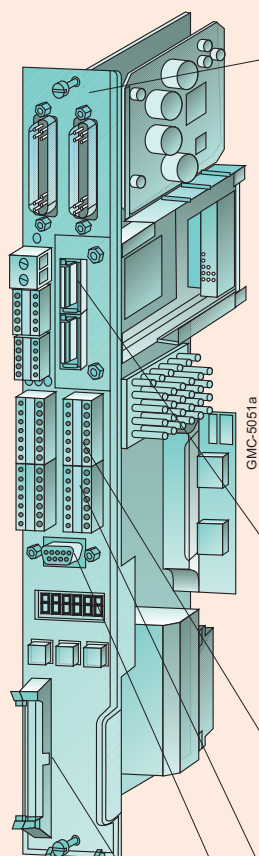
1) PROFIBUS connector, e.g.: Order no.: 6FX2 003-0AA02.

2) 6XV1 830-0EH10: Not suitable for trailing
6XV1 830-3BH10: Suitable for trailing

3) Incremental encoder

4) PC accessories

Control unit with sin/cos encoder

Two-axis,
for encoder with sin/cos 1 V_{pp}Order no.
Preassembled cable

6FX8 002-1AA14-1A□0	Open	Temperature sensor in 1FN3 motor ¹⁾
≤ 5 m (16.4 ft) (1 m (3.3 ft), 2 m (6.6 ft), 5 m (16.4 ft))	Core ends	
6FX□ 002-2CH00-1□□0	Adapter cable ²⁾	Linear absolute measuring system (EnDat) LC 181
≤ 50 m (164 ft)	313 791 ..	
6FX□ 002-2CG00-1□□0	Adapter cable ²⁾	Linear incremental measuring system
≤ 50 m (164 ft)	310 128 ..	LS 186 (C)
	310 123 ..	LS 486 (C)
6FX□ 002-2EQ10-1□□0		Motor encoder absolute; EQN
≤ 50 m (164 ft)		
6FX□ 002-2CA31-1□□0		Motor encoder SIMAG H
≤ 50 m (164 ft)		
6FX□ 002-2CA31-1□□0		Motor encoder incremental; ERN
≤ 50 m (164 ft)		
6XV1 830-□□H10 ⁵⁾	Sold by the meter	PROFIBUS DP SIMATIC S7 CPU 315-2 DP
or		
6FX2 002-4EA07-1□□0		PROFIBUS DP SINUMERIK 840Di/840D FM 357-2
6FX8 002-3AB01-1□□0	Open	FM 354
≤ 35 m (115 ft)	Core ends	
or		
6FX2 002-3AD01-1□□0	Open	FM 357
≤ 35 m (115 ft)	Core ends	4 setpoints
6FX□ 002-2CJ10-1□□0		FM 357 FM 354
≤ 50 m (164 ft)		
X471	Expansion D, 9-pole ³⁾	PG/PC
	Serial interface	
X351	Included in scope of supply	Device bus

1) The temperature sensor must be connected by the customer.
The cores for the temperature sensor are included in the power cable 6FX2 002-5E... for the 1FN motor.

2) The cable can be ordered from the manufacturer of the linear position encoder.

3) PC accessories

4) PROFIBUS connector, e.g.: Order no.: 6FX2 003-0AA02.

5) 6XV1 830-0EH10: Not suitable for trailing
6XV1 830-3BH10: Suitable for trailing

6) Incremental encoder

Planning guide

Communication via PROFIBUS DP for SIMODRIVE 611 universal HR and POSMO CD/CA, SI

The SIMODRIVE 611 universal HR devices, POSMO SI/CD/CA are equipped with a PROFIBUS DP interface for communication with, for example, higher-level PLC systems, industrial PCs, etc.

General information

PROFIBUS DP is an international, open fieldbus standard that is specified in the European fieldbus standard EN 50170 Part 2.

PROFIBUS DP is optimized for high-speed, time-critical data transfer at the field level.

The fieldbus is implemented for the cyclic and non-cyclic exchange of data between a master and the slaves that are assigned to it.

Master and slaves

In the case of PROFIBUS, there are two categories of stations, masters and slaves.

- Master (active bus node)

A device set up as a master on the bus determines the data traffic on the bus and is therefore also known as an active bus node.

There are two classes of master:

- DP master Class 1 (DPMC1):

Masters of Class 1 exchange information with slaves in pre-specified message cycles. Examples: SIMATIC S5, SIMATIC S7, etc.

- DP master Class 2 (DPMC2):

Devices of Class 2 are used for configuration, start-up, operator control and monitoring during normal operation of the bus.

Examples: Programming devices, HMI systems.

- Slaves (passive bus nodes)

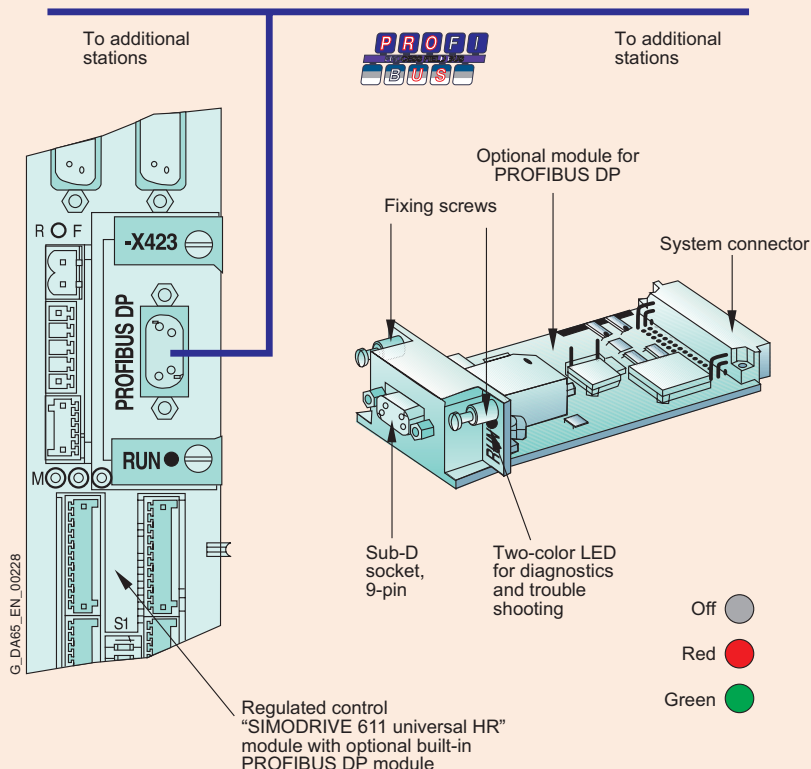
These devices can only receive and acknowledge messages and, in response to a master request, send messages to the master.

SIMODRIVE 611 universal HR with PROFIBUS DP option module

The "SIMODRIVE 611 universal HR" closed-loop control module with the PROFIBUS DP option module is used for connecting drives to higher-level automation systems via PROFIBUS DP.

"SIMODRIVE 611 universal HR" automatically detects the built-in PROFIBUS DP option module on switch-on.

If an option module is used, the input/output functions can be selected via PROFIBUS DP and setpoints can be preset.

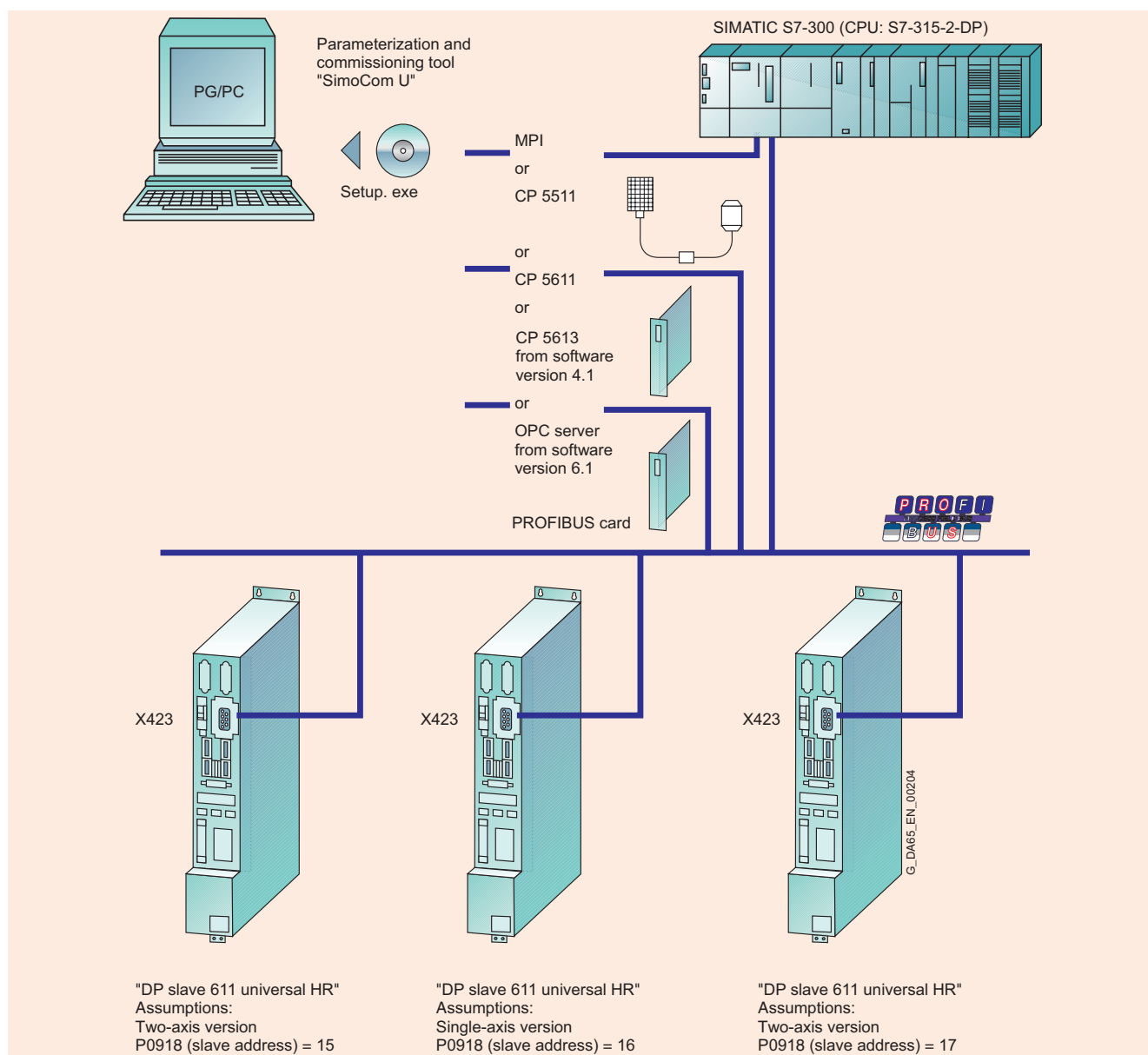


SIMODRIVE 611 universal HR with PROFIBUS DP option module

Option module PROFIBUS DP

Designation	Order No.	Characteristics
PROFIBUS DP2	6SN1114-0NB00-0AA1	- PROFIBUS ASIC DPC31 without PLL - For closed-loop control modules from software version 3.1, this module can be used in place of the PROFIBUS DP1 option module
Characteristics common to PROFIBUS DP2 and DP3		- Requirements: - A closed-loop control module from software version 3.1 upwards is required - Cyclic data transfer (PKW section and PZD section) are possible - Module firmware update with SimoCom U is possible - Non-cyclic data transmission (DP/V1) - The function "SimoCom U via PROFIBUS" can be used
PROFIBUS DP3	6SN1114-0NB01-0AA0	- PROFIBUS ASIC DPC31 with PLL - The function "Motion Control with PROFIBUS DP" (isochronous PROFIBUS mode) can be used

Integration of SIMODRIVE 611 universal HR with PROFIBUS DP in the world of automation



SimoCom U via PROFIBUS (example with 3 closed-loop control modules)

PROFIBUS DP with SIMODRIVE POSMO CD/CA, SI

General information

The PROFIBUS unit is mounted on POSMO SI, POSMO CD or POSMO CA.

It must be disassembled for

- Connecting the PROFIBUS cable to X20
- Setting the PROFIBUS address
- Setting the terminating resistor on the last PROFIBUS station and
- Replacing the memory module

The PROFIBUS cable is connected via the

- PG flange (with preassembled cables) **or**
- M20 screwed cable gland

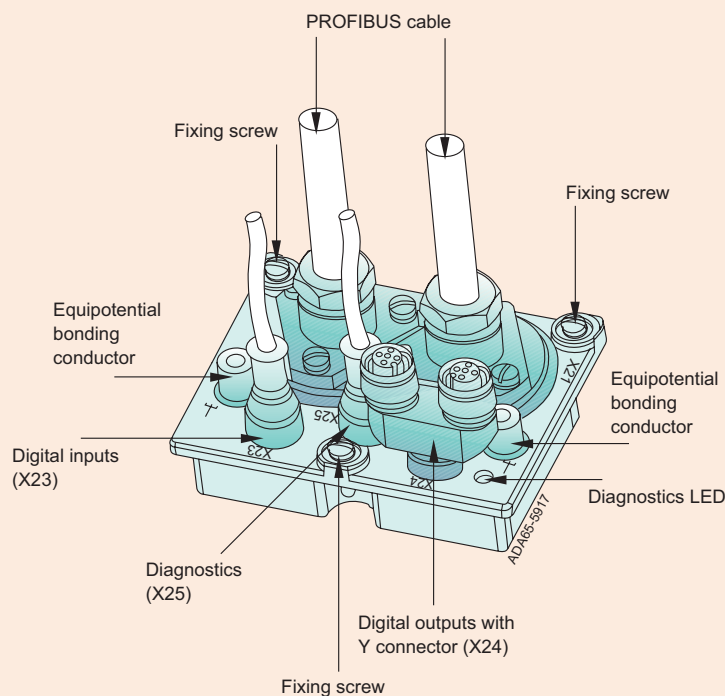
to the X20 screw-type terminal strip (rear side of PROFIBUS unit).

Note

The M20 screwed cable gland and connectors X23 ... X25 are supplied fitted with blanking covers.

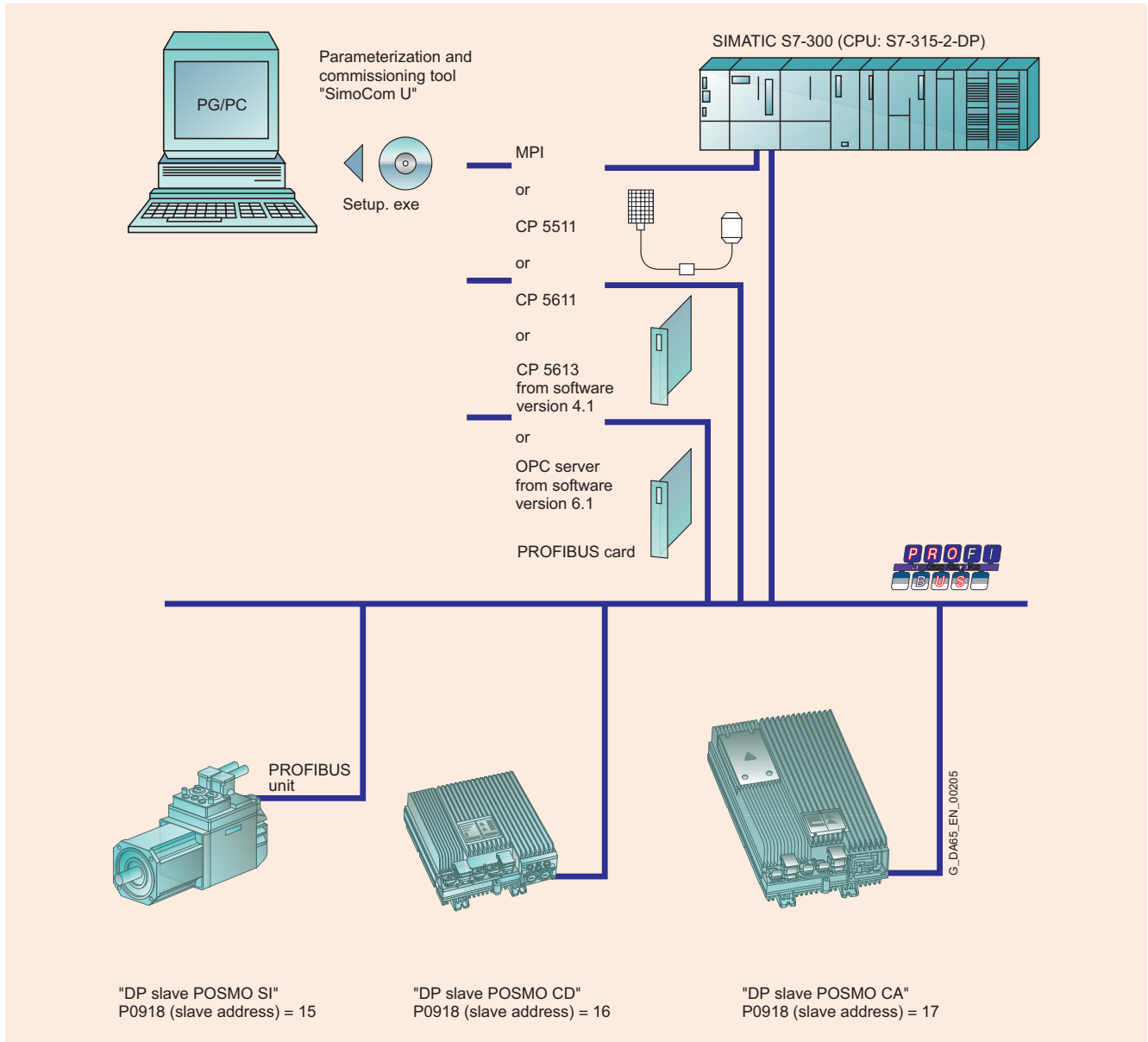
To ensure that the IP65 degree of protection is maintained, the blanking covers must only be removed for cases in which a signal lead is connected!

The connection of signal leads to the PROFIBUS unit is shown schematically in the Figure.



Signal cable installation PROFIBUS unit, e.g. with a PG flange

Integration of SIMODRIVE POSMO CD/CA, SI



"SimoCom U" via PROFIBUS (example with 3 SIMODRIVE POSMO)

Engineering package Drive ES

Overview

With Drive ES (Drive Engineering System), the Motion Control drives SIMODRIVE 611 universal HR and SIMODRIVE POSMO CD/CA/SI are fully integrated into the SIMATIC world of automation with regard to communication, engineering and data storage.

Drive ES comprises the separately available software packages Drive ES Basic and Drive ES SIMATIC.

Drive ES SIMATIC contains a SIMATIC module library, that calls SimoCom U/A from the SIMATIC Manager and permits easy, reliable programming of the PROFIBUS DP interface in the SIMATIC CPU for the drives. The prerequisite for Drive ES SIMATIC is that Step 7 has been installed.

Drive ES Basic

Drive ES Basic is the basic software used for online and offline parameterization of all types of drive.

- Drive ES is based on the user interface of the SIMATIC Manager
- Drive parameters are also available in SIMATIC Manager (system-wide data storage)
- Drive ES ensures that parameters are uniquely assigned to a drive
- A SIMATIC project including drive data can be archived
- SIMATIC Teleservice can be used
- It communicates with the drive via PROFIBUS DP

Functions in SimoCom U

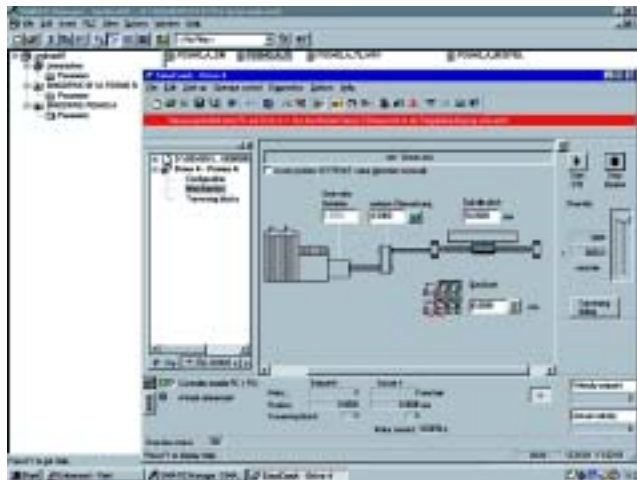
- Trace evaluation
- Read out fault memory
- Upload and download parameter sets (as a complete file or as a delta file with reference to the factory settings)
- Parameter sets can be assembled and processed as required
- Guided start-up
- Self-installation for speed controllers with FFT analysis (Fast Fourier Transformation).

Installation with STEP 7

- Drive ES Basic can be installed as an option for STEP 7 (V ≥ 5.1) and is therefore homogeneously integrated into the SIMATIC environment.

Installation without STEP 7

- Drive ES Basic can also be installed without STEP 7 in which case its own Drive Manager (similar to SIMATIC Manager) can be used.



Integration of SIMODRIVE 611 universal HR and POSMO CD/CA/SI in STEP 7 Manager

Drive ES SIMATIC

- It provides function blocks and sample projects for the SIMATIC CPU that process the communication via PROFIBUS DP with drives from Siemens.
- Communication only has to be parameterized, not programmed.

Features

- Modules of the STEP 7 type; symbolic addressing; function blocks complete with instance data; online Help.
- Can be used in any SIMATIC programming and configuring environment such as LAD, FBD, STL, SCL, CFC.
- New module structure: Separate individual functions for run-time optimized program development.

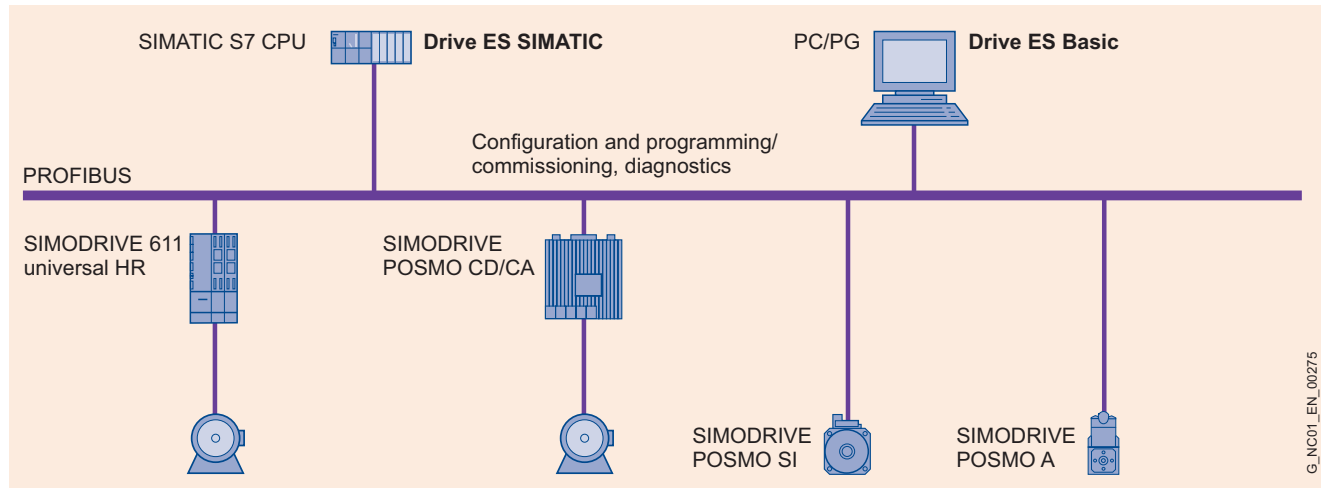
Building block structure

- Reading and writing of process data of a freely configurable length and consistency.
- Replacement of parameters cyclically and non-cyclically, communication monitoring, fault memory read out.
- Downloading parameters via the CPU in the drive.

Contents of the package

- PROFIBUS DP communications software for S7-300 with CPUs with integrated DP interface (function block library DRVDPS7, POSMO) S7-400 with CPUs with integrated DP interface or with CP443-5 (function block library DRVDPS7, POSMO) S7-300 with CP342-5 (function block library DRVDPS7C)
- Communications software USS[®] protocol for S7-300 with CP 340/341 and S7-400 with CP 441 (function block library DRVUSS7)
- STEP 7 slave object manager for the easy configuration of drives as well as for non-cyclic PROFIBUS DP communication with the drives, supports the conversion of DVA_S7 to Drive ES projects (only for V 5.1 upwards)
- SETUP program for installing the software in the STEP 7 environment

Integration



Integration of SIMODRIVE 611 universal HR and SIMODRIVE POSMO in SIMATIC S7 with Drive ES

Engineering and process control of SIMODRIVE 611 universal HR and POSMO SI, CD/CA is particularly user-friendly with a SIMATIC S7 and Step 7 $\geq$ V 5.0.

The complete system can be engineered from the STEP 7 Manager when the Drive ES (Drive Engineering System) option software is installed on the same hardware platform (PC or PG). The S7 system bus PROFIBUS DP performs all data transport functions.

The optional software Drive ES combines the previously separate steps of engineering (hardware configuration, parameterization, technology functions) and the control functions between SIMATIC S7 and SIMODRIVE 611 universal HR and POSMO SI, CD/CA in a single software tool.

Drive ES is fully integrated in STEP 7 Manager and comprises four packages with different functions.

Drive ES Basic supports user-friendly commissioning as well as service and diagnosis during operation of the system. The main advantage over SimoCom U/A stand-alone installations lies in the system-wide data management of drive and automation data of a project in STEP 7 Manager as well as utilization of the complete communications landscape of SIMATIC S7. This also comprises, for example, communication via different bus systems by means of ROUTING.

The communication between SIMATIC S7 and Siemens drives (e.g. SIMODRIVE 611 universal HR and POSMO SI, CD/CA) can then simply be parameterized thanks to ready-to-use CPU function blocks.

Software maintenance service Drive ES

A software update service can also be ordered for the Drive ES software. The user always receives the latest software, service packs and complete versions automatically without the need for prompting.

The update service is offered for one year.

Six weeks before it expires, the customers and their Siemens contact are informed in writing that the update service will be extended for an additional year when it is not cancelled by the customer.

The update service can only be ordered if a complete version has been ordered.

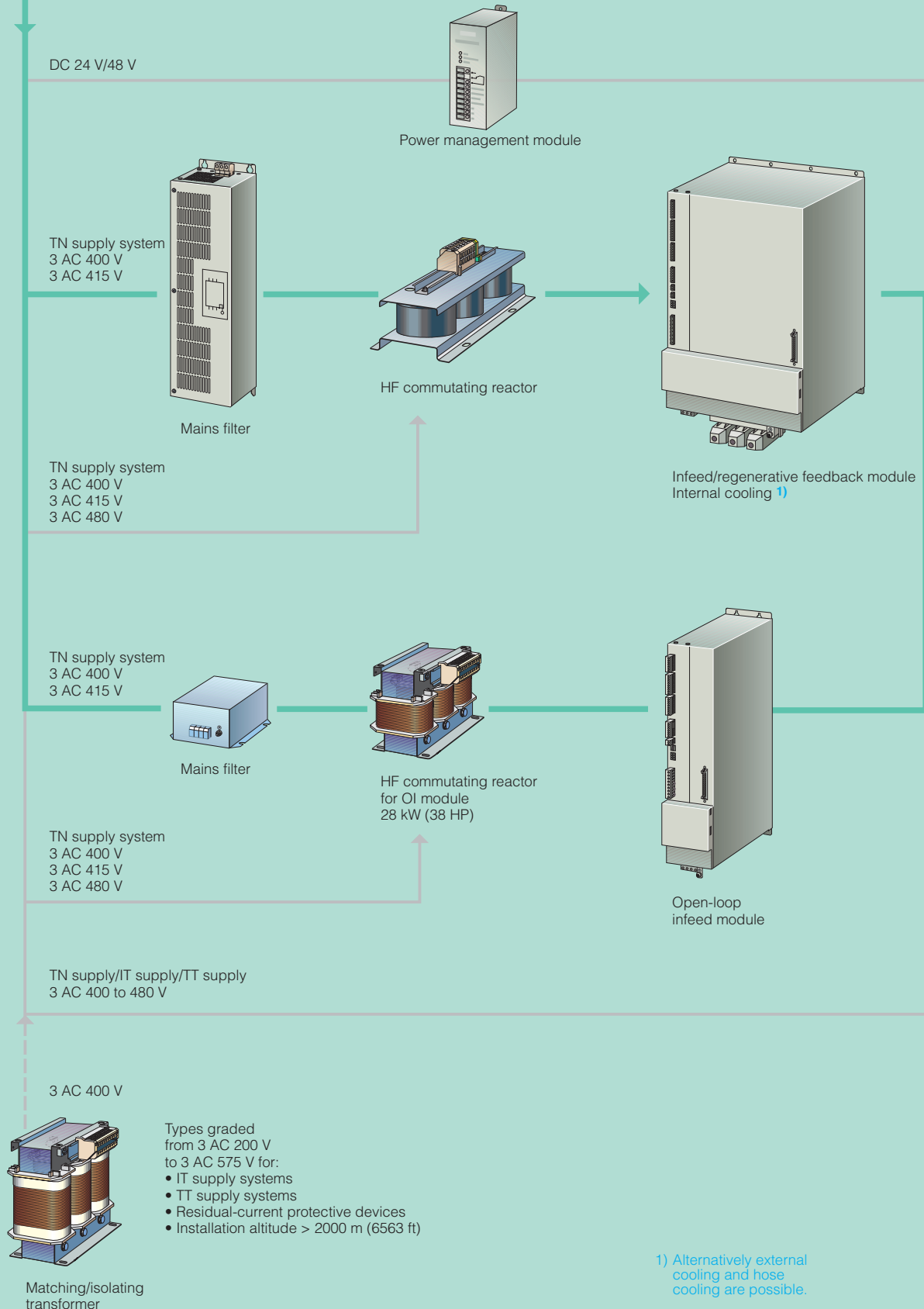
SIMODRIVE 611 universal and POSMO

Planning guide

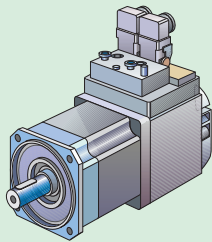
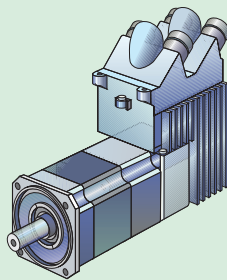
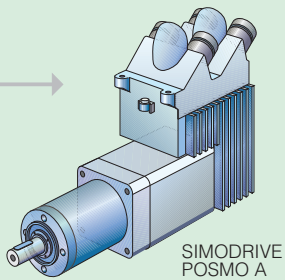
SIMODRIVE POSMO Overview

Supply system interfaces SIMODRIVE 611

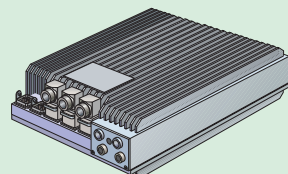
Infeed modules SIMODRIVE 611



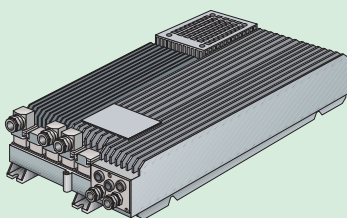
SIMODRIVE POSMO



SIMODRIVE POSMO SI

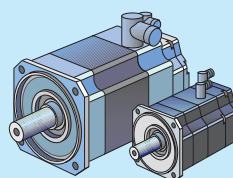


SIMODRIVE POSMO CD

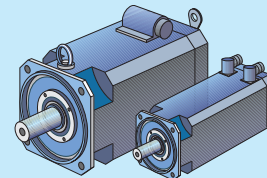


SIMODRIVE POSMO CA

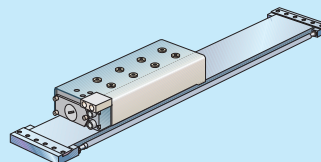
Motors



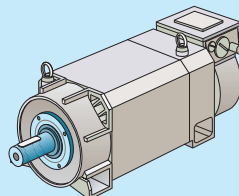
1FK7



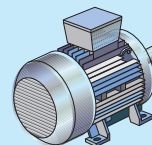
1FT6



1FN3



1PH7



Asynchronous motor
e.g. 1LA

SIMODRIVE 611 universal and POSMO

Planning guide

SIMODRIVE POSMO CD/CA, SI System overview and requirements

Overview

General information

The SIMODRIVE POSMO SI, POSMO CD and POSMO CA drives supplement the modular SIMODRIVE 611 design with decentralized variants that permit installation outside the control cabinet.

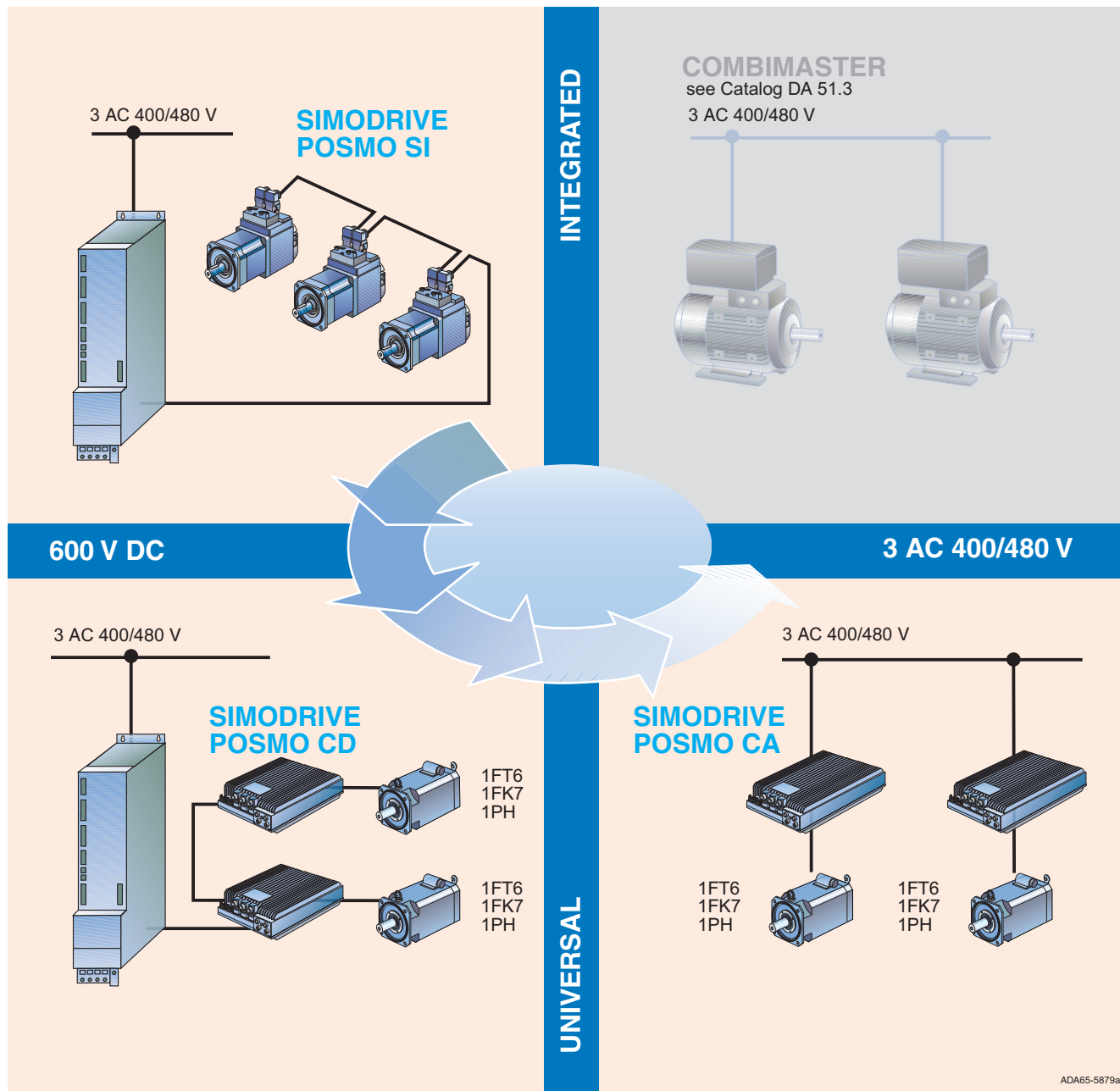
The same software is used for all three drives and is fully compatible with the SIMODRIVE 611 universal HR.

Communication takes place exclusively over PROFIBUS and the expanded standard Motion Control for PROFIBUS can also be used.

An overview of the SIMODRIVE POSMO drive system can be found in the Selection and Ordering Data.

The connection system is identical for all three drives.

The signal lines (encoder signals, bus communication) are not shown in the following diagram to ensure clarity.



ADA65-5879a

Product versions for distributed drive technology

Applications

The SIMODRIVE POSMO SI, POSMO CD and POSMO CA drives are designed for flexible implementation in many application areas.

These distributed drives can be used for all machines and plants, where a distributed configuration provides advantages when it comes to engineering/configuring, commissioning, operation and service.

The advantages of distributed drive systems are:

- Lower cabinet costs by locating the drives in the field "locally".
- Fast machine installation due to mounting a complete drive unit
- Low installation overhead thanks to linking via the communications bus and power bus
- Easy commissioning and parameterization of all SIMODRIVE drives with the user-friendly commissioning tool "SimoCom U".
- Simple expansion of the number of axes without requiring any more space in the control cabinet.

SIMODRIVE POSMO SI for standard applications such as:

- Handling axes
- Positioning axes
- Auxiliary axes for machine tool and production machines

SIMODRIVE POSMO CD/CA for high-performance applications such as:

- Servo applications
- Main spindle applications

Characteristics of distributed drive technology

- Complete drive units with integrated power modules, closed-loop control modules, positioning control, program memory and, in the case of SIMODRIVE POSMO SI, an integrated motor.
- High degree of protection
- High availability
 - Connector with protection against wrong connection
 - PROFIBUS connection with T functionality
 - Replaceable memory module for firmware/user data.
- Generation of the electronics power supply in the unit
 - No external power supply necessary (infeed possible as an option).
- Integrated brake activation.
- Positioning functionality with a programmable sequence of motions "on board".
- Operation on PROFIBUS with high-speed cyclic data transfer.

Parameterization

Parameters are set to integrate the drive and match it to the actual specification of the machine or system. For commissioning and servicing, the following possibilities are available:

- Parameterization and commissioning tool (SimoCom U under Windows 98/NT/2000/ME/XP).

Data storage

The unit is equipped with a removable memory module with a non-volatile data memory (EEPROM) for storing the following data:

- Firmware (system software)
- User data

Function overview

The functions are based on the functionality of SIMODRIVE 611 universal HR.

- Duty types
 - n set (speed/torque setpoint)
 - Speed control
 - Torque control
 - Torque reduction
- Positioning
 - HW/SW limit switch
 - 64 traversing blocks (max.)
 - Position-related switching signals
 - Rotary axis with modulo compensation
 - Jerk limitation
 - External block change
- Commissioning
 - Parameterization and start-up tool SimoCom U
- Motor holding brake - sequence control
- Eight parameter blocks
- Monitoring functions
- Uniform I/O
 - Two digital inputs (freely parameterizable)
 - Two digital outputs (freely parameterizable)
 - Two analog measuring outputs
 - Terminal "Pulse enable" (KL IF)

Planning guide

SIMODRIVE POSMO CD/CA, SI System overview and requirements

Distinguishing characteristics

The differences between SIMODRIVE POSMO SI, POSMO CD and POSMO CA are shown in the following table.

Characteristic	POSMO SI	POSMO CD	POSMO CA
Power infeed	From a centrally generated DC link (DC 600 V _{typ})		From a three-phase mains supply voltage; integration of mains filter (optional), rectifier and pulsed resistor
Integration of power and closed-loop control electronics	In the motor	In a unit (distributed servo drive close to the motor)	
Degree of protection	IP64 (IP54 fan), option IP65 with DE IP67	IP65	
Cooling	Forced convection via integrated fan	Natural convection	
Cabling	Bus-type cabling of PROFIBUS and supply		
Power supply for electronics	Decentralized in the drive unit (external infeed is possible, if required)		
Terminal "Pulse enable" (KL IF)	via terminal to two additional cores in the power cable		
Ambient temperature	0 °C (32 °F) to 45 °C (113 °F) (to 55 °C (131 °F) with derating)		
Closed-loop control	SIMODRIVE 611 universal HR modified platform with removable memory module		
Inputs	2 digital inputs, of which one is a high-speed input		
Outputs	2 digital outputs		
Measuring outputs	2 analog measuring outputs for commissioning and diagnostics		
Indirect measuring system (motor measuring system)	Fixed Resolution 32 increments/revolution 4096 distinct revolutions	According to motor used (1 V _{pp} sin/cos signals; absolute encoder with EnDat) Resolution up to 65536 increments/revolution	
Direct measuring system	–	Optional (1 V _{pp} sin/cos signals; absolute encoder with EnDat)	
Connection system	Power, motor and measuring system connection with power socket connector, PROFIBUS with M20 screwed cable gland (copper conductor) I/O signals with M12 connection system		
Motors	1FK6 with integrated single absolute encoder	1FT6; 1FK7; 1PH; 1FN3 according to power limit as specified in the documentation: Planning guide for linear motors Planning guide for three-phase motors	

Substitute capacitances for calculating the charging limits for SIMODRIVE 611

POSMO on 5 kW (6.5 HP)/10 kW (13.5 HP)/16 kW (22 HP)	Mains supply module	
SIMODRIVE POSMO SI/CD	9 A	600 µF
SIMODRIVE POSMO CD	18 A	1100 µF
POSMO on 28 kW (38 HP) ... 120 kW (160 HP)	Mains supply module	
SIMODRIVE POSMO SI/CD	9 A	1740 µF
SIMODRIVE POSMO CD	18 A	2200 µF

Capacitances built into the devices

SIMODRIVE POSMO SI/CD	9 A	180 µF
SIMODRIVE POSMO CD	18 A	360 µF

SIMODRIVE POSMO CD/CA

Overview



SIMODRIVE POSMO CD

SIMODRIVE POSMO CD/CA are complete converter and control units for a distributed single-axis drive system as a direct station on PROFIBUS DP.

They are used to solve control and drive system tasks with stand-alone, modular function units "locally" at the machine.

This system can be installed virtually anywhere close to a motor thanks to its high degree of protection IP65.

For creating the DC supply voltage for the SIMODRIVE POSMO CD, a line infeed module is usually required. The SIMODRIVE POSMO CA can be directly connected to a 3-phase AC TN supply system. The 24 V DC electronics power supply is generated in the device. For diagnostic purposes, a 24 V DC electronics power supply can also be fed in externally.



SIMODRIVE POSMO CA

Benefits

- Flexibility due to the ability to install close to the motor, for various types of motor
- Reduced control cabinet overhead costs by locating the drives directly "locally" on the machine
- Low installation overhead thanks to linking via the communications bus and power bus
- Direct linking of drive-related process signals via 4 terminals parameterizable as either inputs or outputs
- Reduced installation costs through preassembled power cables.
- High-speed diagnostics via
 - LED for Fault/Ready on the drive unit
 - PROFIBUS DP and SimoCom U
- Easy drive replacement for servicing, because the memory card contains all the commissioning data

Application

- Handling
- Packaging machines
- Textile machines
- Woodworking machinery
- Machine tools

Design

- The SIMODRIVE POSMO CD/CA is a complete functional unit comprising:
 - Power section
 - Control electronics
 - Positioning control with program memory
 - Motion Control with PROFIBUS DP interface
- Safety locks that prevent wrong connection are implemented for power infeed, power loop-through and motor connection
- Connection is through the plug-in PROFIBUS DP unit or ECOFAST. Preassembled cables with a built-on flange are available for the PROFIBUS DP unit.
- M12 connector technology is used to connect
 - Parameterizable digital inputs/outputs,
 - Parameterizable diagnostic signals.
- The measuring systems are connected to the position and speed sensing via connectors that cannot be wrongly connected and are of an identical design to the power socket connectors.

PROFIBUS DP

PROFIBUS DP supports rapid data transfer with the higher-level master, e.g. a SIMATIC S7. With isochronous Motion Control with PROFIBUS DP V2, interpolatory mode of the SIMODRIVE POSMO CD/CA is also possible with a higher-level control, e.g. a SINUMERIK 802D/SINUMERIK 840Di.

Function

- Flexible connection of different 1FK7/1FT6/1FN3 synchronous motors and 1PH/1LA asynchronous motors
- Operation as PROFIBUS DP standard slave with high-speed cyclic data interchange with higher level master
- Interpolating sequence of motions with other nodes through a superior motion control system with PROFIBUS DP
- Connections for high-resolution motor measuring systems and direct measuring system (optional)
- Fast, easy commissioning of all PROFIBUS DP drives via SimoCom U (under Windows 98/NT/2000/ME/XP).

SIMODRIVE POSMO SI

Overview



SIMODRIVE POSMO SI is a single-axis servo drive for a distributed servo drive system which is a direct station on PROFIBUS DP.

This servo drive system is a self-contained, fully functional mechatronic unit. Control and drive tasks can be solved directly on site using autonomous, modular function units.

Individual installation at the machine is possible thanks to the high IP65/IP67 degree of protection of the system.

For generating the DC supply voltage, a line infeed module is usually required. The 24 V DC electronics supply is generated in the unit.

For diagnostic purposes, a 24 V DC electronics power supply can also be fed in externally.

Benefits

- Reduced control cabinet overhead costs by locating the drives directly "locally" on the machine
- Fast machine installation due to mounting a complete drive unit
- Low installation overhead thanks to linking via the communications bus and power bus
- Direct linking of drive-related process signals via 4 parameterizable inputs or outputs
- Reduced installation costs through preassembled power cables
- High-speed diagnostics via
 - LED for Fault/Ready on the drive unit
 - PROFIBUS DP and SimoCom U
- Easy drive replacement for servicing, because the memory card contains all the commissioning data

Application

- Handling
- Packaging machines
- Textile machines
- Woodworking machinery
- Machine tools

Design

In the case of SIMODRIVE POSMO SI, power and information electronics are integrated in the motor.

- The SIMODRIVE POSMO SI is a complete functional unit comprising:
 - 1FK6 synchronous motor
 - Power section
 - Control electronics
 - Positioning control with program memory
 - Motion Control with PROFIBUS DP interface
- Safety locks that prevent wrong connection are implemented for power infeed, power loop-through and motor connection
- Connection is through the plug-in PROFIBUS DP unit. Preassembled cables with a built-on flange are available for the PROFIBUS DP unit.
- M12 connector technology is used to connect
 - Parameterizable digital inputs/outputs,
 - Parameterizable diagnostic signals.

PROFIBUS DP

PROFIBUS DP supports rapid data transfer with the higher-level master, e.g. a SIMATIC S7. With isochronous Motion Control with PROFIBUS DP V2, interpolatory mode of the SIMODRIVE POSMO SI is also possible with a higher-level controller, e.g. a SINUMERIK 802D/SINUMERIK 840Di.

Function

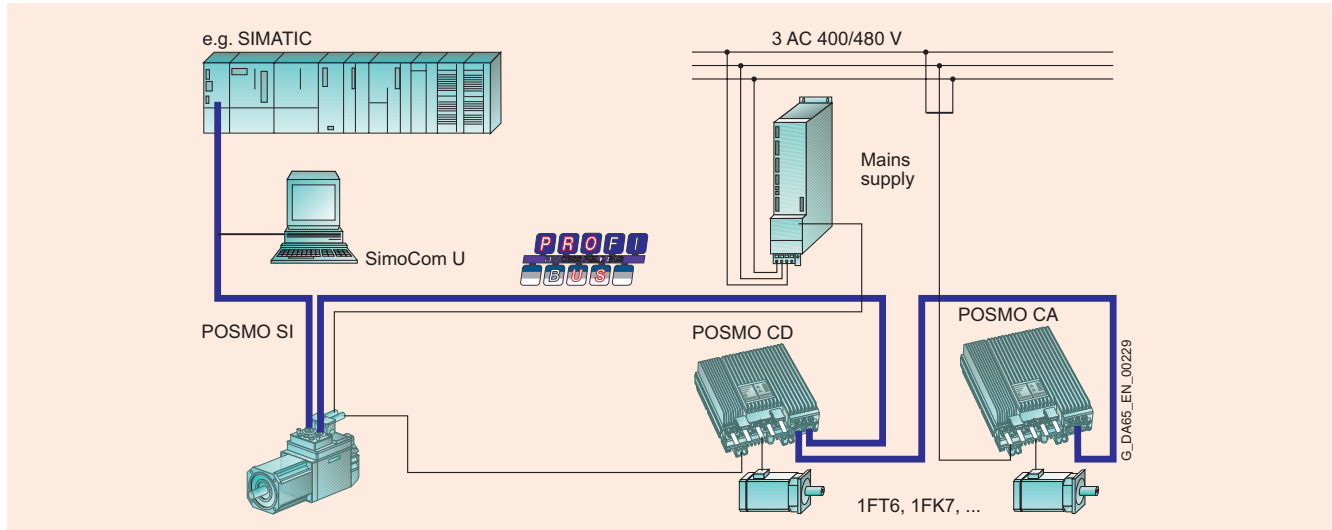
- Positioning functionality with a freely programmable sequence of motions for one axis
- Operation as PROFIBUS DP standard slave with high-speed cyclic data interchange with higher level master
- Interpolating sequence of motions with other nodes through a superior motion control system with PROFIBUS DP
- Integrated absolute-value measuring system
- Fast commissioning of all PROFIBUS DP drives via SimoCom U (under Windows 98/NT/2000/ME/XP).
- POSMO SI drives with a "plain shaft extension" are also available with a planetary gearbox of the LP series $n = n_{Mot}/10$; $n = n_{Mot}/5$.

System integration of SIMODRIVE POSMO CD/CA, SI

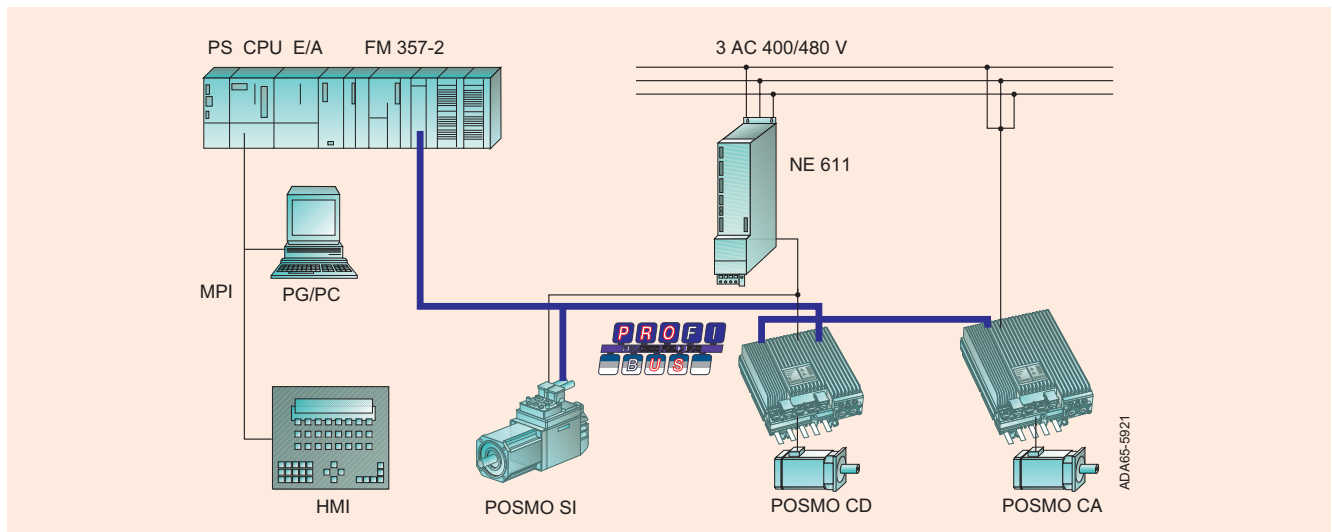
System integration is possible with the following control systems:

- PLC solution (positioning application)
- SIMATIC multi-axis module FM 357-2 (interpolating axes and positioning axes).
- SINUMERIK 840Di (interpolating axes and positioning axes)
- SINUMERIK 840D (interpolating axes and positioning axes)

Examples for connection to control systems are shown in the following diagrams.



PLC solution as a master system

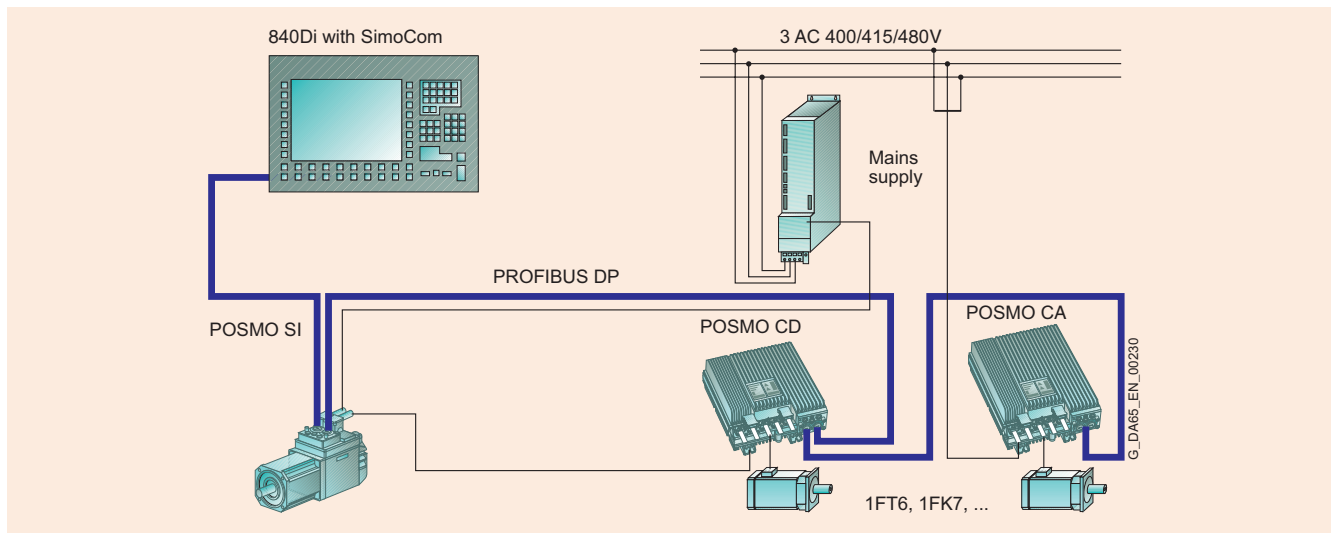


SIMATIC with FM 357-2 as a master system

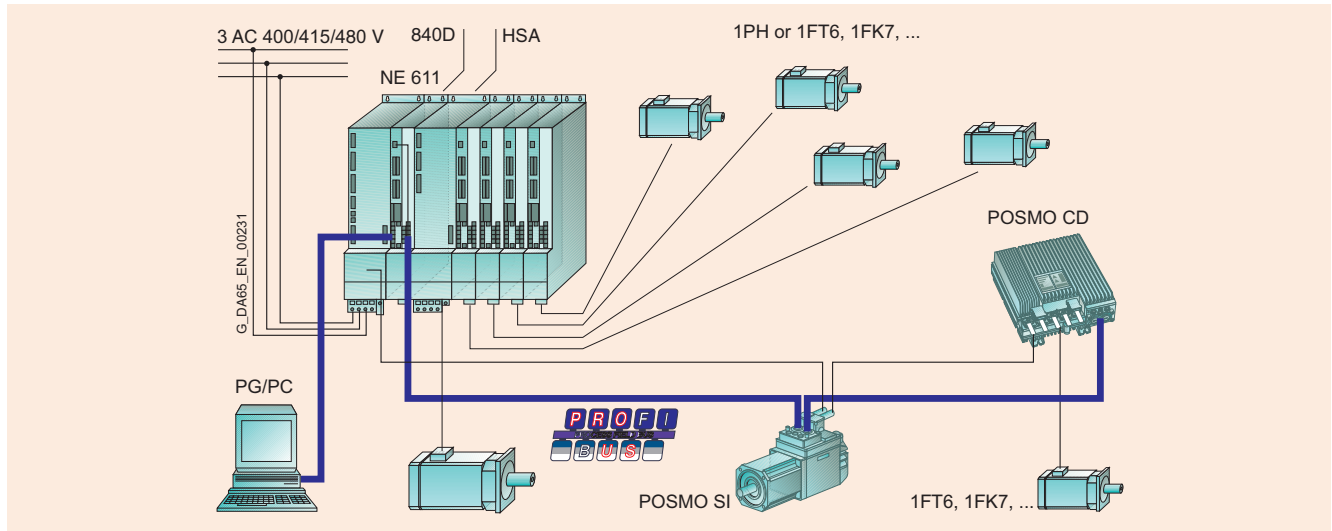
SIMODRIVE 611 universal and POSMO

Planning guide

SIMODRIVE POSMO CD/CA, SI System overview and requirements



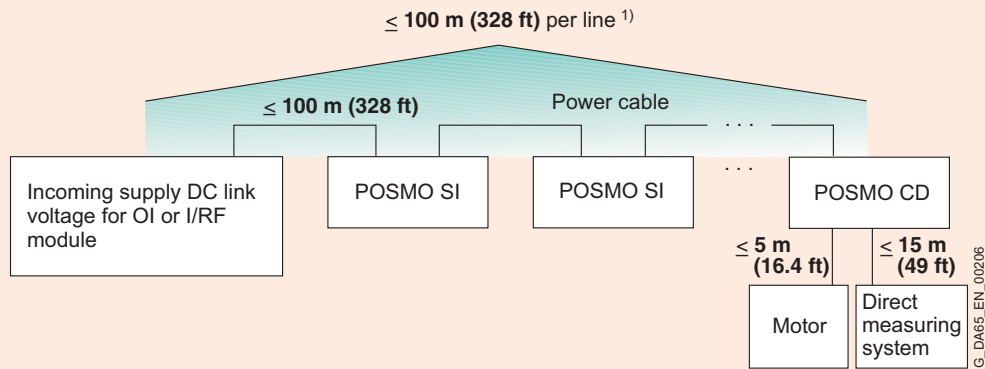
SINUMERIK 840Di as a master system



Mixed mode with SINUMERIK 840D (master) and SIMODRIVE 611D
(NCU 573.2 only)

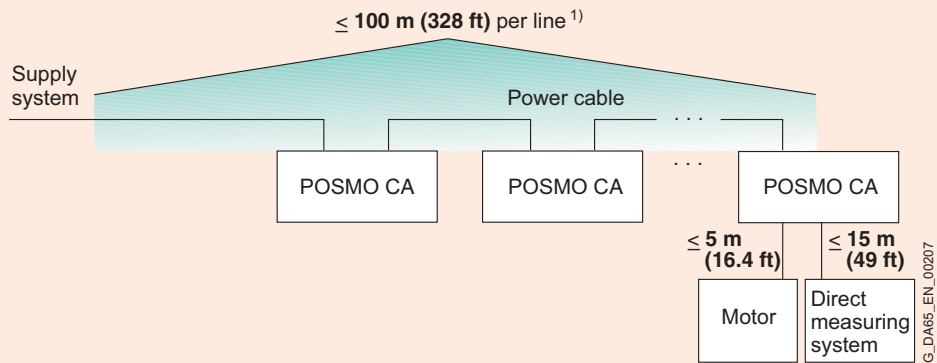
Cable lengths

SIMODRIVE POSMO SI/CD



Max. permissible cable lengths for SIMODRIVE POSMO SI/CD

SIMODRIVE POSMO CA



Max. permissible cable lengths for SIMODRIVE POSMO CA

Note:

Total cable length (power cables, motor + DC link) of all devices connected to an infeed (SIMODRIVE 611 universal HR and POSMO) are not permitted to exceed 350 m (1148 ft) (sinusoidal infeed) and 500 m (1640 ft) (square-wave infeed).

1) A line is considered to be all of the POSMO SI/POSMO CD/POSMO CA units serially connected from the supply point onwards.

Line power

SIMODRIVE POSMO SI/CD must be connected to the DC link voltage or SIMODRIVE POSMO CA must be connected to the supply system with a 6 mm² power cable. This cable designed to VDE specifications can be loaded with 29 A at ambient temperatures up to 40 °C (104 °F).

Note

For ambient temperatures > 40 °C (104 °F), the current carrying capacity of the power cable is reduced in accordance with EN 60204.

Spare capacity for charging limits

For the calculation of the charging limit of the SIMODRIVE mains infeed modules, a spare capacity for POSMO SI/CD must be set for the charging of the "DC voltage link" per unit in dependence of the precharging input circuit of the mains infeed module.

The number of POSMOS with one mains supply is limited by the charging limits.

Mains infeed module SIMODRIVE 611	POSMO SI/CD 9 A	POSMO CD 18 A
5 kW (6.5 HP), 10 kW (13.5 HP), 16 kW (22 HP)	600 µF	1100 µF
28 kW (38 HP) to 120 kW (160 HP)	1740 µF	2200 µF

Max. line power for SIMODRIVE POSMO SI/CD

V _{Supply} V	I/RF module V _{DC link} V _{typ}	OI module V _{DC link} V	P _{S max} kW (HP)
400	600	–	17.40 (23.32)
	–	540	15.66 (20.99)
480	700 ... 750	–	20.30 (27.21) ... 21.75 (29.16)
	–	648	18.80 (25.2)

The total power that can be connected per line in the case of SIMODRIVE POSMO SI/CD changes taking into account the coincidence factor (guide values for typical positioning applications), as shown in the following table.

Number of axes	Coincidence factor
1	1
2	0.63
3	0.5
4	0.38
5	0.33
6	0.28

Max. line power for SIMODRIVE POSMO CA

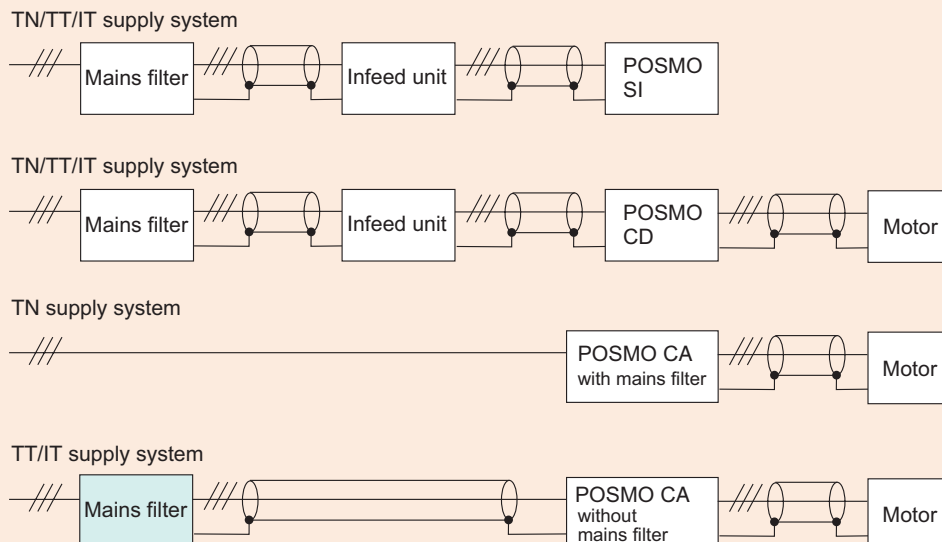
V _{Supply} V	P _{S max} kVA
400	20.0
480	24.1

CE-compatible wiring

To ensure CE conformity in a machine/system, in addition to the signal cables, all the power cables connected downstream of the mains filter must be shielded, see the schematic diagram below.

Note

An isolating transformer is required for the SIMODRIVE 611 infeed unit and for connection to TT/IT supply systems.



ADA65-5882

Power infeed for SIMODRIVE POSMO SI, CD

General information

Requirements for the DC link voltage for SIMODRIVE POSMO SI/CD:

- Max. permissible DC link voltage 750 V DC
- Min. permissible DC link voltage 400 V DC
- Necessary DC link capacitance in the mains supply:
 - POSMO SI, $\geq 180 \mu\text{F}$ per drive
 - POSMO CD 9 A, $\geq 180 \mu\text{F}$ per drive
 - POSMO CD 18 A, $\geq 360 \mu\text{F}$ per drive

Warning:

If the DC link voltage is connected to the mains supply module with the polarity reversed, the device can be damaged.

Recommended mains supply

To provide the DC link voltage for SIMODRIVE POSMO SI/CD, appropriate infeed modules can be selected from SIMODRIVE and SIMOVERT MASTERDRIVES. The tables contain recommended supply systems and the necessary DC link fuses. The DC link fuses must be connected externally by the customer.

UL-approved systems

When using SIMODRIVE POSMO SI or SIMODRIVE POSMO CD in UL-approved plants and systems, a UL-approved varistor must be used in the supply circuit

When the 5 kW (6.5 HP) SIMODRIVE OI module is used and with POSMO CA, an appropriate protection circuit is already integrated.

For SIMODRIVE mains supply modules from 10 kW (13.5 HP) upwards, the overvoltage limiting module with the order number 6SN1 111-0BA00-0AA0 can be used.

Overview of possible mains supplies

Device	Type	Line fuse (recommended)	Supply system type	Mains voltage	Ext. varistor module	DC link fuse
SIMODRIVE 611	OI 5 kW (6.5 HP)	V_{mains} 415 V: 16 A D01; Neozed/B. No., 5SE2116	TN	3 AC 400 V –10%	No	No
			TT	3 AC 480 V + 6%		
			IT			
	OI 10 kW (13.5 HP)	V_{mains} 500 V: 16 A DII; Diazed/B. No., 5SB261			Yes	No
		16 A Size 00; NH/B. No., 3NA3805				
		V_{mains} 415 V: 25 A D02; Neozed/B. No., 5SE2125				
	OI 28 kW (38 HP)	V_{mains} 500 V: 25 A DII; Diazed/B. No., 5SB281			Yes	
		25 A Size 00; NH/B. No., 3NA3810				
	I/RF 16 kW (22 HP)	80 A				
	I/RF ≥ 36 kW (49 HP)	35 A				
	I/RF ≥ 36 kW (49 HP)	≥ 80 A				
SIMOVERT MASTERDRIVES Compact Plus	OI 15 kW (20 HP)	50 A	TN	3 AC 380 V –15%	No	HLS 32 A Size 0; NH B. No.; 3NE4101 ³⁾
	OI ≥ 37 kW (50 HP)	100 A	TT	3 AC 480 V +10%		
			IT			
SIMOVERT MASTERDRIVES Compact Plus	OI 15 kW (20 HP)	50 A		3 AC 380 V –15% ¹⁾	No	
	OI ≥ 45 kW (60 HP)	100 A		3 AC 480 V +10%		
	I/RF 7.5 kW (10 HP)	See SIMODRIVE OI 10 kW (13.5 HP)				
	I/RF 15 kW (20 HP)	50 A				
	OI ≥ 37 kW (50 HP)	100 A				

DC link voltage monitoring

The thresholds for the DC link voltage monitoring are preset for a 400 V line supply voltage. For 480 V supply systems, parameter P1171 must be set to 1.

Threshold	P1171 = 0 ²⁾	P1171 = 1
Threshold for DC link monitoring	$V_{\text{mains}} = 400 \text{ V}$	$V_{\text{mains}} = 480 \text{ V}$

Power supply conditions

For instructions on connecting to TN, TT and IT supply systems see the section "Supply System Types".

1) Only the NE can be connected to an IT/TT supply system; for UL, POSMO SI/CD requires line-side varistors due to air and creepage distance.

2) Default value

3) Fuse holder 3NH3120.

Power infeed for SIMODRIVE POSMO CA

Mains infeed

Supplied from a three-phase mains voltage (3 AC 400/480 V).

The thresholds for pulsed resistor management is preset for a mains voltage of 400 V. For 480 V supply systems, the thresholds can be increased by adjusting parameter P1171.

Threshold	P1171 = 0 ¹⁾	P1171 = 1
Switch-on/switch-off threshold for pulsed resistor	$V_{\text{mains}} = 400 \text{ V}$	$V_{\text{mains}} = 480 \text{ V}$

Note

The integrated mains filter in SIMODRIVE POSMO CA contains fault protection capacitors that are connected between protective earth. The effective capacitance of the three linked mains inputs with reference to earth is up to 270 nF.

According to EN 50178, components of this type are not permitted to be disconnected or short-circuited before the high voltage test. In this case, a DC voltage must be used for the test of the level given in the following table:

Rated voltage	DC test voltage
400 V AC	1900 V DC
480 V AC	2100 V DC

Line fuse

With SIMODRIVE POSMO CA 9 A, the following line fuse must be inserted:

- V_{mains} 415/500 V: HLS 32 A size 0; NH/B. No.; 3NE4101
- Fuse holder: 3NH3120

Mains short-circuit power**Note**

The mains short-circuit power must be larger than the power rating of the equipment operated on the line by a factor of approximately 30.

Motor connection to SIMODRIVE POSMO CD/CA

The motor is connected via a power cable with a 6-pin connector.

Motor supply
(MOT POWER)

Angled connector



Connection of motor cable to SIMODRIVE POSMO CD/CA

Cable data:

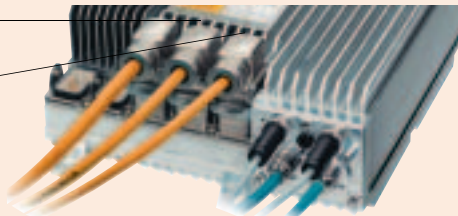
Cross-section mm ²	Core identification	Color of conductor	Motor Name	Designation
4 x 6 mm², 2 x 1.5 mm²				
6	U/L1/C/L+	bk	Motor voltage	U
6	V/L2	bk	Motor voltage	V
6	W/L3/D/L-	bk	Motor voltage	W
6	None	gnye	PE conductor	⊕
1.5	None	bk	Brake + ¹⁾	1 (BRP)
1.5	None	wh	Brake - ¹⁾	2 (BRM)
4 x 2.5 mm², 2 x 1.5 mm²				
2.5	U	bk	Motor voltage	U
2.5	V	bk	Motor voltage	V
2.5	W	bk	Motor voltage	W
2.5	None	gnye	PE conductor	⊕
1.5	None	bk	Brake + ¹⁾	1 (BRP)
1.5	None	wh	Brake - ¹⁾	2 (BRM)

Measuring system connection for SIMODRIVE POSMO CD/CA**Connection of measuring system (SIMODRIVE POSMO CD/CA only)**

Indirect measuring system
(MOT ENCODER, 21-pin)

Direct measuring system
(MOT ENCODER, 17-pin)

POSMO CD/CA
Angled connector



Connection of measuring system to SIMODRIVE POSMO CD/CA

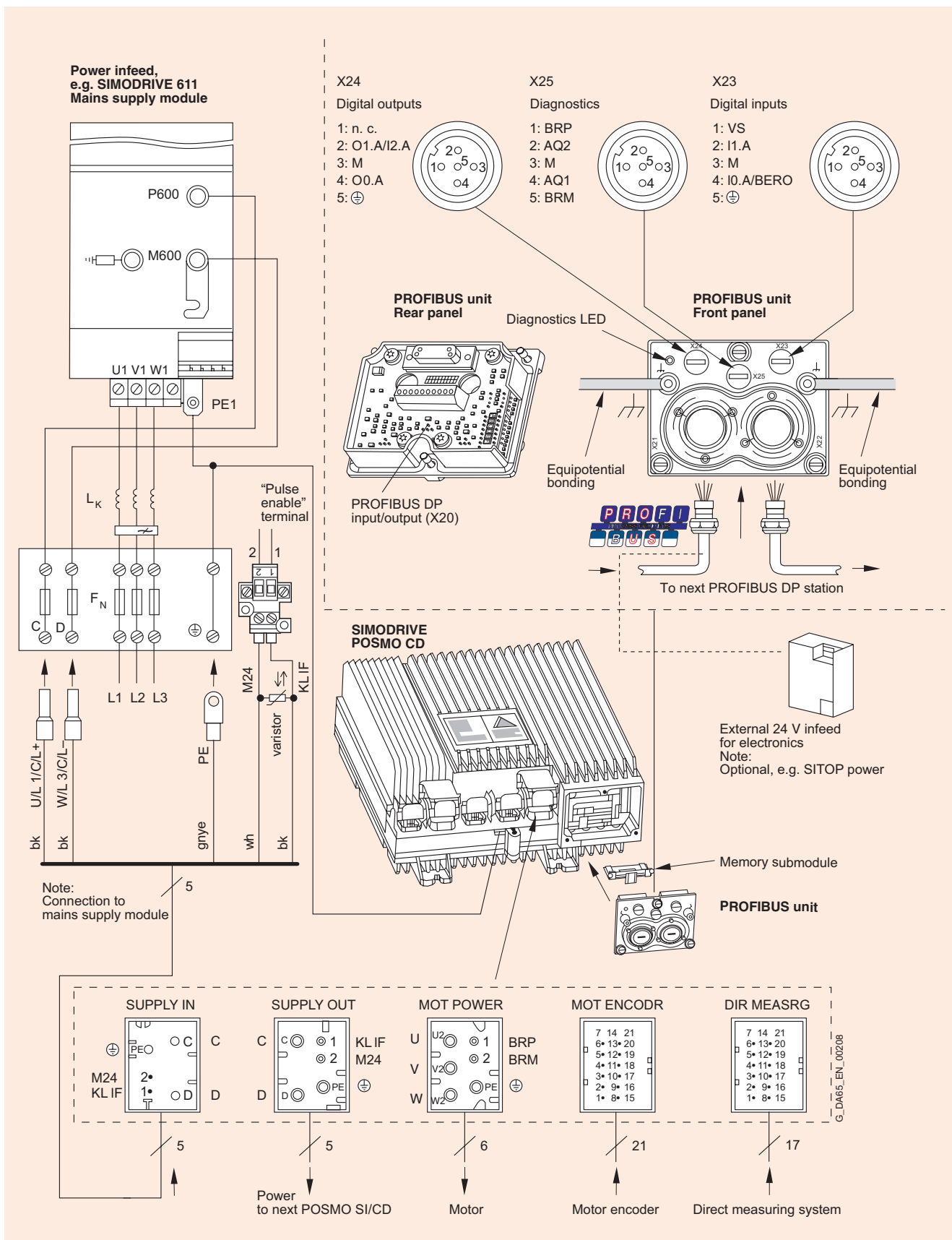
1) When 1FN3 motors are used, instead of the brake, the motor PTCs are connected in series to sw (1) and ws (2).

SIMODRIVE 611 universal and POSMO

Planning guide

SIMODRIVE POSMO CD/CA, SI System overview and requirements

Connection overview for SIMODRIVE POSMO CD



Connection overview for SIMODRIVE POSMO CD

Power terminal wiring for SIMODRIVE POSMO CD

Connector Designation	Function	Type ¹⁾	Technical data
SUPPLY IN	Power input		Preassembled cable for wiring (Order No.): • 6FX1002-5DA65-1□□□
C	DC link voltage P600	V	Permissible DC link voltage range
D	DC link voltage M600	V	400 V ... 750 V DC

Note:

A safe electrically isolated voltage 24 V (1P24) ±2% is generated from the DC link voltage. The following are connected to this voltage:

- Motor brake
- Digital outputs
- Supply for digital inputs (e.g. for BERO)

DC link terminal:

- to SIMODRIVE 611
- to SIMOVERT MASTERDRIVES

Warning:

The DC link coupling has a safety protective interlocking function that is intended to provide protection against residual voltages. This can only be opened by qualified personnel using a suitable tool, e.g. screwdriver. The DC link connection must not be disconnected until 4 minutes after the power supply has been switched off!

⊕	Conductor PE	V	
–	Spare		
1	Terminal "Pulse enable" (KL IF)	I	Voltage tolerance (including ripple): 21 V ... 30 V
2	Reference potential for KL IF (M24)	V	Current consumption typical: 1.4 mA at 24 V Max.: 2.0 mA at 30 V

Note:

The terminal "Pulse enable" acts on all axes operated on a line.

Connection conditions:

- Connect up KL IF (e.g. 24 V at 1; 0 V at 2)
- Pulse enable via PROFIBUS control word
- Varistor

To maintain the limit values according to EN 61000-6-2 (line cable lengths > 30 m (98.4 ft)), the SIOV-S20-K25 varistor from EPCOS must be used between these terminals.

SUPPLY OUT	Power output		Preassembled cable for wiring to additional POSMO SI (Order No.): • 6FX1002-5DA35-1□□□ to additional POSMO SI or POSMO CD: • 6FX1002-5DA15-1□□□
C	DC link voltage P600	V	The DC link voltage, PE conductor and "Pulse enable" terminal are wired to the next POSMO SI/CD
D	DC link voltage M600	V	
⊕	Conductor PE	V	Important! In the last station, the blanking cover must remain on the SUPPLY OUT connector to safeguard the protection type!
–	Spare		
1	Terminal "Pulse enable" (KL IF)	O	
2	Ref. potential for KL IF (M24)	V	

Warning:

The DC link coupling has a safety protective interlocking function that is intended to provide protection against residual voltages. This can only be opened by qualified personnel using a suitable tool, e.g. screwdriver. The DC link connection must not be disconnected until 4 minutes after the power supply has been switched off!

Motor connection wiring for SIMODRIVE POSMO CD

Connector Designation	Function	Type ¹⁾	Technical data
MOT POWER	Motor output		Preassembled cable for wiring (Order No.): • 1FT6/1FK7 motor – 6FX1002-5DA01-1□□□ – 6FX1002-5DA02-1□□□ – 6FX1002-5DA03-1□□□ – 6FX1002-5DA85-1□□□
U2	Motor voltage <i>U</i>	O	• Terminal box connection for 1PH motor – 6FX1002-5CA16-1□□□ – 6FX1002-5CA23-1□□□ – 6FX1002-5CA31-1□□□ – 6FX1002-5CA32-1□□□
V2	Motor voltage <i>V</i>	O	
W2	Motor voltage <i>W</i>	O	
⊕	Conductor PE	V	
1	Brake + (BRP)	O	Information regarding the "brake" output Voltage tolerance: 22.8 A ... 25.2 V max. output current: 1.4 A
2	Brake – (BRM)	O	

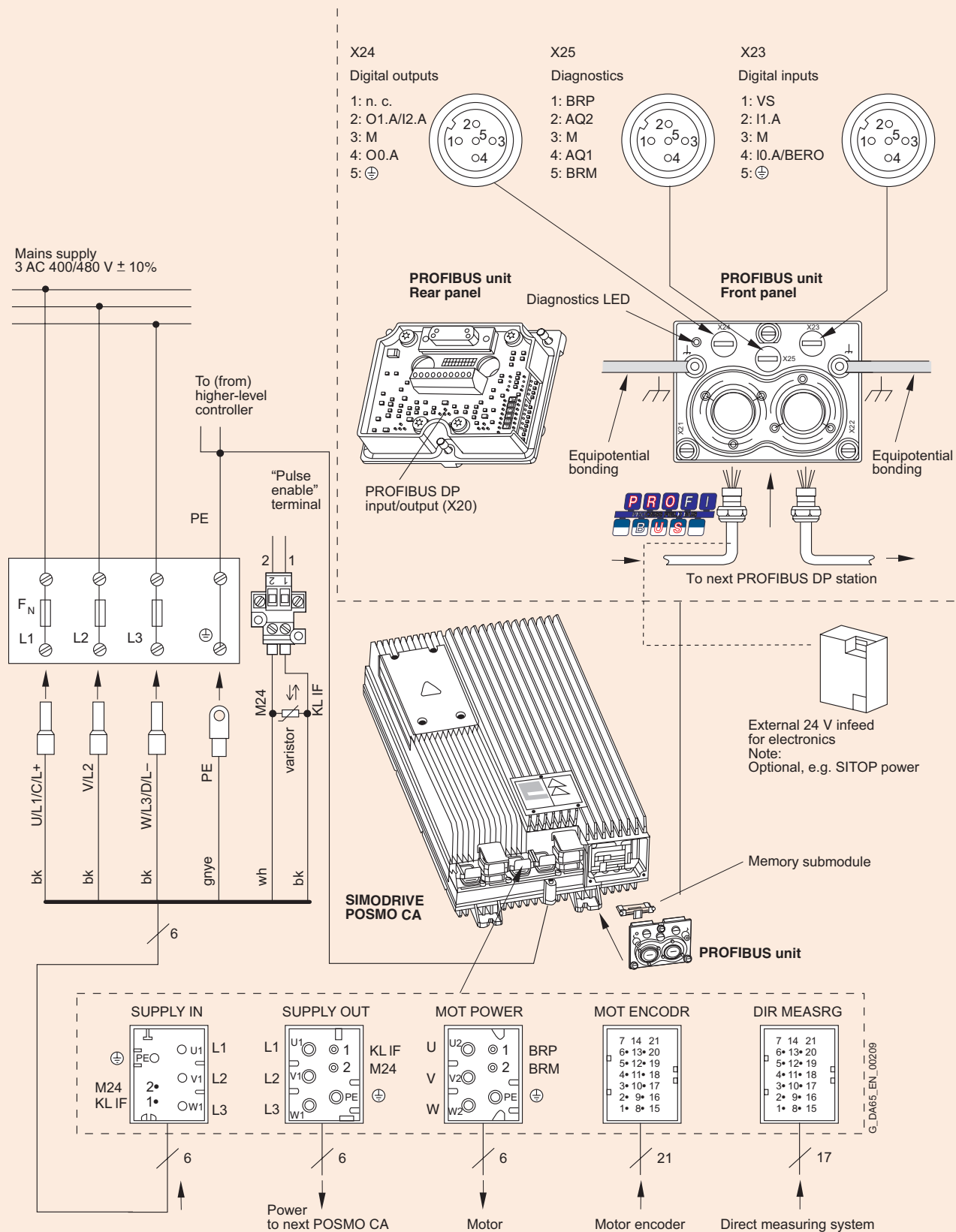
1) I: Input; V: Supply; O: Output

SIMODRIVE 611 universal and POSMO

Planning guide

SIMODRIVE POSMO CD/CA, SI System overview and requirements

Connection overview for SIMODRIVE POSMO CA



Connection overview for SIMODRIVE POSMO CA

Power terminal wiring for SIMODRIVE POSMO CA

Connector Designation	Function	Type ¹⁾	Technical data
SUPPLY IN	Power input		Preassembled cable for wiring (Order No.): • 6FX1002-5DA75-1□□□
L1	Mains voltage	V	Supply voltage: (3 AC 400/480 V) ± 10%
L2	Mains voltage	V	
L3	Mains voltage	V	
⊕	Conductor PE	V	
1	Terminal "Pulse enable" (KL IF)	I	Voltage tolerance (including ripple): 21 V ... 30 V
2	Reference potential for KL IF (M24)	V	Current consumption typical: 1.4 mA at 24 V max.: 2.0 mA at 30 V

Note:

The terminal "Pulse enable" acts on all axes operated on a line.

Connection conditions:

- Connect up KL IF (e.g. 24 V at 1; 0 V at 2)
- Pulse enable via PROFIBUS control word
- Varistor:

To maintain the limit values according to EN 61000-6-2 (line cable lengths > 30 m (98.4 ft)), the SIOV-S20-K25 varistor from EPCOS must be used between these terminals.

Note:

A safe electronically isolated voltage 24 V (1P24) ±2% is generated from the internal DC link voltage. The following are connected to this voltage:

- Motor brake
- Digital outputs
- Supply for digital inputs (e.g. for BERO)

SUPPLY OUT	Power output		Preassembled cable for wiring to additional POSMO CA (Order No.): • 6FX1002-5DA45-1□□□
L1	Mains voltage	V	The mains voltage, PE conductor and "Pulse enable" terminal are wired to the next POSMO CA.
L2	Mains voltage	V	
L3	Mains voltage	V	
⊕	Conductor PE	V	Important! In the last station, the blanking cover must remain on the SUPPLY OUT connector to safeguard the protection type!
–	Spare		
1	Terminal "Pulse enable" (KL IF)	O	
2	Reference potential for KL IF (M24)	V	

Warning:

The mains supply connection has a safety protective interlocking function that is intended to provide protection against residual voltages. This can only be opened by qualified personnel using a suitable tool, e.g. screwdriver. The mains supply connection must not be disconnected until 4 minutes after the power supply has been switched off!

Motor connection wiring for SIMODRIVE POSMO CA

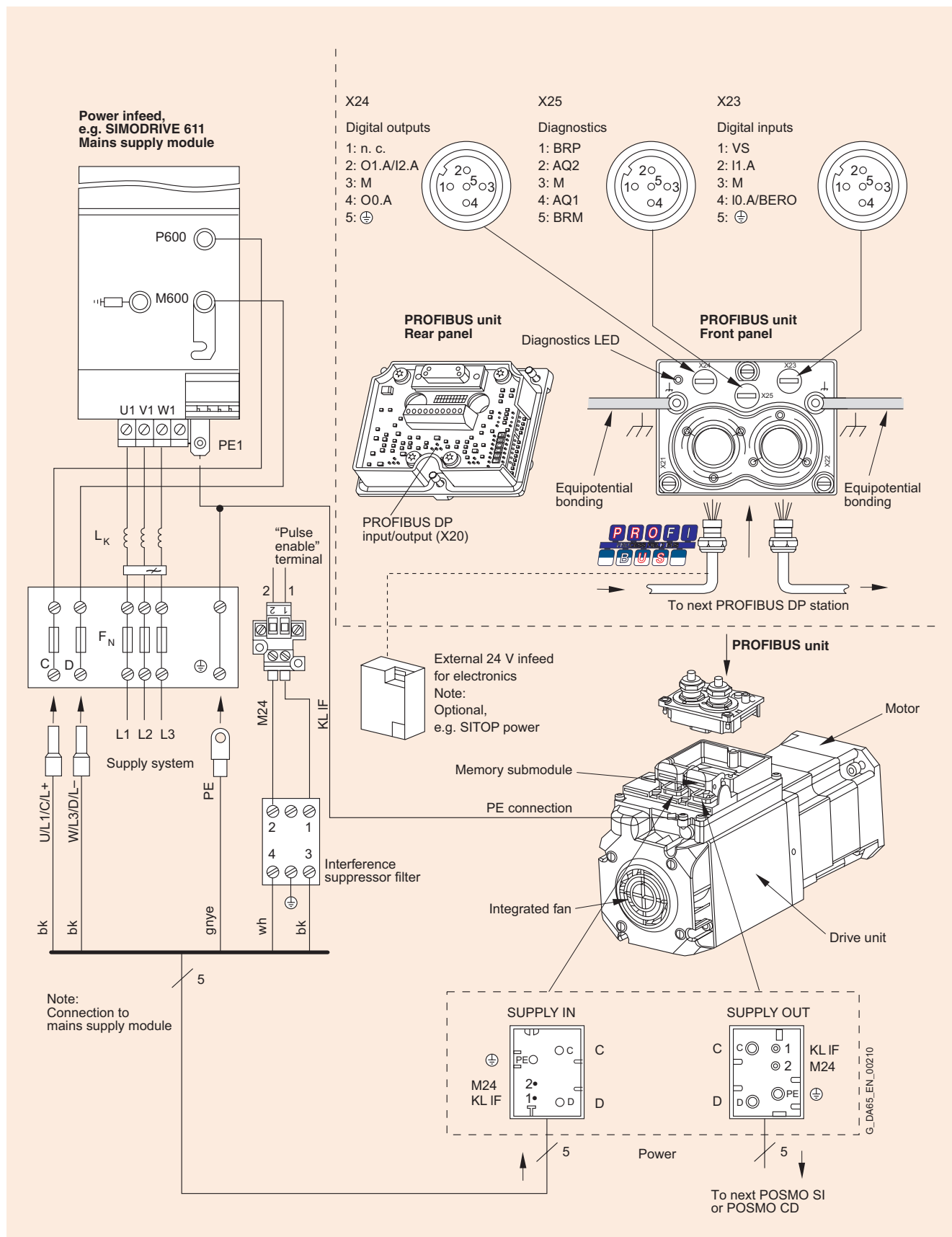
Connector Designation	Function	Type ¹⁾	Technical data
MOT POWER	Motor output		Preassembled cable for wiring (Order No.):
U	Motor voltage <i>U</i>	O	• 1FT6/1FK7 motor – 6FX1002-5DA01-1□□□ – 6FX1002-5DA02-1□□□ – 6FX1002-5DA03-1□□□ – 6FX1002-5DA85-1□□□
V	Motor voltage <i>V</i>	O	
W	Motor voltage <i>W</i>	O	
⊕	Conductor PE	V	• Terminal box connection for 1PH motor – 6FX1002-5CA16-1□□□ – 6FX1002-5CA23-1□□□ – 6FX1002-5CA31-1□□□ – 6FX1002-5CA32-1□□□
1	Brake + (BRP)	O	
2	Brake – (BRM)	O	

Information regarding the "brake" output

Voltage tolerance: 22.8 A ... 25.2 V
max. output current: 1.4 A

1) I: Input; V: Supply; O: Output

Connection overview for SIMODRIVE POSMO SI



Power terminal wiring for SIMODRIVE POSMO SI

Connector Designation	Function	Type ¹⁾	Technical data
SUPPLY IN	Power input		Preassembled cable for wiring (Order No.): • 6FX1002–5DA55–1□□□ or • 6FX1002–5DA65–1□□□
C	DC link voltage P600	V	Permissible DC link voltage range 400 V ... 750 V DC
D	DC link voltage M600	V	
Note: A safe electrically isolated voltage 24 V (1P24) ±2% is generated from the DC link voltage. The following are connected to this voltage: • Motor brake • Digital outputs • Supply for digital inputs (e.g. for BERO) DC link terminal: • to SIMODRIVE 611 • to MASTERDRIVES Warning: The DC link coupling has a safety protective interlocking function that is intended to provide protection against residual voltages. This can only be opened by qualified personnel using a suitable tool, e.g. screwdriver. The DC link connection must not be disconnected until 4 minutes after the power supply has been switched off!			
⊕	Conductor PE	V	
–	Spare		
1	Terminal "Pulse enable" (KL IF)	I	Voltage tolerance (including ripple): 21 V ... 30 V
2	Reference potential for KL IF (M24)	V	Current consumption typical: 1.4 mA at 24 V max.: 2.0 mA at 30 V
Note: The terminal "Pulse enable" acts on all axes operated on a line. Connection conditions: • Connect up KL IF (e.g. 24 V at 1; 0 V at 2) • Pulse enable via PROFIBUS control word Terminal "Pulse enable" (KL IF) Note: Additional connection conditions: • Interference suppression filter An interference suppression filter, which is connected with PE using a short connecting cable (<15 cm (5.9 in)) must be used to increase the immunity against transient interference and disturbances (burst). The interference suppression filter is provided with the unit.			
SUPPLY OUT	Power output		Preassembled cable for wiring to additional POSMO SI (Order No.): • 6FX1002–5DA05–1□□□ or • 6FX1002–5DA35–1□□□ Preassembled cable for connecting to an additional POSMO SI or POSMO CD (Order No.): • 6FX1002–5DA15–1□□□ or • 6FX1002–5DA25–1□□□
C	DC link voltage P600	V	The DC link voltage, PE conductor and "Pulse enable" terminal are wired to the next POSMO SI/CD
D	DC link voltage M600	V	
⊕	Conductor PE	V	Important! In the last station, the blanking cover must remain on the SUPPLY OUT connector to safeguard the protection type!
–	Spare		
1	Terminal "Pulse enable" (KL IF)	O	
2	Reference potential for KL IF (M24)	V	
Warning: The DC link coupling has a safety protective interlocking function that is intended to provide protection against residual voltages. This can only be opened by qualified personnel using a suitable tool, e.g. screwdriver. The DC link connection must not be disconnected until 4 minutes after the power supply has been switched off!			

1) I: Input; V: Supply; O: Output

Connection of the PROFIBUS unit

Design

Note

For SIMODRIVE POSMO SI, POSMO CD and POSMO CA, the same PROFIBUS unit is used!

- The PROFIBUS signals and I/O signals are connected to the PROFIBUS unit.
- If the communication has to remain operational even when the power supply is switched off, the necessary 24 V supply voltage can be fed in separately. For this purpose, a PROFIBUS cable with additional cores (SIMATIC ET200X accessories) must be used.
- Digital input signals must be connected to X23 and digital output signals must be connected to X24.
- Diagnostic signals are routed to connector X25.
- Connectors X23 ... X25 are in M12 plug-in technology and are supplied fitted with covers.

T functionality

The PROFIBUS unit is designed such that when the PROFIBUS unit is removed, the PROFIBUS segment continues to function correctly.

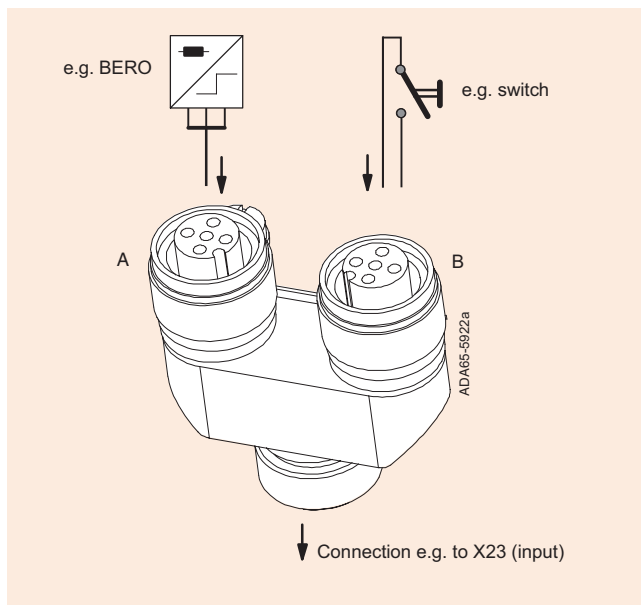
Important

The PROFIBUS unit is only permitted to be plugged in or removed when the power supply is disconnected!

Y connector

If input or output signals from or to different locations are routed to connector X23 or from connector X24, these signals can be distributed onto separate signal leads using a Y connector (for wiring, see Figure).

The Y connection piece is not a component part of the PROFIBUS unit and can be ordered separately under Order No. 6ES7194-1KA01-0XA0.



Y connector

PROFIBUS cabling

Important

The cable shield for each bus station must be connected to ground over as wide an area as possible (at the SIMODRIVE POSMO SI/CD/CA in the metallic M20 cable gland or flange PG).

Recommendation: Route the potential bonding conductor in parallel to the PROFIBUS cable (cable cross-section, 4 to 16 mm²). Two M5 threads are provided for this purpose on the PROFIBUS unit (see "Connection and Wiring Overview")

When using connector couplings for PROFIBUS, at higher data transfer rates (> 1.5 Mbaud), perfect functioning is no longer guaranteed (cable reflection).

Optional 24 V electronics supply

If the bus communication and position sensing are to remain active even with the load power supply switched-out, then an optional electronics power supply, e.g. SITOP power (24 V ± 20%) can be used. The supply cables are routed unshielded in the PROFIBUS cable.

The maximum cable length for an external 24 V supply is determined by the following limitations:

- Maximum current
 - Typical current drain for each POSMO SI/CD/CA from the external 24 V: 600 mA
 - Current loading capability of the 0.75 mm² cable (acc. to IEC 60364-5-52, 40 °C (104 °F), B1): 7.6 A
- Voltage drop along the cable
 - SITOP power: 24 V typ., POSMO SI/CD/CA 19 V min. 5 V voltage drop

The following cable lengths may not be exceeded:

- Max. overall cable length: 100 m (328 ft)

Supplementary conditions:

- The maximum cable length is calculated as $L = 400/x$.
 L = Overall cable length
 x = No. of drives in the cable line
- Max. POSMO SI/CD/CA on a 24 V line: 10

24 V DC, which is generally used in machinery construction, can be used for the power supply.

Note

- The optional 24 V electronics power supply does not supply the digital inputs/outputs and the brake.
- In order to increase the immunity against transient interference and disturbances (burst) and to maintain the limit values of EN 61000-6-2, an interference suppression filter should be connected at the shielded cable entry point using a short connection (< 15 cm (5.9 in)) with respect to PE.
- The interference suppression filter can be ordered with Order No. 6SN2414-2TX00-0AA1.

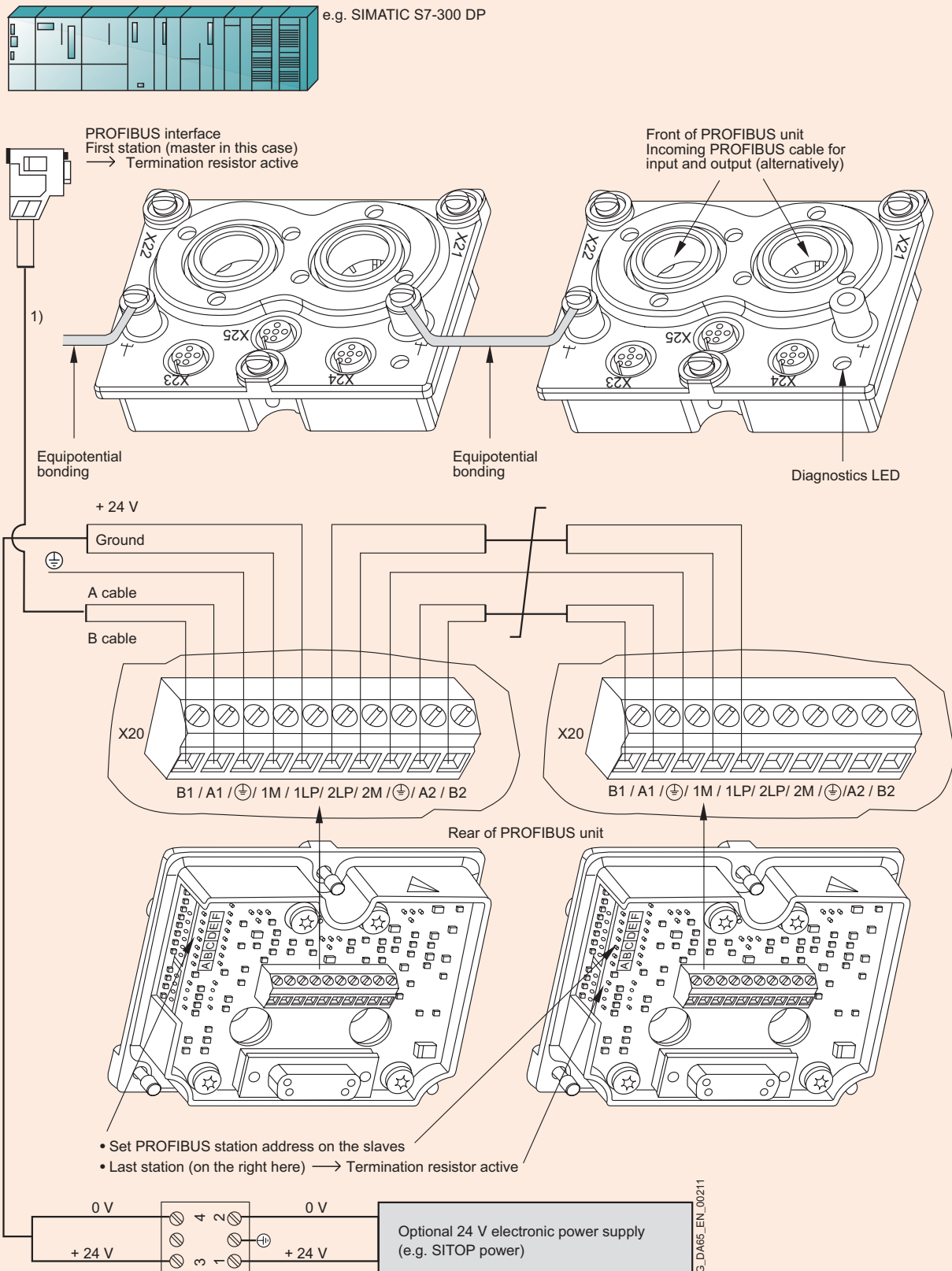
Recommended for the optional power supply:

Use the regulated SITOP power supply module

Grounding, optional 24 V electronics power supply

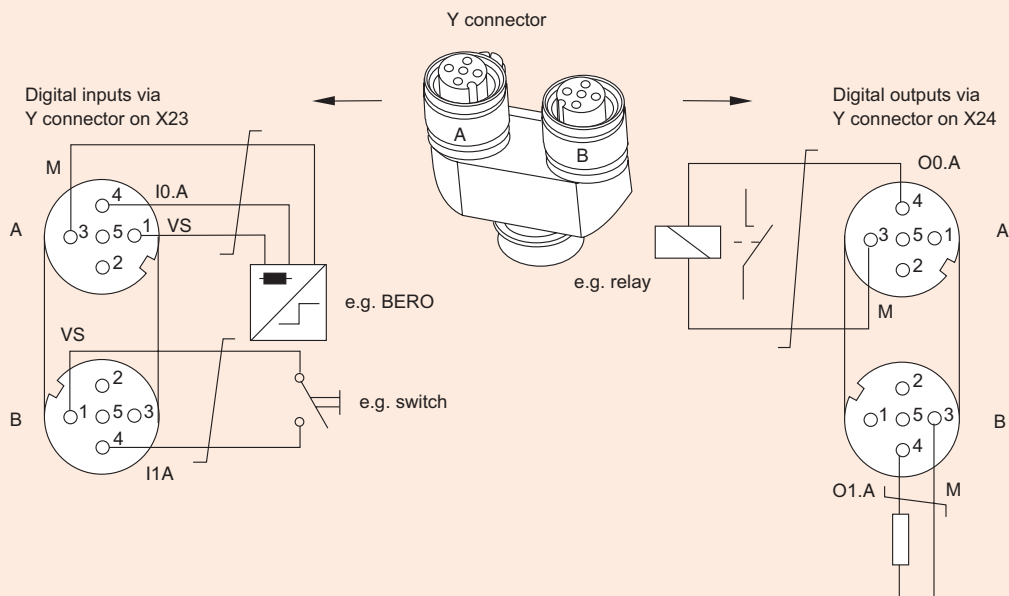
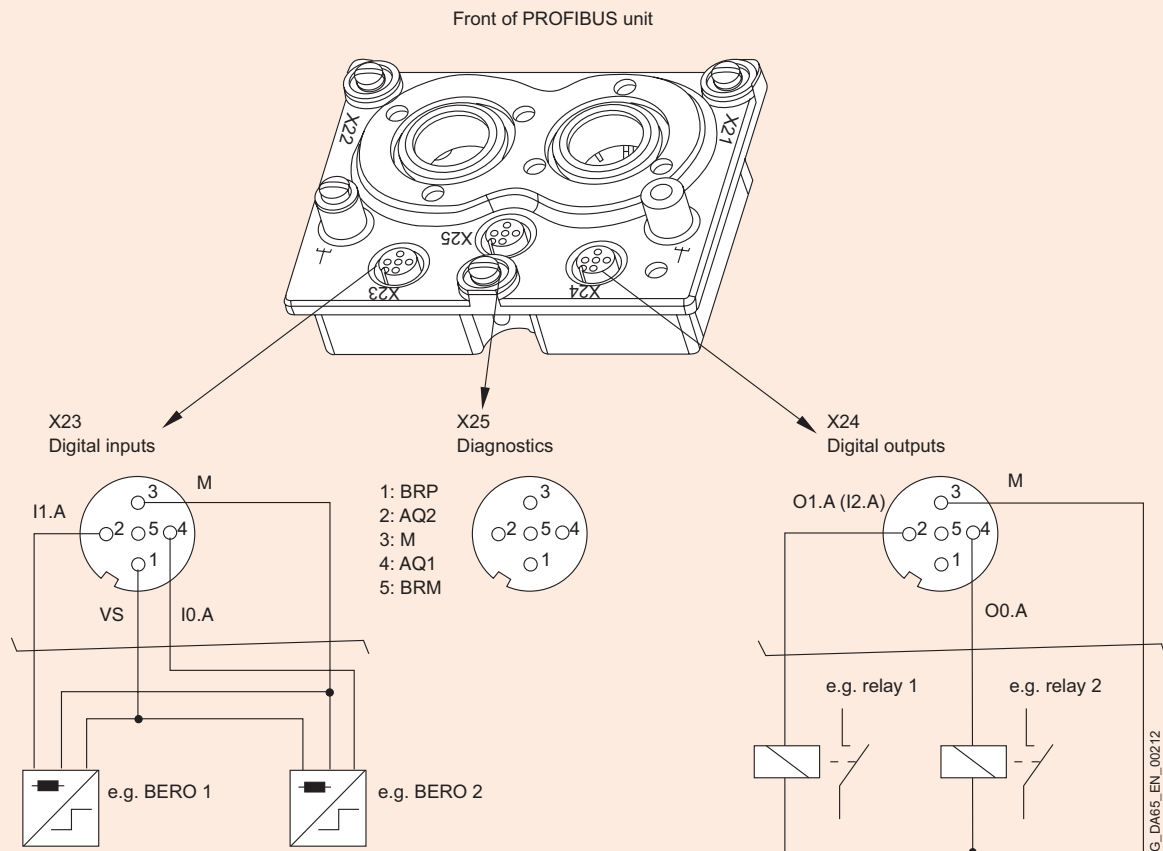
Ground the 24 V electronics power supply on the secondary side in the cabinet.

Connection and wiring overview



Connection and wiring overview with PROFIBUS cable
(example with additional electronics supply)

1) Externally combined into a 5-core PROFIBUS cable.



Terminal assignment

Wiring of the PROFIBUS unit	Terminal designation	Terminal No.	Function	Type ¹⁾	Technical data
PROFIBUS connection Cu PG (X20)					
X20	PROFIBUS input				Connector type: Screw terminal strip (X20)
B1		B-wire for PROFIBUS	I		Note: • Preassembled cable for the wiring including flange PG at both ends (Order No.): - 5-core: 6FX1002-1AA00-1□□□ - 2-core: 6FX1002-4EA00-1□□□ • Preassembled cable for the wiring including flange PG at one end (Order No.): - 5-core: 6FX1002-1AA01-1□□□ - 2-core: 6FX1002-4EA01-1□□□ • Cable, not preassembled, for wiring with an M20 screwed cable gland. • The PROFIBUS cable should be assembled and the cable conductors connected to X20. Note: Slot screwdriver for terminal → Size 0 (0.4 x 2.5) → Tightening torque 0.22 Nm ... 0.25 Nm (1.9 lbf·in ... 2.2 lbf·in) • In the last PROFIBUS station, the blanking cover must remain plugged in to safeguard the protection type! • 24 V input (optional): - To increase immunity to transient interference and disturbances (burst) and to maintain the limit values of EN 61000-4-5, an interference suppression filter should be connected at the shielded cable entry point using a short connection (<15 cm (5.9 in)) to PE. - As well as the necessary 5-core cable, an EMC set (Order No. 6SN2414-2TX00-0AA1), comprising interference suppression filter and mounting instructions, must be ordered.
A1		A-wire for PROFIBUS	I		
⊕		PE conductor	V		
1M		Ground 24 V input	V		
1LP		+ 24 V input	V		
	PROFIBUS output				
2LP		+ 24 V output	V		
2M		Ground 24 V output	V		
⊕		PE conductor	V		
A2		A-wire for PROFIBUS	O		
B2		B-wire for PROFIBUS	O		

Connection of digital inputs and supply (X23)

X23				Connector type:	5-pole M12 connector
				Signal line:	5-core with conductor cross-section ≤ 0.75 mm ²
I0.A	X23.4	Digital input 1 ²⁾ High-speed input ³⁾ e.g. for BERO equivalent zero mark, external block change	DI	Voltage:	24 V
				Current consumption, typ.:	6 mA at 24 V
				Reference potential:	X23.3
				Level (including ripple)	
				High level:	15 V ... 30 V
				Low level:	-3 V ... 5 V
				Signal run time for I0.A:	typical 500 μs
I1.A	X23.2	Digital input 2 ²⁾	DI	Note: An open-circuit input is interpreted as a "0" signal.	
VS	X23.1	+24 V	V	Voltage range:	24 V ±2% (short-circuit proof)
M	X23.3	Ground 24 V input	V	Current load:	max. 100 mA
				Note: This voltage can be used to supply an external BERO.	
⊕	X23.5	PE conductor	V	Not used	

Connection of digital outputs and supply (X24)

X24				Connector type:	5-pole M12 connector
				Signal line:	5-core with conductor cross-section ≤ 0.75 mm ²
O0.A	X24.4	Digital output 1	DO	Rated current per output:	100 mA short-circuit proof
O1.A (I2.A)	X24.2	Digital output 2 (digital input 3, from SW 4.1)	DO DI	Reference potential:	X24.3
				Note: From SW 4.1, digital output 2 can also be optionally parameterized as digital input 3 (I2.A) (P0677 = 1).	
n.c.	X24.1	Not assigned			
M	X24.3	Ground 24 V	V		
⊕	X24.5	PE conductor	V		

Connection of diagnostics DAC and external brake activation (X25)

X25				Connector type:	5-pole M12 connector
				Signal line:	5-core with conductor cross-section ≤ 0.75 mm ²
AQ1	X25.4	Diagnostic output 1 ⁴⁾ (test socket 1)	AO	Resolution:	8 bit
AQ2	X25.2	Diagnostic output 2 ⁴⁾ (test socket 2)	AO	Voltage range:	0 V ... 5 V
				Max. current:	3 mA
				No electrical isolation:	Reference is X25.3
BRP	X25.1	Brake signal BRP	I	Note: The motor holding brake can be ventilated during servicing via an external 24 V power supply on BRP/BRM.	
M	X25.3	Ground 24 V	V		
BRM	X25.5	Brake signal BRM	I	Voltage:	24 V ±10%
				Current input:	1.3 A at 24 V (max) ⁵⁾

1) I: Input; DI: Digital input; DO: Digital output;
AO: Analog output; V: Supply.

2) Can be freely parameterized.

All of the digital inputs are debounced per software. The signal recognition results in a delay time of interpolation clock cycles (P1010).

3) I0.A is hardwired internally to the position sensing function where it acts almost instantaneously.

4) Freely parameterizable.

The digital inputs are updated in the interpolation clock cycle (P1010). This is supplemented by a hardware-related delay time of approx. 200 μs.

5) Dependent on the brake type.

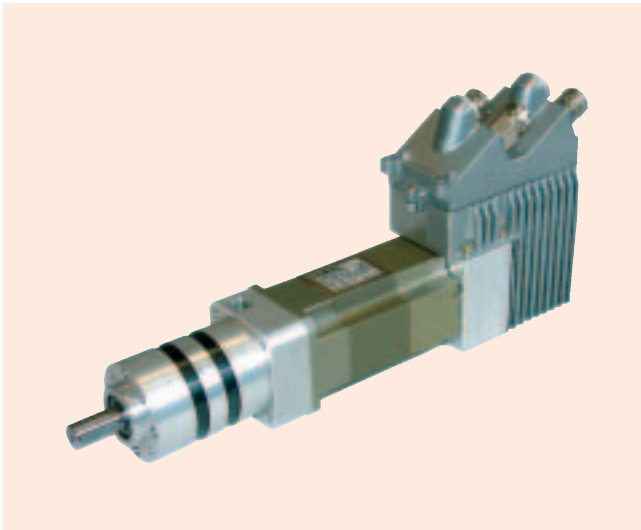
Overview



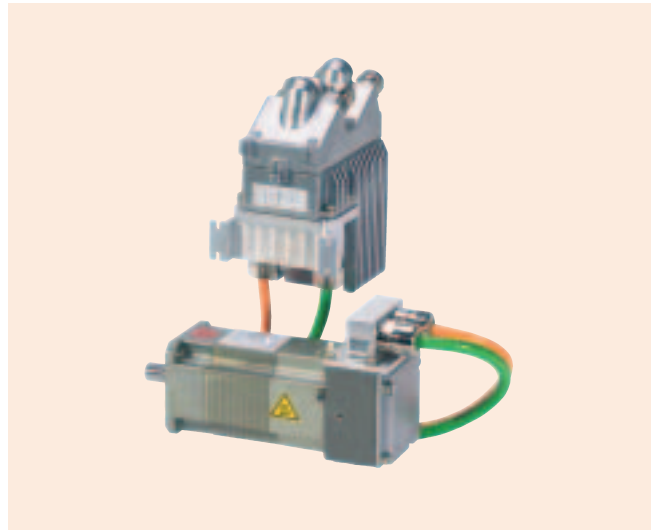
SIMODRIVE POSMO A 75 W (0.1 HP)



SIMODRIVE POSMO A 75 W (0.1 HP) SIPLUS



SIMODRIVE POSMO A 300 W (0.4 HP) with gearbox



SIMODRIVE POSMO A 300 W (0.4 HP), drive unit separated from motor

Intelligent positioning motor as distributed node on PROFIBUS DP with the following features:

- Power section and complete motion control in the motor
- Connection via communication and power bus

Benefits

- Simplification of the machine structure thanks to connection via the communications bus and power bus
- Simple communication interface for integration in any PROFIBUS environment. Uses only the basic PROFIBUS services.
- 2 Terminals (programmable as either inputs or outputs) for monitoring or controlling external drive-related signals, such as clamping and limit switches
- User-friendly function blocks simplify configuring with STEP 7 in the SIMATIC world
- Easy startup with clear, user-friendly commissioning tool SimoCom A
- TIA conformity through Drive ES.
Therefore uniform
 - Communication
 - Configuring
 - Data management

Application

- Positioning of formats, stops and tools
- Resetting of process variables (e.g. via valves)
- Simple positioning tasks in the handling sector

Areas of application are found wherever simple positioning tasks must be solved on a decentralized basis on the machine or in the plant, without taking up additional space in the control cabinet and having to accommodate for the associated power losses. Flexible retrofitting of axes is possible without having to extend the control cabinet.

Design

Compact mounting of converter power section, motor control, encoder, holding brake (300 W (0.4 HP)), positioning control, program memory, and communications interface on the motor.

The motor can be equipped with a modular gearbox with graduated planetary gearbox (one gearbox per motor) or worm gearbox (75 W (0.1 HP)).

- The removable terminal cover with integrated PROFIBUS address switch and terminating resistor makes it possible to disconnect the motor without any interruption to communication or power supply of additional stations.
- All connections are made using standard cables
- Local diagnostics via LED (fault/ready), plus two diagnostic socket connectors (parameterizable analog outputs) for service purposes.
- Separate variant can be supplied for 300 W (0.4 HP) SIMODRIVE POSMO A for confined spaces. The drive unit is separate from the motor. The power and signal cables required are supplied as a preassembled extension kit.

Function**Software functions**

- Jerk limitation
- Block change on-the-fly
- Set actual value
- Travel to fixed stop
- Backlash compensation
- Software limit switch
- Retentive actual value memory

Single-axis positioning drive

A 24/48 V DC supply voltage, commonly used in machine tools, supplies the drive power. PROFIBUS DP provides the full range of traversing functions, such as:

- **Travel to** (absolute)
End position, with velocity and adjustable acceleration
- **Travel through** (relative)
One path and direction, with velocity and adjustable acceleration
- **Travel with** (controlled speed)
Controlled velocity and adjustable acceleration

Additional links:

- **Travel as soon as**
a time condition or logical condition is satisfied
- **Travel as long as**
a time condition or logical condition is satisfied
- **Travel and signal**
a previously defined byte combination from a particular position
- **Set actual value on-the-fly**
New synchronization of the actual value system (during movement of axis) to a fast input

Additional functions

- Brake management for internal holding brake (300 W (0.4 HP))
- The integral retentive actual value memory provides characteristics similar to those of an absolute encoder.

Planning guide

SIMODRIVE POSMO A System overview and requirements

Drive system with SIMODRIVE POSMO A

The components shown in the Figure below are available together with the SIMODRIVE POSMO A positioning motor to build a complete drive system.

The following requirements must be observed:

- The PROFIBUS DP link is realized in conformance with the norm. A standard PROFIBUS cable can be used. In order to loop-in the optional electronics power supply, the same bus cable can be used as is used in the distributed ET 200X I/O station.

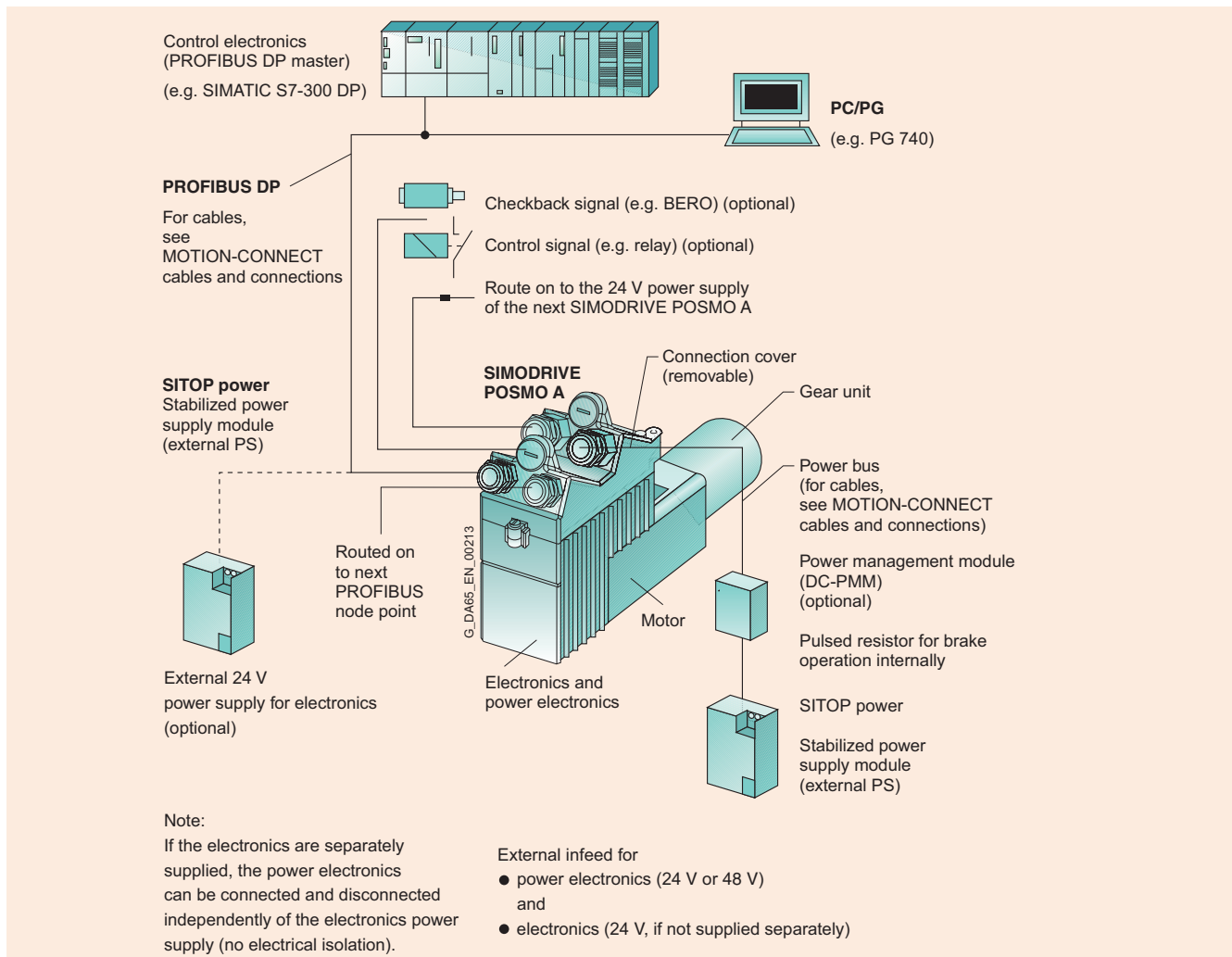
Note

- When using connector couplings for PROFIBUS, at higher data transfer rates (> 1.5 Mbaud), perfect functioning is no longer guaranteed (cable reflection).
- An external +24 V power supply unit must be provided (voltage range: $24\text{ V} \pm 20\%$) for POSMO A 75 W (0.1 HP) and $48\text{ V} \pm 20\%$ for POSMO A 300 W (0.4 HP). With POSMO A 300 W (0.4 HP), operation is possible at 24 V DC with derating. This is, however, subject to the condition that the applied voltage is greater than 24 V when the integrated holding brake is used.
- The maximum conductor cross-section for the 24/48 V load power supply is 4 mm^2 . If the power supply unit is able to supply a higher current than is permitted for the respective cable, suitable fuses must be provided.

- A Power Management Module (PMM) can be optionally connected between the external load power supply and input terminals of SIMODRIVE POSMO A. The PMM is used to dissipate the regenerative feedback energy.
- If bus communications and position sensing are to remain active even with the load power supply switched off, an optional electronics power supply can be connected ($24\text{ V} \pm 20\%$). The cable is routed in the ET 200X bus cable (distributed I/O system).
- A BERO can only be connected as a three-wire PNP type.
- All the power supplies must have "protective separation".
- When using SIMODRIVE POSMO A in UL-approved plants and systems, a UL-approved varistor must be used in the 24 V supply cable; it must have the following characteristic data:
24 V: $V_{\text{rated}} = 31\text{ V DC}$, $I_{\text{max}} = 2000\text{ A}$
e.g. SIOV-S20-K25 from EPCOS
48 V: $V_{\text{rated}} = 65\text{ V DC}$, $I_{\text{max}} = 6500\text{ A}$
e.g. SIOV-S20-K50 from EPCOS

<http://www.epcos.com>

When the Power Management Module (PMM) is used, a varistor is not necessary since it is part of the PMM.



System overview

DC power supply (24 V, 48 V)**Power supply sizing**

The load power supply must be engineered in accordance with the number of SIMODRIVE POSMO A positioning motors and the coincidence factor.

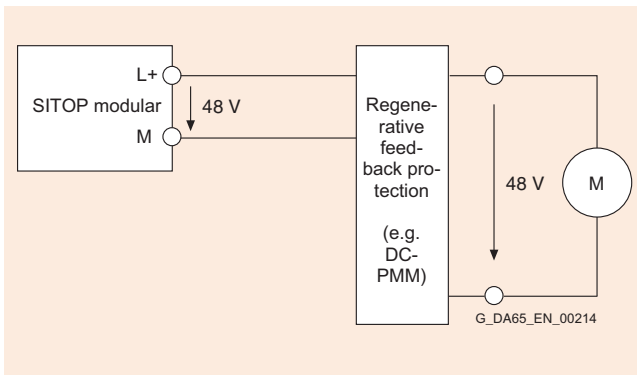
24 V supply (75 W (0.1 HP) motor)**Recommendations for the 24 V power supply:**

We recommend that a regulated SITOP power supply module is used for the 24 V load power supply.

5 A, 10 A, 20 A and 40 A modules are available.

48 V supply (300 W (0.4 HP) motor)**First recommendation for the 48 V power supply:**

Use a regulated SITOP modular 48V/20A power supply module to provide the 48 V load power supply. The SITOP 48 V/20 A power supply is a chassis unit.

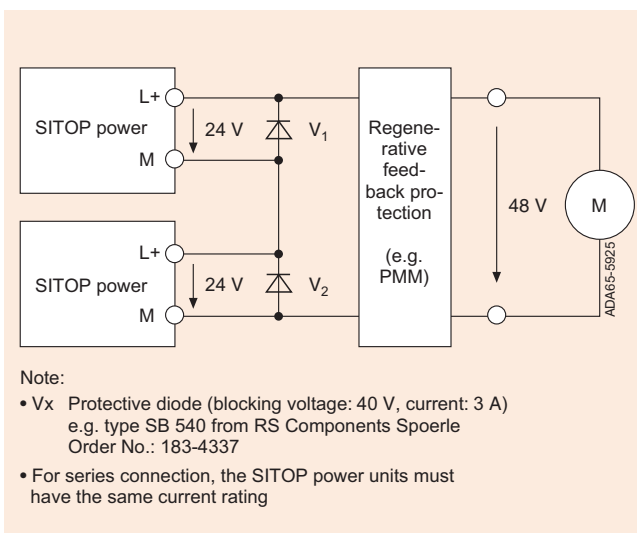


SITOP modular 48 V/20 A with regenerative feedback protection

Second recommendation for the 48 V power supply:

Use two SITOP power regulated power supply modules connected in series to provide the 48 V load power supply.

There are units with current ratings of 10 A, 20 A and 40 A.



Series connection of two SITOP power units to double the voltage

Our third recommendation for the 48 V power supply:

Use a rectifier unit to generate the 48 V load power supply.

The rectifier unit is an unregulated DC supply with a safety transformer and varistor connection.

Applicable specifications

- EN 61558, EN 61131-2
- Conducted immunity EN 50082-2, interference emission EN 50081-1
- Suitable for connection to public or industrial supply systems in accordance with EN 61000-3-2/3-3

Installation conditions

- Upright mounting position
- Installation altitude up to 1000 m (3282 ft) above sea level
- M6 screw mounting on angle bracket
- Rooms with outdoor climate acc. to DIN 50010
- Ambient temperature -25°C (-13°F) to $+40^{\circ}\text{C}$ ($+104^{\circ}\text{F}$)
- Storage temperature -25°C (-13°F) to $+60^{\circ}\text{C}$ ($+140^{\circ}\text{F}$)

Coincidence factor

When several SIMODRIVE POSMO A devices are implemented but are not operated simultaneously, a lower rating load power supply can be used.

However, a brief overload capability of the power supply must be guaranteed. Otherwise the electronics of the SIMODRIVE POSMO A would interpret voltage dips as an undervoltage condition and trip.

- Example 1:
3 SIMODRIVE POSMO A – 75 W (0.1 HP)
- Coincidence factor = 1
- Rated output, full speed
→ $3 \times 4.5 \text{ A} \times 1 = 13.5 \text{ A}$
→ SITOP power 20 A
- Example 2:
3 SIMODRIVE POSMO A – 75 W (0.1 HP)
- Coincidence factor = 0.7
(not all units are simultaneously operating)
- Rated output, full speed
→ $3 \times 4.5 \text{ A} \times 0.7 = 9.45 \text{ A}$
→ SITOP power 10 A
- Example 3:
3 SIMODRIVE POSMO A – 300 W (0.4 HP)
- Coincidence factor = 1
- Rated output, full speed
→ $3 \times 5.25 \text{ A} \times 1 = 15.75 \text{ A}$
→ SITOP power 20 A
- Example 4:
3 SIMODRIVE POSMO A – 300 W (0.4 HP)
- Coincidence factor = 0.5
(not all units are simultaneously operating)
- Rated output, full speed
→ $3 \times 5.25 \text{ A} \times 0.5 = 7.875 \text{ A}$
→ SITOP power 10 A
- Example 5:
4 SIMODRIVE POSMO A – 300 W (0.4 HP)
- Coincidence factor = 1
- Rated output, full speed
→ $4 \times 5.25 \text{ A} \times 1 = 21 \text{ A}$
→ 48 V transformer 4AV3596

Planning guide

SIMODRIVE POSMO A System overview and requirements

Regenerative feedback protection for motor braking

Regenerative feedback protection

If SIMODRIVE POSMO A is used in a plant or system with low mechanical friction, the electrical power regenerated when braking can increase the level of the load power supply.

In such cases, regenerative feedback protection must be used.

The type of regenerative feedback protection used depends on the following factors:

- Coincidence factor in the line
- Number of positioning motors operated on one line
- Efficiency of the existing mechanical system
- Existing friction
- The moments of inertia

Braking energy

The following typical braking energy per drive is generated under the specified conditions:

- Conditions
 - Braking from rated speed in S3 duty
 - Effective overall moment of inertia = 1 motor moment of inertia
- Braking energy
 - 1.0 Ws for SIMODRIVE POSMO A – 75 W (0.1 HP)
 - 2.5 Ws for SIMODRIVE POSMO A – 300 W (0.4 HP)

The effective overall moment of inertia and the braking energy are related linearly, i.e. if the moment of inertia doubles, the braking energy is doubled when the motor brakes.

Rules for feedback protection

The following rules must be observed for regenerative feedback protection:

- If a switched load power supply is used (e.g. SITOP power), regenerative feedback protection is necessary.
- If the regenerative feedback power is not known, regenerative feedback protection must be used.
- If one Power Management Module (PMM) is not sufficient for converting the braking energy, another supply line complete with an additional PMM is necessary.

Regen. feedback protection for 24 V supply (75 W motor)

Depending on the type of power supply used, the following methods can be used for feedback protection during motor braking:

Unstabilized 24 V power supply (transformer, rectifier)

The type of regenerative feedback protection used depends on the following factors:

- Effective overall moment of inertia
- Coincidence factor
- Power supply used (output capacitance)

Stabilized 24 V power supply (SITOP power)

- Regenerative feedback protection with diode and capacitor

An example is shown in the Figure for which operation with up to 3 drives is possible under the following conditions:

 - Eff. overall moment of inertia = 1 motor moment of inertia
 - Coincidence factor = 1
 - Braking from rated speed in S3 duty

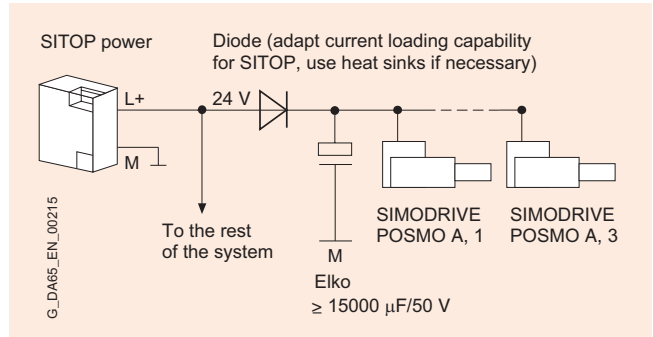
- Regenerative feedback protection with Power Management Module DC 24 V (DC PMM/24 V)

1 DC PMM/24 V can accept a braking energy of 10 Ws.

Example:

- 3 motors each with a braking energy of = 1.0 Ws
- Maximum continuous current-carrying capacity = 25 A
- Coincidence factor = 1

→ A maximum of 5 POSMO A – 75 W (0.1 HP) can be operated on 1 DC PMM/24 V.



Example: Regenerative feedback protection with diode and capacitor

Regen. feedback protection for 48 V supply (300 W motor)

Depending on the type of power supply used, the following methods can be used for feedback protection during motor braking:

Unstabilized 48 V power supply (transformer, rectifier)

The type of regenerative feedback protection used depends on the following factors:

- Effective overall moment of inertia
- Coincidence factor
- Power supply used (output capacitance)

Stabilized 48 V power supply (SITOP power)

- Regenerative feedback protection with diode and capacitor

An example is shown in the Figure for which operation with up to 3 drives is possible under the following conditions:

- Eff. overall moment of inertia = 1 motor moment of inertia
- Coincidence factor = 1
- Braking from rated speed in S3 duty

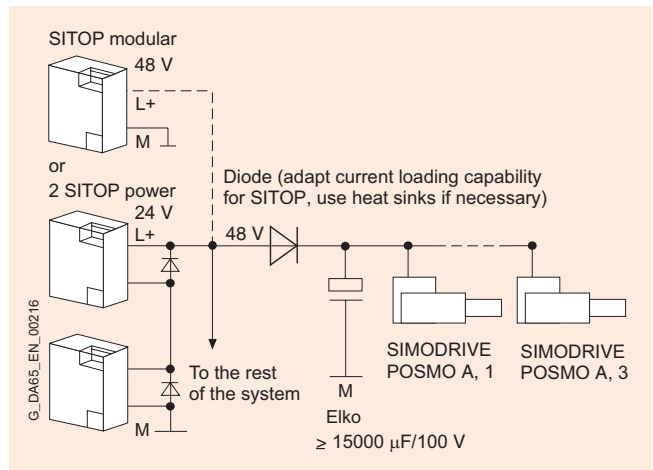
- Regenerative feedback protection with Power Management Module DC 48 V (DC PMM/48 V)

1 DC PMM/48 V can accept a braking energy of 115 Ws.

Example:

- 3 motors each with a braking energy of = 4.5 Ws
- Maximum continuous current-carrying capacity = 25 A
- Coincidence factor = 1

→ A maximum of 3 POSMO A – 300 W (0.4 HP) can be operated on 1 DC PMM/48 V.



Example: Regenerative feedback protection with diode and capacitor

Power Management Module (DC PMM 24V/48 V)**Overview**

For operating SIMODRIVE POSMO A on stabilized power supplies with output voltages of 24 V DC or 48 V DC, e. g. SITOP power.

The DC PMM/24 V/48 V is required when one or more SIMODRIVE POSMO A regenerate so much energy through simultaneous braking that this results in an impermissible voltage overshoot on the infeed side (e.g. due to high coincidence factor).

The module is installed between the load power supply and the first SIMODRIVE POSMO A, and converts the regenerated energy into heat.

For further dissipation of the feedback energy, the Power Management Module Extension (PMME) can be used as an extension to the DC PMM/48 V Power Management Module.

The maximum permissible number of positioning motors that can be connected to a module is dependent on the load rating, the coincidence factor of the feedback and the feedback energy.

The feedback energy is calculated for a drive as follows:

$$W = \frac{1}{2} \times J \times \omega^2$$

W : Braking energy
[Ws = (kgm²/s²)]

J : Inertia
[kgm²]

ω : Angular frequency = $2 \times \pi \times n / 60$
[s⁻¹]

Function

- Feedback protection for the load power supply
At overvoltage, the PMM recognizes the braking operation being carried out by the positioning motor and converts the recovered energy from the motor into heat via an internal pulsed resistor.
- An integrated R^2t monitoring protects the pulsed resistor from thermal overload and destruction.
- Diagnostic signal/display
 - Contact assemblies (changeover contact) on the PMM serve as signaling or monitoring contacts for the operating states "Ready" and "Fault"
 - The operating states are displayed via LED.

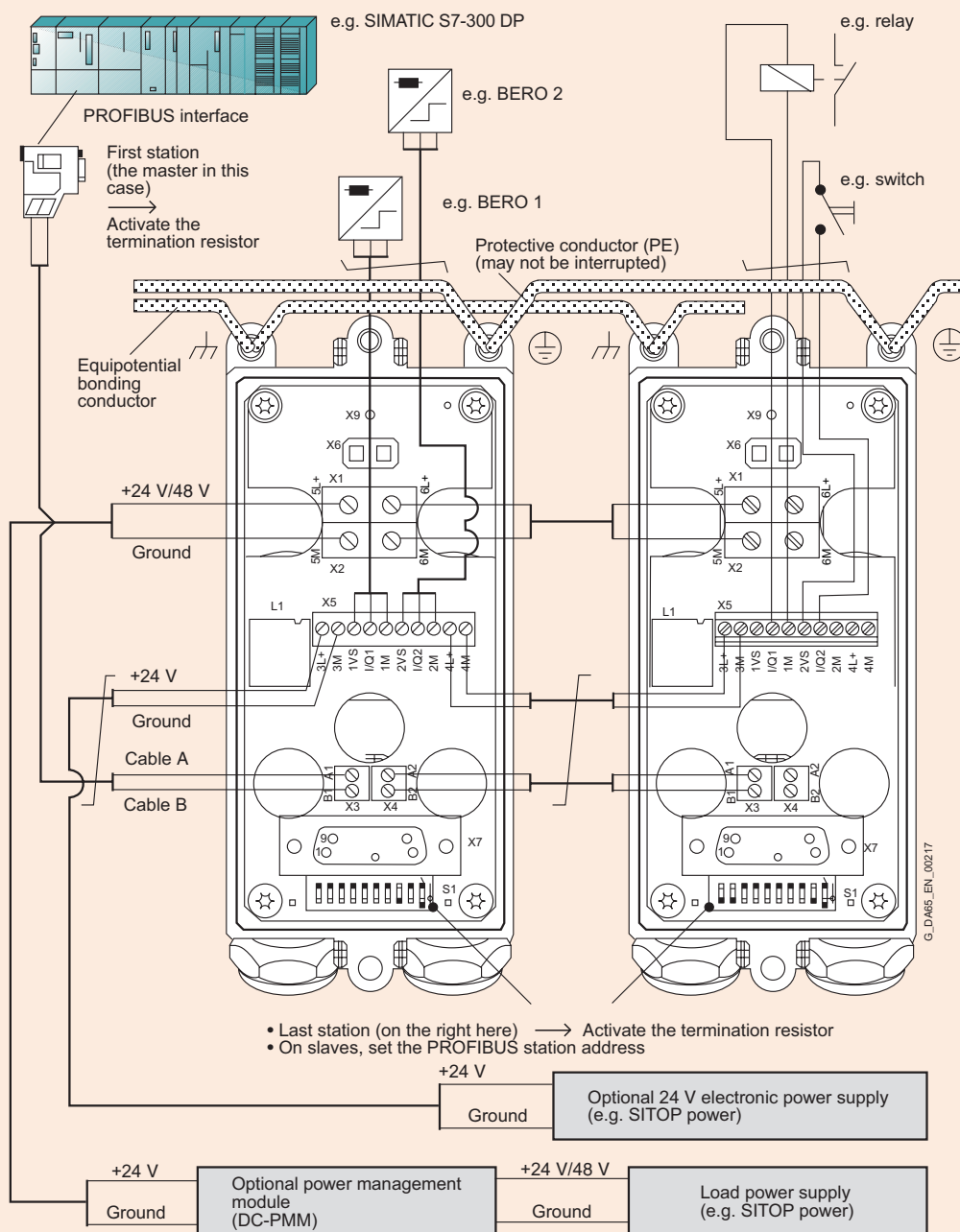


Power Management Module

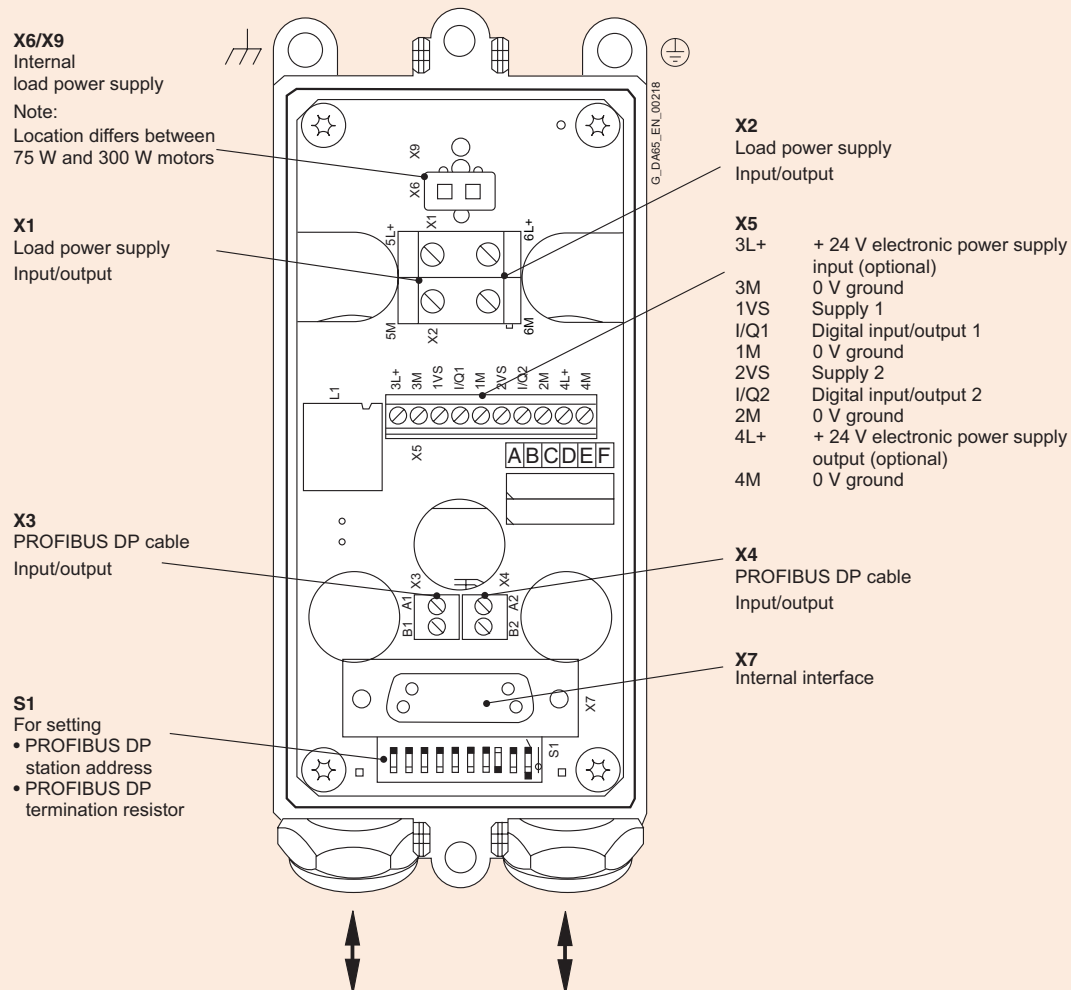
Connection and wiring overview

The connection of the SIMODRIVE POSMO A is completely realized in the terminal cover. This design makes it especially quick and easy to replace a unit. The cover can be released from the old motor (2 screws) and attached to the new motor without having to remove the wiring.

All cables enter through PG glands.



Connection and wiring overview
(example with additional electronics supply)



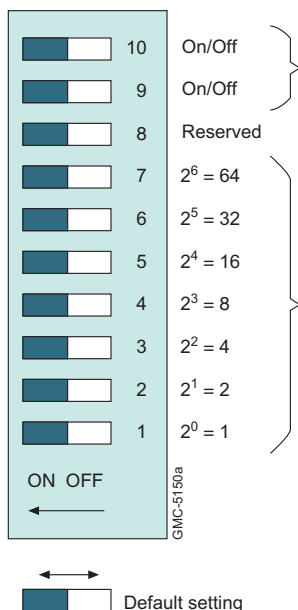
Connections for SIMODRIVE POSMO A

Interfaces, terminals and switches S1

No.	Designation	Function	Type ¹⁾	Technical data	Cross-section
X1		Load power supply		24 V for 75 W motor, 48 V for 300 W motor	max. 4 mm ²
	5L+	+ 24 V/+ 48 V	I/O		
	6L+	+ 24 V/+ 48 V	I/O		
X2	5M	Ground 24 V/48 V	I/O	0 V	
	6M	Ground 24 V/48 V	I/O	0 V	
X3		PROFIBUS DP bus connection			max. 0.35 mm ²
	A1	A cable	I/O	–	
	B1	B cable	I/O	–	
X4		PROFIBUS DP bus connection			max. 0.35 mm ²
	A2	A cable	I/O	–	
	B2	B cable	I/O	–	
X5		Electronic supply (optional)			max. 0.75 mm ²
	3L+	+24 V	I/O	24 V ± 20%	
	3M	Ground 24 V	I/O	Current input: ≤ 250 mA The electronics can be supplied separately with 24 V via these terminals. Advantage: When the load power supply is switched off, the electronics remain supplied and operational.	
	1VS	P24 output	O	• Output (KL Q1 and Q2): - Maximum current/output: 100 mA • Supply (KL VS): - Maximum current/terminal: 100 mA • Input (KL I1 and I2): - Current input: ≤ 15 mA - 24 V ± 20% Typical connections for: • BERO (3-wire PNP) • External relay • Logical I/Os (PLC)	max. 0.75 mm ²
	I/Q1	Input/output terminal 1	I/O		
	1M	M24 output	O		
	2VS	P24 output	O		
	I/Q2	Input/output terminal 2	I/O		
	2M	M24 output	O		
		Electronic supply (optional)			max. 0.75 mm ²
	4L+	+ 24 V	O	24 V ± 20%	
	4M	Ground 24 V	O	The electronics of another unit can be supplied from these terminals.	

1) I: Input, O: Output

No.	Designation	Function	Type ¹⁾	Technical data	Cross-section
X6 X9	–	Internal load power supply	O	Equipment level differs depending on whether it is a 75 W or 300 W motor	–
X7	–	Internal interface	I/O	15-pin Sub-D socket connector	–
		Equipotential bonding conductor (route in parallel with PROFIBUS cable)	I O	0 V 0 V	4 ... 16 mm ²
		Protective conductor	I O	0 V 0 V	4 ... 16 mm ²
S1	–	PROFIBUS station address	I	DIL switch, 10-pin	–

**PROFIBUS terminating resistor**Termination ON $\hat{=}$ OnTermination OFF $\hat{=}$ Off**PROFIBUS station address**

Example:	1	2
S7:	ON $\hat{=}$ 64	OFF $\hat{=}$ 0
S6:	ON $\hat{=}$ 32	ON $\hat{=}$ 32
S5:	ON $\hat{=}$ 16	ON $\hat{=}$ 0
S4:	OFF $\hat{=}$ 0	ON $\hat{=}$ 0
S3:	OFF $\hat{=}$ 0	ON $\hat{=}$ 4
S2:	OFF $\hat{=}$ 0	ON $\hat{=}$ 0
S1:	ON $\hat{=}$ 1	ON $\hat{=}$ 1
Total	113	37

Note:

- The valid address range is: 3 to 126
- For the first and last PROFIBUS station, the terminating resistor must be activated. Switches 9 and 10 must always be set to the same switch position.
- The set addresses are indicated in P918 (PROFIBUS station address).
- From software version 1.4 upwards:
When the positioning motor is switched on, if PROFIBUS station address 0 or 127 is recognized (all address switches are OFF or ON), the function "Jog mode without PROFIBUS and parameterization" is activated.

1) I: Input, O: Output

PROFIBUS DP overview

SIMODRIVE POSMO A is exclusively controlled and parameterized via PROFIBUS.

This means that communications must be established between the "DP master" and the "DP Slave POSMO A" to be commissioned.

Communication possibilities:

- Start-up tool "SimoCom A" (Version 1.5.x and higher)
- Start-up tool "POSMO A Master"
- DP Master SIMATIC S5 or S7
- Third-party master

Stand-alone operation without PROFIBUS communication is possible. However, to parameterize the drive initially, access is required by means of one of the communication possibilities listed above.

PROFIBUS devices have different performance characteristics. To enable all the master systems of the DP slave to be addressed correctly, the characteristic features of the slave are combined in a device master file (GSD). This file must be installed in the directory "GSD". The GSD file for the SIMODRIVE POSMO A, "SIEM8054.GSD", can be obtained from your local Siemens office (sales partner) or via the Internet: http://www.siemens.com/automation/csi_d/gsd

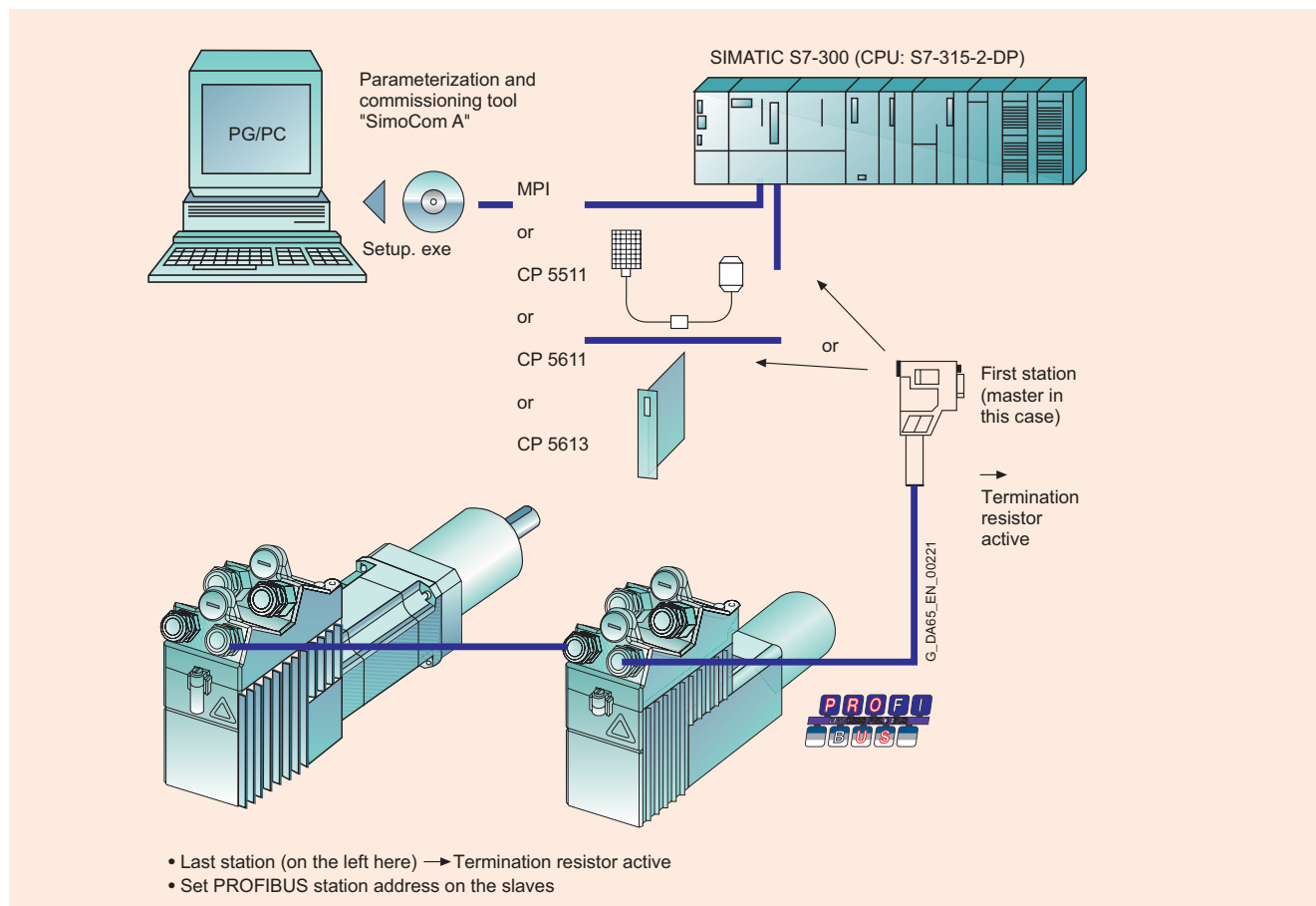
Data transfer between the master and slave uses the master/slave technique, whereby the drives are always the slaves. This ensures extremely fast cyclic data transfer. POSMO A uses the PPO type 1 (Parameter Process Data Object) data structure as defined by the PROFIBUS organization.

PPO type 1 (PPO 1) is structured as follows:

- 4 words for the parameter area (PKW, parameter ID, value)

This message section is used to read and/or write parameters and to read out faults.

- 2 words for the process data area (PZD area)



Example of online operation via PROFIBUS: "SimoCom A" ↔ 2 drives

SIMATIC S7 function blocks

To make it easier to control and parameterize a SIMODRIVE POSMO A positioning motor from the SIMATIC S7 program, specific function blocks have been developed. This means that, for example, a drive can be parameterized without the need to know the PROFIBUS parameter formats and the task IDs. The function blocks are available free of charge from your sales partner.

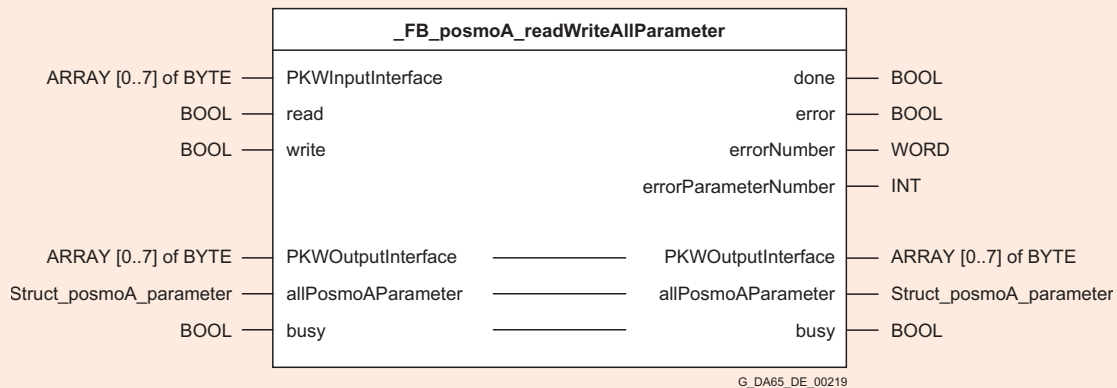
Integration of the SIMODRIVE POSMO A positioning motor into the SIMOTION Motion Control System

Function blocks are available for the SIMOTION Motion Control System that simplify activation and programming of a SIMODRIVE POSMO A positioning motor from the SIMOTION program.

The function blocks including an application example for a user interface based on ProTool/Pro are a component of the **SIMOTION Function Library**. The **SIMOTION Function Library** is included in the scope of supply of the SIMOTION Engineering System SCOUT.

The following function blocks are available:

- Function block `_FB_posmoA_control`
- Function block `_FB_posmoA_readWriteParameter`
- Function block `_FB_posmoA_readWriteAllParameter`



Schematic LAD diagram

SIMODRIVE 611 universal and POSMO

Planning guide

Tools

Start-up, parameterization and diagnostics with SimoCom U

SIMODRIVE 611 universal HR and POSMO CD/CA, SI are programmed using the SimoCom U parameterization and commissioning tool.

Features of SimoCom U

- Programming, selecting and starting traversing blocks
- Setting and monitoring all basic-unit parameters in tables which can be individually created
- Reading, writing, managing, printing and comparison of parameter sets
- Handling of process data (control commands, setpoints)
- Diagnostics (faults, alarms, fault memory)
- Offline and online operation
- The drive can be operated from the PC
- Automatic self-optimization of speed controller
- Integrated machine analysis for determining resonance points by means of FFT analysis
- Function generator/oscilloscope function "on board"
- Very simple handling
- The software can be downloaded from the Internet at <http://www.siemens.com/automation>

PC configuration (hardware and software requirements)

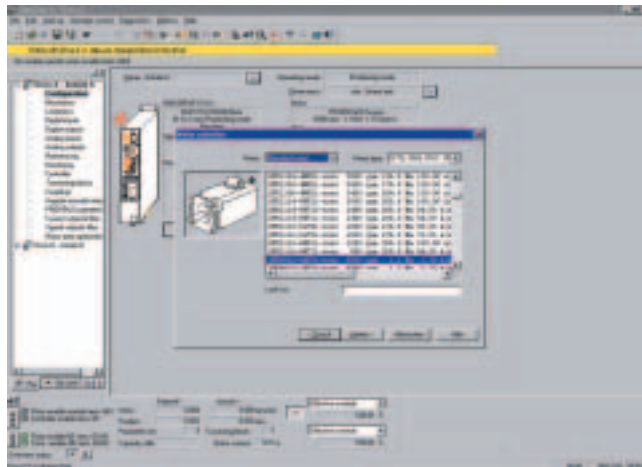
- Windows 98/NT/2000/ME/XP
- RAM $\geq$ 32 MB
- Free hard-disk memory: 30 MB
- Screen resolution: 800 x 600 or higher

For stand-alone operation:

- RS232 serial interface
(for SIMODRIVE 611 universal HR only)

For use with SIMATIC S7/PROFIBUS DP:

- CP5511 or CP5611 communications processor



Working window of SimoCom U

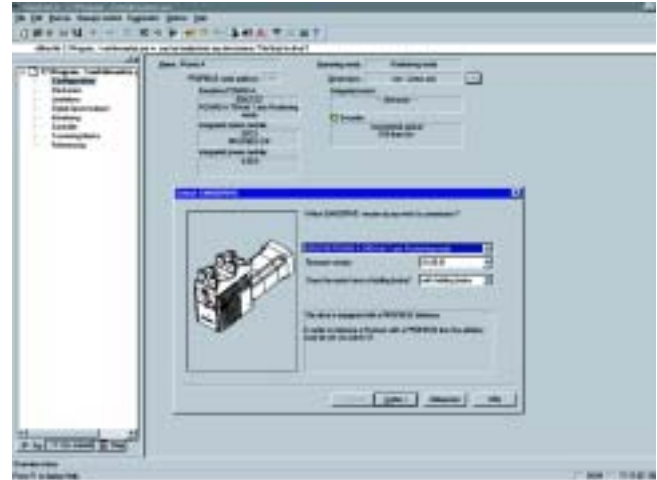
Parameterization and commissioning tool "SimoCom A" (Version 1.5 upwards)

From software version 1.5.x upwards, SIMODRIVE POSMO A 75 W and POSMO A 300 W can be operated, parameterized and programmed using the "SimoCom A" commissioning tool.

SimoCom A communicates with SIMODRIVE POSMO A via the acyclic communication services of PROFIBUS DP.

Features of SimoCom A

- Programming, selecting and starting traversing blocks
- Control and operation of SIMODRIVE POSMO A for commissioning purposes
- Offline and online operation
- Setting and monitoring all basic parameters in tables which can be individually created
- Reading, writing, managing, printing and comparison of parameter sets
- Handling of process data (control commands, setpoints)
- Diagnostics (faults, alarms, fault memory)
- Very simple handling
- The software can be downloaded from the Internet at <http://www.siemens.com/automation>



Working window of SimoCom A

PC configuration (hardware and software requirements)**Software**

- Windows 98/NT/2000/XP
- RAM $\geq$ 32 MB
- Free hard-disk memory 30 MB

Hardware

- Screen resolution 800 x 600 or higher
- CP 5511 communications processor (PROFIBUS interfacing via PCMCIA card) or CP 5611 (PROFIBUS interfacing via short PCI card)

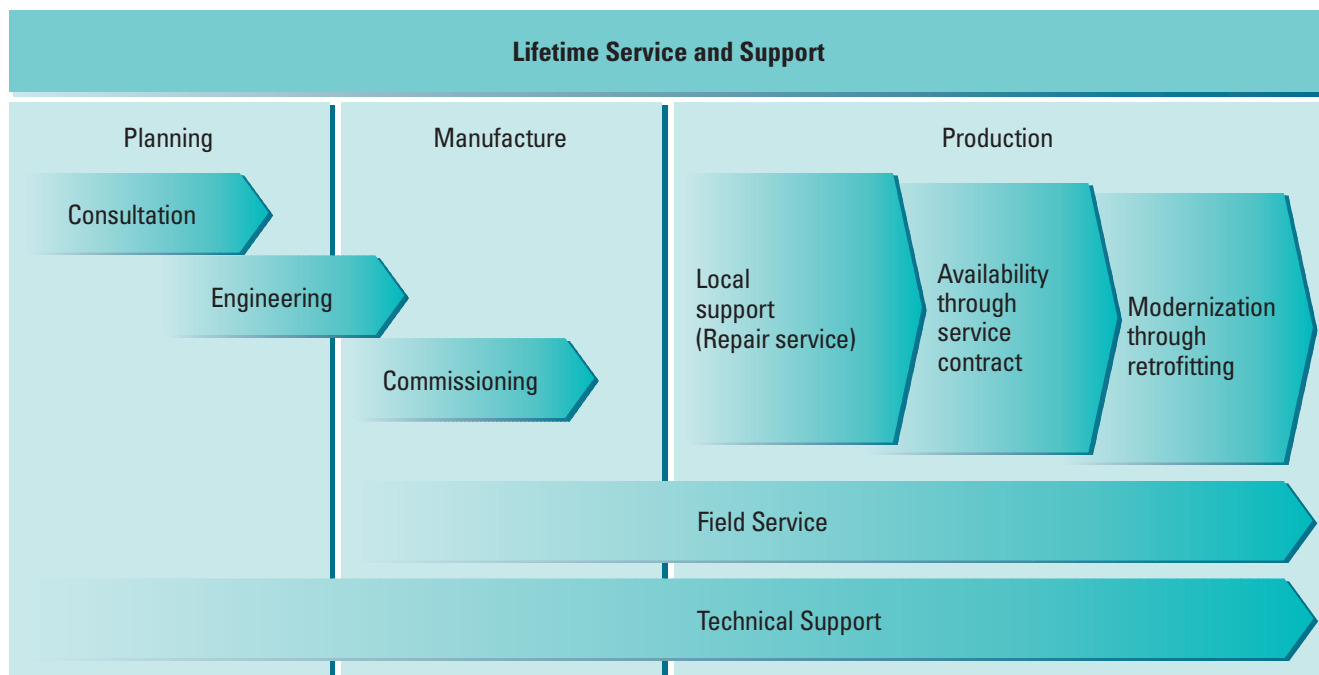
Services and documentation

9



9/2	Service & Support
9/2	General
9/3	Repair service contract RSC
9/5	Training equipment
9/5	SIMODRIVE POSMO A training case
9/5	SIMODRIVE POSMO CD training case
9/6	SIMODRIVE POSMO SI training case
9/6	SIMODRIVE 611 universal HR for Motion Control training case
9/7	Start-up box
9/8	Training
9/9	Documentation
9/9	SIMODRIVE
9/10	Motors





G_NC01_EN_00155

Overview

Our customer support provides all services required throughout the life cycle of your machine – covering the planning phase, retrofitting and even modernization.

Competent consulting and engineering

Consult our experts. They will be pleased to advise you. Our experts not only develop application-specific programs and graphical user interfaces, they can also match the CNC functionality to your specific technology. The advantages gained compared to your competitors simultaneously reduce the implementation requirements for your projects.

Start-up

It is a matter of course for us that we support you during commissioning and start-up of the produced applications. We also run in your machines, independent of whether prototype or series machine.

Local support (repair service)

With our repair service contract, you as a machine manufacturer or dealer can guarantee local support for your customers at low cost. The contract covers the repair of components delivered by Siemens at the machine location. For details, refer to the "Repair service contract RSC".

Field Service

Our qualified field service personnel are of course also available if you have not agreed on a service contract. Our personnel will eliminate faults, supply any required spare parts, and arrange the necessary repairs.

Technical Support

Do you need help with using our products? Here we offer you both advice over the telephone and online support.

For many products, online support offers technical information concerning:

- FAQs, tips and tricks, downloads
- Manuals
- Helpful programs and software products

Further information

If you are looking for a contact for our wide range of service and support activities, then you have come to the right place!

Technical Support
Phone: +49 (0) 180 50 50 222
Fax: +49 (0) 180 50 50 223

Online support:



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

Field Service for Germany
Phone: +49 (0) 180 50 50 444

Worldwide service centers on the Internet:



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

It goes without saying that our field service is also ready to provide you with service and support for engineering, installation, repairs, service contracts, modernization and replacement parts/repairs.

Overview

RSC description of performance

Siemens eliminates the faults on the Siemens Automation & Drives components (not applicable for complete motor spindles) specified in the contract at the machine location for the machine tool manufacturer and dealer in the context of the repair service contract (RSC).

RSC services

- Provision of servicing personnel
- Fault diagnostics on site
- Troubleshooting on site
- Proof of troubleshooting

Fault diagnostics refers to the components specified in the parts list of the final destination memo. Diagnostics is carried out on the basis of a technically preclarified fault message by the manufacturer or dealer with specification of the contract number.

Fault correction is carried out by repairing and/or replacing faulty components. In the event of a machine standstill, fault correction is carried out with the response time specified for the country group. Within the agreed contract period, faulty components which were not older than 12 months at the beginning of the RSC will be replaced free-of-charge.

Siemens provides qualified personnel for fault diagnostics and fault correction on our products. If mechanical work is also necessary, this must be provided or arranged by the manufacturer/dealer. Example: dismantling/mounting of motors or other mechanical components.

The services are provided during the usual working hours in the country of installation.

Spare parts are provided either from our central warehouse or from regional warehouses using our worldwide spare part logistics. Our central warehouse contains all important spare parts. Regional warehouses are adapted to include the components referred to in the final destination memo ¹⁾.

The following components are not defined as spare parts :

- Motors ²⁾
- Cables ³⁾
- Special or customer-specific modules and components which are not available from Siemens as spare parts.

Faulty components ⁴⁾ are replaced free-of-charge within the agreed contract period.

Contract prerequisites

- Final destination memo
- Data stored at the user

The manufacturer/dealer provides the final destination memo early enough prior to commencement of the contract, and guarantees that all data of the machine are stored and available at the user. Particular data for the final destination memo are: Machine number, machine type, processing technology, control system, drive system, number of measuring circuits, type of data storage, data storage medium, data on OEM application, date of commissioning at end user, country of end user, parts list of components used.

RSC certificate

The manufacturer or dealer as the RSC contract partner is provided with a certificate following handing over of the final destination memo (prerequisite for provision of services at the end customer). This certificate contains the contract number and the important contract data such as machine number, machine type, start of contract, end of contract, and address for provision of the services.

Period of applicability

The RSC commences with the date registered with us for completion of the 2nd commissioning at the end customer, and ceases following expiry of the selected period for the RSC.

Contract periods

The RSC is offered for the limitation period (warranty period) of our customers (manufacturer/dealer) compared to their end customers. Various RSC periods permit you to satisfy different market requirements. In the case of RSC periods exceeding the originally selected limitation period for the Siemens A&D components, the limitation period is extended with respect to claims for subsequent fulfillment, with the exception of further rights and claims, in line with the extended RSC period. An existing RSC can be extended once by $\frac{1}{2}$ a year or 1 year. The extension must be ordered during the period of the basic RSC.

Service exclusions

The contract service is excluded in all cases of Point VIII./7 Article deficiencies of the "General conditions of supply and delivery for the electrical industry" ⁴⁾. In the case of parts subject to wear (e.g. motor bearings and fans or cables), replacement will be provided free-of-charge within 12 months following commencement of the RSC in the case of proper use, and independent of the actual RSC duration.

Export license

Fulfillment of the service call may be subject to authorization due to the purpose of use or due to the type of spare parts, equipment and documentation required. The service call is therefore subject to the granting of the necessary export licenses and absence of any other obstacles due to German or other applicable export regulations.

1) Since the export of standard versions (components/system) is subject to a time-consuming official approval procedure, which applies in equal measure to the supply of such components for the purpose of servicing and spare parts supply, we recommend **supply of the export version** wherever possible. This applies in particular in cases where the control can be exported without official approval after the machine manufacturer has installed it in a machine tool.

2) For selected motors, we centrally stock components for fast delivery within Germany and the U.S.A. These motors can be manufactured and delivered within a few working days. You can obtain the current list from your Siemens partner.

3) The delivery times known to you usually apply.

4) Examples of service exclusions:

- Non-observance of the "Siemens configuring and application guidelines"
- Contamination critical to function (e.g. oil, conducting materials, rust)
- Mechanical damage
- External electrical effects
- Intentional damage.

Repair service contract RSC

Overview (continued)

Reaction time

The following response times apply to RSC implementation in the case of a machine standstill.

Regional groups

LG 1	Next working day
LG 2	Within two working days
LG 3	Depending on specific circumstances

We define the response time as the time from receipt of your clarified order up till our service engineer begins the journey to the site stated in the order, or until commencement of troubleshooting using Teleservice.

Country list

The repair service is offered for the following countries:

Continent	Country/region
Regional group 1	
America	Brazil, USA
Asia	China, Japan
Europe	Belgium, Denmark, Germany, Finland, France, Great Britain, Italy, Luxembourg, The Netherlands, Austria, Sweden, Switzerland, Spain
Regional group 2	
America	Canada
Asia	South Korea, Taiwan
Europe	Portugal, Turkey
Regional group 3	
Africa	Egypt, South Africa
America	Argentina, Mexico
Asia	India, Indonesia, Iran, Israel, Malaysia, Pakistan, Philippines, Saudi Arabia, Singapore, Thailand, Vietnam
Australia	Australia, New Zealand
Europe	Bulgaria, Greece, Croatia, Rumania, Russia, Ukraine, Belarus, Liechtenstein, Czech Republic, Andorra, Estonia, Ireland, Latvia, Lithuania, Norway, Poland, Slovak Republic, Slovenia, Hungary

Selection and ordering data

Designation	Order No.
Repair service contract (RSC) for Siemens A&D components on production machines for countries in regional groups 1 to 3	6FC8 507-0RX ■ ■ - ■ ■ ■ 0
Contract period	
12 months ¹⁾	1 2
24 months ²⁾	2 4
Equipment value in €	
0.–	0
100,000.–	1
200,000.–	2
300,000.–	3
400,000.–	4
500,000.–	5
600,000.–	6
700,000.–	7
800,000.–	8
0.–	A
10,000.–	B
20,000.–	C
30,000.–	D
40,000.–	E
50,000.–	F
60,000.–	G
70,000.–	H
80,000.–	J
90,000.–	K
0.–	A
1,000.–	B
2,000.–	C
3,000.–	D
4,000.–	E
5,000.–	F
6,000.–	G
7,000.–	H
8,000.–	J
9,000.–	K

Ordering example

Contract period: 12 months
Equipment list price: € 96,000.–

Repair service contract

Order No.:

6FC8 507-0RX 1 2 -

6FC8 507-0RX . . - 0 K G.

6FC8 507-0RX 1 2 - 0 K G 0

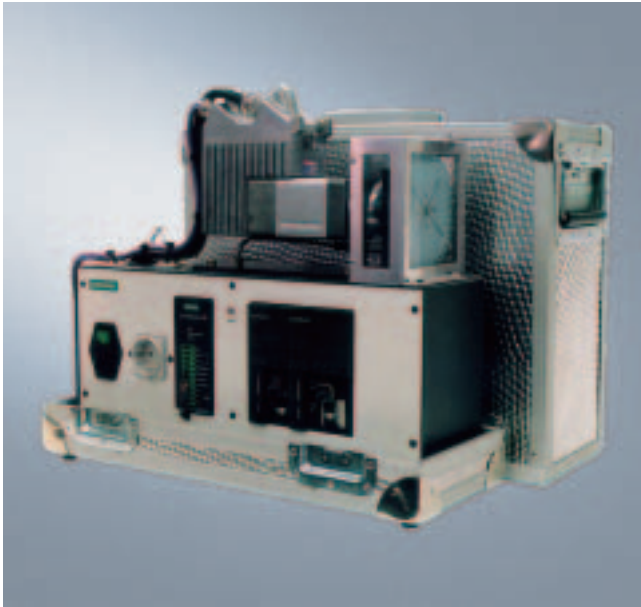
Prices are valid for deliveries since January 2005

1) Max. 24 months from the transfer of risk (delivery of components).

2) Max. 36 months from the transfer of risk (delivery of components).

SIMODRIVE POSMO A training case

Application



SIMODRIVE POSMO A training case with 1 axis

The training case can be used for customer presentations and to teach technical know-how for configuring, commissioning and service.

Design

Compact solution with all the necessary accessories as

- Distributed station for PROFIBUS DP as a single-axis unit for operation on a notebook or programming device with the commissioning tool of SIMODRIVE POSMO A or as
- Automation network with two SIMODRIVE POSMO A axes and a SIMATIC C7-626 DP as a master.

The training case can be connected to a 230 V AC single-phase supply. The SIMODRIVE POSMO A units can be adapted to 110 V AC using the changeover switch on the SITOP power unit.

Technical data

SIMODRIVE POSMO A training case

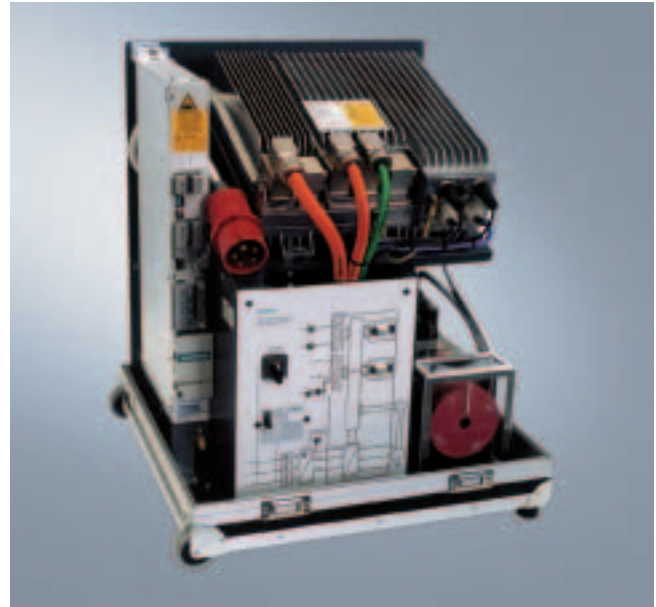
Degree of protection to DIN VDE 0470 Part 1/EN 60529/IEC 60529	IP00
Permissible ambient temperature	
• Storage and transport	-5 ... +60 °C (+23 ... +140 °F)
• Operation	+5 ... +40 °C (+41 ... +104 °F)
Weight, approx.	15 kg (33 lb)
Dimensions (W x H x D)	470 mm x 150 mm x 410 mm (18.5 in x 5.9 in x 16.1 in)

Selection and ordering data

Designation	Order No.
SIMODRIVE POSMO A training case Distributed station for PROFIBUS DP, 1 axis for operation with programming device	6SN2 832-0PG00-0AA0

SIMODRIVE POSMO CD training case

Application



SIMODRIVE POSMO CD training case

The training case can be used for customer presentations and to teach technical know-how for configuring, commissioning and service.

Design

The training case is supplied with a complete converter and control unit, operator front panel, mains supply and synchronous motor for a distributed drive system. A transport trolley is also included in the scope of supply.

Technical data

SIMODRIVE POSMO CD training case

Degree of protection to DIN VDE 0470 Part 1/EN 60529/IEC 60529	IP00
Permissible ambient temperature	
• Storage and transport	-5 ... +60 °C (+23 ... +140 °F)
• Operation	+5 ... +40 °C (+41 ... +104 °F)
Weight, approx.	50 kg (110.3 lb)
Dimensions (W x H x D)	460 mm x 530 mm x 450 mm (18.1 in x 20.9 in x 17.7 in)

Selection and ordering data

Designation	Order No.
SIMODRIVE POSMO CD training case	6SN2 803-2AA00-0BA0

SIMODRIVE POSMO SI training case

Application



SIMODRIVE POSMO SI training case, front view and rear view

The training case can be used for customer presentations and to teach technical know-how for configuring, commissioning and service.

Design

The training case is supplied with a complete converter and control unit, operator front panel, mains supply and synchronous motor for a distributed drive system. A transport trolley is also included in the scope of supply.

Technical data

SIMODRIVE POSMO SI training case

Degree of protection to DIN VDE 0470	IP00
Part 1/EN 60529/IEC 60529	
Permissible ambient temperature	
• Storage and transport	-5 ... +60 °C (+23 ... +140 °F)
• Operation	+5 ... +40 °C (+41 ... +104 °F)
Weight, approx.	32 kg (70.6 lb)
Dimensions (W x H x D)	300 mm x 530 mm x 450 mm (11.8 in x 20.9 in x 17.7 in)

Selection and ordering data

Designation	Order No.
SIMODRIVE POSMO SI training case	6SN2 860-2BF00-0GA0

SIMODRIVE 611 universal for Motion Control training case

Application



SIMODRIVE 611 universal training case

The training case can be used for customer presentations and to teach technical know-how for configuring, commissioning and service. With the "Motion Control" variant, functions such as synchronous operation or positioning can be simulated using the toothed discs with scale divisions and stroboscopic equipment.

Design

- RIMOWA hard shell case with rollers
- SIMODRIVE O/I module with 2-axis power module for 0.5 kW motors
- 2-axis control unit with option module Motion Control with PROFIBUS DP
- Start-up box

Technical data

SIMODRIVE 611 universal for Motion Control training case

Degree of protection to DIN VDE 0470	IP00
Part 1/EN 60529/IEC 60529	
Permissible ambient temperature	
• Storage and transport	-5 ... +60 °C (+23 ... +140 °F)
• Operation	+5 ... +40 °C (+41 ... +104 °F)
Weight, approx.	36 kg (79.4 lb)
Dimensions (W x H x D)	700 mm x 520 mm x 260 mm (27.6 in x 20.5 in x 10.2 in)

Selection and ordering data

Designation	Order No.
SIMODRIVE 611 universal for Motion Control training case Version with 1FK6 motors with encoders and option module Motion Control with PROFIBUS DP • 230 V AC power connection • 110 V AC power connection	6ZB2 420-0AB00 6ZB2 420-0AD00
SIMODRIVE 611 universal training case Version with 1FT6 motors with absolute encoders and option module Motion Control with PROFIBUS DP	6ZB2 420-0AA02

Application



Start-up box

The start-up box is a support device for starting up SIMODRIVE 611 universal controllers.

Technical data

SIMODRIVE 611 universal HR start-up box

Power supply	24 V DC (via terminal X101)
Voltage range, analog setpoint	0 ... 12.5 V/10 mA
Length of signal cable	1.3 m (4.3 ft)
Dimensions (L x W x H)	175 mm x 90 mm x 45 mm (6.9 in x 3.5 in x 1.8 in)

Selection and ordering data

Designation	Order No.
Start-up box	9AK1014-1AA00

Design

The start-up box can be connected to the control unit. An electronic circuit within the device is used to convert the 24 V DC auxiliary power supply value of the converter into an analog setpoint. The analog setpoint can be adjusted and is displayed via a five-digit LCD.

Performance features of the start-up box

- Analog setting of setpoints:
 - Coarse and fine setting via two potentiometers in the ratio 1 : 10.
 - Polarity selector switch between normal and inverse setpoint polarity.
 - Potentiometer for analog offset value with autonomous ON/OFF switch.
 - ON/OFF switch for setting analog setpoints.
- The analog setpoint is completely decoupled and well-protected from polarity reversal within the operating voltage range.
- The analog output signal of the control terminal strip is wired to the 2 mm (0.08 in) test sockets in the start-up box.
- Six OFF switches for digital enabling signals with green LED indicators.
- Four red LEDs for displaying digital output signals

Overview

Training is decisive for your success

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

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

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



Top trainers

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

Practical experience

The practical experience of our trainers makes it possible for them to pass on theoretical matter in a plausible manner. But since it is known that all theory is drab, we attach great importance to practical exercises which can comprise up to half of the course time. You can therefore immediately implement your new knowledge in practice. We train you on state-of-the-art methodically/didactically designed training equipment. You feel absolutely certain when trained in this manner.

Wide variety

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

Close to customer

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

The right mixture: blended learning

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

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

The international training portal

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

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

Contact

Visit our site on the Internet at:



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

or allow us to offer you advice personally. You can request our current training catalog from:

Course office, Infoline Germany:
Tel.: 01805/23 56 11 (0.12 €/min.)
Fax: 01805/23 56 12

Selection and ordering data

Designation	Order No.
Catalog ITC · 2004	E86060-K6850-A101-B5
Dates and prices incl. CD-ROM: Interactive course information system SITRAINonCD	E86060-P6850-A101-C9
Interactive course information system SITRAINonCD on CD-ROM	E86060-D6850-A100-C2-7400
Overview of training worldwide 2004	E86060-K6899-A101-B4-7400

Overview

A high-quality programmable controller or drive system can only be used to maximum effect if the user is aware of the performance of the CNC machine tool control and the machine tool drives as a result of intensive training and good technical documentation.

This is becoming more important due to the shorter innovation cycles of modern automation products and the convergence of electronics and mechanical engineering.

Comprehensive documentation is available for the SINUMERIK CNC controllers and the SIMODRIVE drive system. This documentation includes Operator's Guide, Programming Guide as well as Planning Guides.

An overview of publications that is updated monthly is provided in a number of languages in the Internet at:



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

via "Support" "Technical documentation" "Summary of publications"

For our actual technical documentation, please visit <http://www.siemens.com/automation/doconweb>

Selection and ordering data

Designation	Order No.
Catalog NC 60 · 2004	
• German	E86060-K4460-A101-B1
• English	E86060-K4460-A101-B1-7600
• French	E86060-K4460-A101-B1-7700
• Italian	E86060-K4460-A101-B1-7200
• Spanish	E86060-K4460-A101-B1-7800
Catalog ST 70 · 2005	
• German	E86060-K4670 -A111-A9
• English	E86060-K4670 -A111-A9-7600
• French	E86060-K4670 -A111-A9-7700
• Italian	E86060-K4670 -A111-A9-7200
• Spanish	E86060-K4670 -A111-A9-7800
Decentralizing with PROFIBUS DP	ISBN 3-89578-074-X
Safety Integrated Application manual	
• German	6ZB5 000-0AA01-0BA0
• English	6ZB5 000-0AA02-0BA0
User/manufacture documentation	
DOC-on-CD	
Current edition	
SINUMERIK 802S/802C/802D	
SINUMERIK 810D/840D/840D	
SINUMERIK 611	
User and manufacturer documentation on CD-ROM with Help tool	
Current edition	
• German	6FC5 298-0CD00-0AG0
• English	6FC5 298-0CD00-0BG0
Update service for DOC-on-CD	
• German	6FC5 298-0CD00-0AG2
• English	6FC5 298-0CD00-0BG2
User Manual Collection	
On CD-ROM with SINUMERIK user documentation in 5 languages: Eng, Fr, Ger, It, Sp	6FC5 298-7CA00-0YG0

Selection and ordering data

Designation	Order No.
Manufacturer and service documentation	
SIMODRIVE sensor Absolute Encoder with PROFIBUS Encoder User Manual	
• German/English	6SN1 197-0AB10-0YP3
SIMODRIVE POSMO A User Manual	
• German	6SN2 197-0AA00-0AP6
• English	6SN2 197-0AA00-0BP6
SIMODRIVE POSMO SI/CD/CA User Manual	
• German	6SN2 197-0AA20-0AP6
• English	6SN2 197-0AA20-0BP6
Configuring/Installation Guide SIMODRIVE sensor Hollow-Shaft Measuring System SIMAG H2	
• German	6SN1 197-0AB31-0AP1
• English	6SN1 197-0AB31-0BP1
Description of Functions SIMODRIVE 611 universal/universal E Closed-Loop Control Components for Speed Control and Positioning	
• German	6SN1 197-0AB20-1AP0
• English	6SN1 197-0AB20-1BP0
Description of Functions SIMODRIVE 611 digital/810D Drive Functions	
• German	6SN1 197-0AA80-1AP1
• English	6SN1 197-0AA80-1BP1
See Planning Guide for SIMODRIVE 611 converter	
• German	6SN1 197-0AA00-0AP7
• English	6SN1 197-0AA00-0BP7
EMC Guidelines	
• German	6FC5 297-0AD30-0AP2
• English	6FC5 297-0AD30-0BP2
Operating Instructions Manual Turn SINUMERIK 810D/840D	
• German	6FC5 298-6AD00-0AP0
• English	6FC5 298-6AD00-0BP0
Short Guide to ShopMill SINUMERIK 810D/840D	
• German	6FC5 298-5AD30-0AP0
• English	6FC5 298-5AD30-0BP0
Operating Instructions ShopMill SINUMERIK 810D/840D	
• German	6FC5 298-6AD10-0AP2
• English	6FC5 298-6AD10-0BP2

Motors

Selection and ordering data

Designation

Order No.

Manufacturer and service documentation

Planning Guide
Synchronous Servo Motors
General Section, 1FT5, 1FT6,
1FK6, 1FK7, 1FS6

- German
- English

6SN1 197-0AC20-0AP0
6SN1 197-0AC20-0BP0

Planning Guide
1FT6 Synchronous Servo
Motors

- German
- English

6SN1 197-0AD02-0AP0
6SN1 197-0AD02-0BP0

Planning Guide
1FK7 Synchronous Servo
Motors

- German
- English

6SN1 197-0AD06-0AP0
6SN1 197-0AD06-0BP0

Planning Guide
General Section for
1FT/1FK Motors

- German
- English

6SN1 197-0AD07-0AP1
6SN1 197-0AD07-0BP1

Selection and ordering data

Designation

Order No.

Manufacturer and service documentation

Planning Guide
Three-Phase Asynchronous
Motors for Main Spindle Drives
1PH2/1PH4/1PH7

- German
- English

6SN1 197-0AC60-0AP0
6SN1 197-0AC60-0BP0

Planning Guide
Asynchronous Motors
General Section, 1PH2, 1PH4,
1PH7, 1PL6

- German
- English

6SN1 197-0AC61-0AP0
6SN1 197-0AC61-0BP0

Planning Guide
General Section for Asynchro-
nous Motors

- German
- English

6SN1 197-0AC62-0AP0
6SN1 197-0AC62-0BP0

Planning Guide
1PH4 Asynchronous Motors

- German
- English

6SN1 197-0AC64-0AP0
6SN1 197-0AC64-0BP0

Planning Guide
1PH7 Asynchronous Motors

- German
- English

6SN1 197-0AC65-0AP0
6SN1 197-0AC65-0BP0

Planning Guide
1FN1/1FN3 Linear Motors

- German
- English

6SN1 197-0AB70-0AP4
6SN1 197-0AB70-0BP4



10/2	Approvals
10/5	Notes on software
10/5	Information on software licensing
10/7	Usage and copy rights
10/8	Siemens contact partners worldwide
10/9	A&D online services
10/9	Information and ordering options on the Internet and on CD-ROM
10/10	Indexes
10/10	Subject index
10/12	Index of order numbers
10/14	Conversion Tables
10/18	Conditions of sale and delivery



Approvals

Overview

Many of the products in this Catalog comply with UL, CSA or FM requirements and are labeled with the corresponding approval designation.

UL: Underwriters Laboratories **Independent public testing institution in North America**

Test designation:

- **UL** for end products, tested by UL in accordance with the UL standard
- **cUL** for end products, tested by UL in accordance with the CSA standard
- **cULus** for end products, tested by UL in accordance with the UL and CSA standard
- **UR** for mounting parts in end products, tested by UL in accordance with the UL standard
- **cUR** for mounting parts in end products, tested by UL in accordance with the CSA standard
- **cURus** for mounting parts in end products, tested by UL in accordance with the UL and CSA standard

Test standards:

- SIMODRIVE: Standard UL 508C
- Motors: Standard UL 547

Product category/file No.:

- SIMODRIVE: NMMS2/E192450
- Motors: PRGY27/E93429

CSA: Canadian Standards Association **Independent public testing institution in Canada**

Test designation:

- **CSA** Tested by CSA in accordance with the CSA standard

Test standard:

- Standard CAN/CSA-C22.2 No. 0-M91/No. 14-95/No. 142-M1987

FMRC: Factory Mutual Research Corporation **Independent public testing institution in North America**

Test designation:

- **FM** Tested by FM in accordance with the FM standard

Test standard:

- Standard FMRC 3600, FMRC 3611, FMRC 3810 Class I, Div.2, Group A, B, C, D

TUV Rheinland of North America Inc. **Indep. non-profit-making testing institute in North America** National recognized testing laboratory (NRTL)

Test designation:



NRTL Listing to UL 508C standard
Testing by TUV according to UL and CSA standard

Motors

Order No.	Test symbol	
1FT6	UR/cUR	
1FK6	UR/cUR	
1FK7	UR/cUR	
1PH4...-4NF26 ¹⁾	UR/cUR	
1PH7101... to 1PH7167...	UR/cUR	
1PH7184... ¹⁾	UR/cUR	
1PH7186... ¹⁾	UR/cUR	
1PH7224... ¹⁾	UR/cUR	
6SN1113-1A00-1FA0	cULus	
6SN1113-1A00-1KA0	cULus	

SIMODRIVE 611

Order No.	Test symbol	
6SN1111-0AB00-0AA ²⁾	cULus	
6SN1112-0AC01-0AA ²⁾	cULus	
6SN1113-1AA00-0CA ²⁾	cULus	
6SN1113-1AA00-0DA0	cULus	
6SN1113-1AB01-0BA ²⁾	cULus	
6SN1114-0AA01-....	cULus	
6SN1114-0AA02 -....	cULus	
6SN1114-0NA0-....	cULus	
6SN1114-0NB0-....	cULus	
6SN1115-0BA11-....	cULus	
6SN1117-0DG21-0AA ²⁾	cULus	
6SN1118-.NH00-....	cULus	
6SN1118-.NH01-....	cULus	
6SN1118-.NH10-....	cULus	
6SN1118-.NH11-....	cULus	
6SN1118-.NJ00-....	cULus	
6SN1118-.NJ01-....	cULus	
6SN1118-.NK00-....	cULus	
6SN1118-.NK01-....	cULus	
6SN1118-0AA11-....	cULus	
6SN1118-0AD11-....	cULus	
6SN1118-0AE11-....	cULus	
6SN1118-0BJ11-....	cULus	
6SN1118-0BK11-....	cULus	
6SN1118-0DG21-...	cULus	
6SN1118-0DG22-...	cULus	
6SN1118-0DG23-...	cULus	
6SN1118-0DH21-...	cULus	
6SN1118-0DH22-...	cULus	
6SN1118-0DH23-...	cULus	
6SN1118-0DJ21-...	cULus	
6SN1118-0DJ23-...	cULus	
6SN1118-0DK21-...	cULus	
6SN1118-0DK23-...	cULus	
6SN1118-0DK33-...	cULus	
6SN1118-0DM11-...	cULus	
6SN1118-0DM13-...	cULus	
6SN1118-0DM21-...	cULus	
6SN1118-0DM23-...	cULus	
6SN1118-0DM31-...	cULus	
6SN1118-0DM33-...	cULus	
6SN1121-0BA11-....	cULus	
6SN1122-0BA11-....	cULus	
6SN1123-1AA00-0AA ²⁾	cULus	
6SN1123-1AA00-0BA ²⁾	cULus	
6SN1123-1AA00-0CA ²⁾	cULus	
6SN1123-1AA00-0DA ²⁾	cULus	
6SN1123-1AA00-0EA ²⁾	cULus	
6SN1123-1AA00-0HA ²⁾	cULus	
6SN1123-1AA00-0JA ²⁾	cULus	
6SN1123-1AA00-0KA ²⁾	cULus	

1) The UL version must be ordered separately.

2) 1 to 9.

SIMODRIVE 611

Order No.	Test symbol	
6SN1123-1AA00-0LA ¹⁾	cULus	
6SN1123-1AA01-0FA ¹⁾	cULus	
6SN1123-1AA02-0FA ¹⁾	cULus	
6SN1123-1AA02-0JA ¹⁾	cULus	
6SN1123-1AA02-0KA ¹⁾	cULus	
6SN1123-1AB00-0AA ¹⁾	cULus	
6SN1123-1AB00-0BA ¹⁾	cULus	
6SN1123-1AB00-0CA ¹⁾	cULus	
6SN1123-1AB00-0HA ¹⁾	cULus	
6SN1124-1AA00-0AA ¹⁾	cULus	
6SN1124-1AA00-0BA ¹⁾	cULus	
6SN1124-1AA00-0CA ¹⁾	cULus	
6SN1124-1AA00-0DA ¹⁾	cULus	
6SN1124-1AA00-0EA ¹⁾	cULus	
6SN1124-1AA00-0HA ¹⁾	cULus	
6SN1124-1AA00-0JA ¹⁾	cULus	
6SN1124-1AA00-0KA ¹⁾	cULus	
6SN1124-1AA00-0LA ¹⁾	cULus	
6SN1124-1AA01-0FA ¹⁾	cULus	
6SN1124-1AB00-0AA ¹⁾	cULus	
6SN1124-1AB00-0BA ¹⁾	cULus	
6SN1124-1AB00-0CA ¹⁾	cULus	
6SN1124-1AB00-0HA ¹⁾	cULus	
6SN1125-1AA00-0CA ¹⁾	cURus	
6SN1125-1AA00-0DA ¹⁾	cURus	
6SN1125-1AA00-0EA ¹⁾	cURus	
6SN1125-1AA00-0KA ¹⁾	cURus	
6SN1145-1AA00-0CA ¹⁾	cULus	
6SN1145-1AA01-0AA ¹⁾	cULus	
6SN1145-1BA01-0BA ¹⁾	cULus	
6SN1145-1BA01-0DA ¹⁾	cULus	
6SN1145-1BA02-0CA ¹⁾	cULus	
6SN1145-1BB00-0DA ¹⁾	cULus	
6SN1145-1BB00-0EA ¹⁾	cULus	
6SN1145-1BB00-0FA ¹⁾	cULus	
6SN1146-1AA00-0CA ¹⁾	cULus	
6SN1146-1AB00-0BA ¹⁾	cULus	
6SN1146-1BB00-0DA ¹⁾	cULus	
6SN1146-1BB00-0EA ¹⁾	cULus	
6SN1146-1BB00-0FA ¹⁾	cULus	
6SN1146-1BB01-0BA ¹⁾	cULus	
6SN1146-1BB02-0CA ¹⁾	cULus	
6SN1147-1BB00-0CA ¹⁾	cURus	
6SN1147-1BB00-0DA ¹⁾	cURus	
6SN1147-1BB00-0FA ¹⁾	cURus	
6SN1161-1DA00-0AA ¹⁾	cULus	
6SN2132-....-1BA0	cULus	
6SN2155-....-1BA0	cULus	
6SN2460-....-....	cULus	
6SN2463-....-....	cULus	
6SN2480-....-....	cULus	
6SN2483-....-....	cULus	
6SN2500-....-....	cULus	
6SN2703-....-....	cTUVus	

Cables for SIMODRIVE

Order No.	Test symbol	
6ES7901-0BF00-0AA0	²⁾	
6ES7368-3...1-0AA0	²⁾	
6FC5203-0AC01-0AA0	²⁾	
6FC5403-0AA00-0AA.	²⁾	
6FC5411-0AA80-0AA0	²⁾	
6FC5412-0FA80-0AA0	²⁾	
6FX.00.-2CA31-1..0	²⁾	
6FX.00.-2CH00-1..0	²⁾	
6FX.00.-2EQ00-1..0	²⁾	
6FX...2-2....-....	³⁾	
6FX2-00.-1AA01-1..0	²⁾	
6FX200.-1AA03-1..0	²⁾	
6FX200.-1AA13-1..0	²⁾	
6FX200.-1BA01	²⁾	
6FX200.-1CA01-1..0	²⁾	
6FX200.-1CB01-1AB0	²⁾	
6FX200.-1CC00-....	²⁾	
6FX200.-1DA01-1..0	²⁾	
6FX200.-1DB01-1..0	²⁾	
6FX200.-2AD00-1..0	²⁾	
6FX200.-2BB01-1..0	²⁾	
6FX200.-2CA11-1..0	²⁾	
6FX200.-2CC11-...0	²⁾	
6FX200.-2CD01-1..0	²⁾	
6FX200.-2CE01-...0	²⁾	
6FX200.-2CG00-1..0	²⁾	
6FX200.-2CJ00-1..0	²⁾	
6FX200.-2CJ01-1..0	²⁾	
6FX200.-2EQ10-1..0	²⁾	
6FX200.-3AC02-1..0	²⁾	
6FX200.-3AD01-1..0	²⁾	
6FX200.-3AD02-1..0	²⁾	
6FX200.-4AA21-1..0	²⁾	
6FX200.-4AA41-1..0	²⁾	
6FX200.-4EA0-...0	²⁾	
6FX2001-....	²⁾	
6FX2003-3AB01-1..0	²⁾	
6FX2006-1BF00	cULus	
6FX2007-1AC..	cULus	
6FX2008-1BD71	UR	
6FX4002- ...	³⁾	
6FX4008-1BA..-....	UR	
6FX4008-1BB..-....	UR	
6FX5..8-....-....	UR/CSA	
6FX5..2-5-....-....	UR/CSA	
6FX5247-0AA28-0AA0	²⁾	
6FX5247-0AA35-0AA0	²⁾	

1) 1 to 9.

2) Product is specified in the list as "Reference". It has no UL or UR designation.

3) No separate designation necessary.

Approvals

Cables for SIMODRIVE

Order No.	Test symbol	
6FX7..2-5.....	1)	
6FX7..8-.....	UR/CSA	
6FX8..2-5.....	1)	
6FX8..8-.....	UR/CSA/cURus	
6SN1161-1CA00-0.A0	2)	
6SN1161-1CA00-0.A1	2)	
6SN1161-1CA00-1.A1	2)	

HF commutating reactors for SIMODRIVE

Order No.	Test symbol	
6SN1111-0AA00-0BA1	UR	
6SN1111-0AA00-0CA1	UR	
6SN1111-0AA00-0DA1	UR	
6SN1111-0AA00-1EA0	UR	
6SN1111-0AA00-1FA0	UR	
6SN1111-1AA00-0CA0	cURus	

Mains filters for SIMODRIVE

Order No.	Test symbol	
6SN1111-0AA01-1BA0	UR	
6SN1111-0AA01-1AA0	UR	
6SN1111-0AA01-1CA0	UR	
6SN1111-0AA01-2BA0	UR	
6SN1111-0AA01-2CA0	UR	
6SN1111-0AA01-2DA0	UR	
6SN1111-0AA01-2EA0	UR	
6SN1111-0AA01-2FA0	UR	
6SL3000-0BE21-6AA0	UR	
6SL3000-0BE23-6AA0	UR	
6SL3000-0BE25-5AA0	UR	
6SL3000-0BE28-0AA0	UR	
6SL3000-0BE31-2AA0	UR	

Matching transformers in economy circuit for SIMODRIVE

Order No.	Test symbol	
4AU3695-0SB00-0CN2	cURus	
4AU3695-0SB02-0CN2	cURus	
4AU3695-0SB10-0CN2	cURus	
4AU3695-0SB12-0CN2	cURus	
4AU3695-0SB20-0CN2	cURus	
4AU3695-0SB22-0CN2	cURus	
4AU3995-0SA30-0CN2	cURus	
4AU3995-0SA32-0CN2	cURus	
4AU3995-0SA40-0CN2	cURus	
4AU3995-0SA42-0CN2	cURus	
4AU3995-0SA50-0CN2	cURus	
4AU3995-0SA52-0CN2	cURus	
4BU4395-0SA70-0C	cURus	
4BU4395-0SA80-0C	cURus	

Matching transformers in economy circuit for SIMODRIVE

Order No.	Test symbol	
4BU4395-0SB00-0C	cURus	
4BU4795-0SC30-0C	cURus	
4BU4795-0SC40-0C	cURus	
4BU4795-0SC50-0C	cURus	
4BU5595-0SA40-0C	cURus	
4BU5595-0SA50-0C	cURus	
4BU5595-0SA60-0C	cURus	
4BU5895-0SA60-0C	cURus	
4BU5895-0SA70-0C	cURus	
4BU5895-0SA80-0C	cURus	
4BU6095-0SA60-0C	cURus	
4BU6095-0SA70-0C	cURus	
4BU6095-0SA80-0C	cURus	
6SN1111-0AA00-0BB1	UR/CSA	
6SN1111-0AA00-0CB0	cURus	
6SN1111-0AA00-0DB0	cURus	
6SN1111-0AA00-0EB0	UR/CSA	
6SN1111-0AA00-0FB1	cURus	

Connectors for SIMODRIVE

Order No.	Test symbol	
6FX2003-0CA10	UR/cUR	
6FX2003-0CB00	UR/cUR	
6FX2003-0CB10	UR/cUR	
6FX2003-0CB20	UR/cUR	
6FX2003-0CC11	UR/cUR	
6FX2003-0CC21	UR/cUR	
6FX2003-0CG10	UR/cUR	
6FX2003-0CG20	UR/cUR	
6FX2003-1AX00	UR/cUR	
6FX2003-1AX10	UR/cUR	
6FX2003-1CA10	UR/cUR	
6FX2003-1CB00	UR/cUR	
6FX2003-1CB10	UR/cUR	
6FX2003-1CB20	UR/cUR	
6FX2003-1CG10	UR/cUR	
6FX2003-1CG20	UR/cUR	
6FX2003-2CA00	UR/cUR	
6FX2003-2CB00	UR/cUR	
6FX2003-2CC00	UR/cUR	
6FX2003-2CE00	UR/cUR	
6FX2003-2CF00	UR/cUR	

1) No separate designation necessary.

2) Product is specified in the list as "Reference". It has no UL or UR designation.

Software types

There are different types of licensed software. The different types of software are:

- Engineering software
- Runtime software

Engineering software

This includes all the software products used in the creation (engineering) of user software, e.g. project engineering, programming, parameterization, test, start-up and service.

The data or executable programs generated using the engineering software can be copied free-of-charge for the customer's own use or for use by third parties.

Runtime software

This includes all software products that are necessary for plant/machine operation, e.g. operating system, basic system, system expansions, drivers, etc.

Copying of the runtime software or the executable files generated using the runtime software for the customer's own use or for use by third parties is subject to a charge. For details regarding the requirement to pay a license fee in accordance with the different types of use, see the ordering data (e.g. in the catalog). The different types of use are differentiated, for example, as use per CPU, per installation, per channel, per instance, per axis, per control loop, per variable, etc.

Where extended rights exist for tools for parameterization or configuration that have been supplied as part of the scope of supply of the runtime software, these are indicated in the accompanying Readme file.

Certificate of License

The Certificate of License (CoL) is the licensee's proof that the use of the software has been licensed by Siemens. A CoL relates to each type of use and must be stored in a safe place.

License types:

Siemens Automation & Drives offers different types of licenses for software:

- Floating license
- Single license
- Rental license
- Trial license

Floating license

The software can be installed on any number of devices of the licensee for use by the licensee. Only the concurrent user is licensed. The concurrent user is the person who uses a program. Use begins when the software is started up. One license is required for each concurrent user.

Single license

In contrast to the floating license, only one installation of the software is permitted. The type of use for which the license is granted is specified in the ordering data and on the Certificate of License (CoL). The different types of use are differentiated, for example, as use per unit, per axis, per channel, etc. A single license is required for each defined type of use.

Rental license

The rental license permits the "sporadic use" of engineering software. Following installation of the license keys, the software is operational for a defined number of hours, during which use can be interrupted any number of times. One license is required for each installation.

Trial license

The trial license permits "temporary use" of the software under non-productive circumstances, e.g. use for test and evaluation purposes. It can be converted into a different type of license.

Appendix

Notes on software

Information on software licensing

Delivery types

Software is subject to continuous further development. With the delivery types

- PowerPack
- Upgrade
- ServicePack

access to these further developments is possible.

PowerPack

PowerPacks are packages for upgrading to more powerful software.

With the PowerPack, the licensee receives a new license contract including the CoL. This CoL in conjunction with the CoL of the original product is proof of licensing of the new software.

A separate PowerPack must be obtained for each original license of the software to be used.

Upgrade

An upgrade allows a new available version of the software to be used, provided that a license has previously been obtained for a predecessor version. With the upgrade, the licensee receives a new license contract including the CoL. This CoL in conjunction with the CoL of the predecessor version is proof of licensing of the new version.

A separate upgrade must be obtained for each original license of the software to be upgraded.

ServicePack

Existing bugfixes are distributed by means of ServicePacks. ServicePacks are permitted to be copied for proper implementation in accordance with the number of original licenses.

Software Update Service

If you intend to keep your software up-to-date with the latest version, you can apply for the Software Update Service. This service ensures that the latest software versions are automatically sent to you for upgrading, which are released for the relevant software product subsequent to completion of the contract. This service can be obtained for single licenses with/without data carrier and applies to all specified software products. The Software Update Service is obtained separately in the form of an order for each software product to be upgraded and has a duration of one year. The Software Update Service contract will be renewed for a further year unless the customer cancels it up to three months before the contract expires.

License key

Siemens Automation & Drives offers software products with and without a license key.

The license key is an electronic license certificate and also acts as a "switch" for the behavior of the software (floating license, rental license, etc.).

In the case of software that is subject to a license key, a complete installation comprises the program to be licensed (the software) and the license key (the representative of the license).

Downgrading

The licensee is authorized to use the software or an earlier version/release of the software provided that the licensee is already in possession of it and that it is technically possible to use it.

Note:

For more detailed information about the licensing of software, see "Usage and copy rights".

For explanations of license conditions, see the brochure "Terms and Conditions of Siemens AG" or visit the Internet at:



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

(see under "Help" and then "A&D Mall Online Help system")

Legal notes during setup for new software products

All software products feature a uniform reference to the license conditions. The license conditions are enclosed either with the documentation or in the software pack. When software is downloaded from the Internet, the license contract is displayed before the ordering procedure and must be accepted by the user before downloading can continue.

Note:

This software is protected by German and/or US copyright laws and the regulations of international agreements. Unauthorized reproduction or sale of this software or parts of it is a criminal offense. This will lead to criminal and civil prosecution, and may result in significant fines and/or claims for damages. Prior to installing and using the software, please read the applicable license conditions for this software. You will find these in the documentation or packaging.

If you have received this software on a CD that is marked "Trial version", or accompanying software that is licensed for your use, the software is only permitted to be used for test and validation purposes in accordance with the accompanying conditions for the trial license. To this end, it is necessary that programs, software libraries, etc. are installed on your computer. We therefore urgently recommend that installation is performed on a single-user computer or on a computer that is not used in the production process or for storing important data, since it cannot be completely excluded that existing files will be modified or overwritten. We accept no liability whatsoever for damage and/or data losses that result from this installation or the non-observance of this warning. Every other type of use of this software is only permitted if you are in possession of a valid license from Siemens is obtained.

If you are not in possession of a valid license that can be proven by presenting an appropriate Certificate of License/software product certificate, please abort installation immediately and contact a Siemens office without delay to avoid claims for damages.

Order

To order the Software Update Service, an order number must be specified. The Software Update Service can be ordered when the software products are ordered or at a later date. Subsequent orders require that the ordering party is in possession of at least one single license.

Note:

It is recommended that the Software Update Service is ordered as early as possible. If a new software version of a software product is released for delivery by Siemens, only those customers will receive it automatically who are entered in the appropriate delivery list at Siemens at this time. Previous software versions, or the current software version are not supplied when the Software Update Service is ordered. The Software Update Service requires that the software product is up-to-date at the time of completion of the contract for the Software Update Service.

Delivery

When a Software Update Service is ordered, you will be sent the contractual conditions of this service and the price is due for payment. At the same time, you will be included in a delivery list for the software product to be updated. If Siemens releases a new software version for the corresponding software product for general sale (function version or product version), it will be delivered automatically to the goods recipient specified in the delivery address within the contract period.

You can also find information about the A&D license manager on the Internet at:



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



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

You can obtain in most cases a contact partner for

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

- Country,
- Product or
- Sector.

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

A&D in the WWW



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

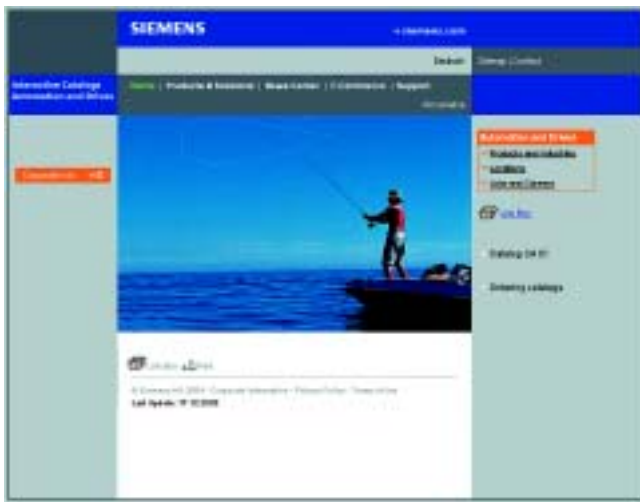
The Siemens Automation and Drives Group (A&D) has therefore built up a comprehensive range of information in the World Wide Web, which offers quick and easy access to all data required.

Under the address

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

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

Product Selection Using the Interactive Catalog



Detailed information together with convenient interactive functions:

The interactive catalog CA 01 covers more than 80,000 products and thus provides a full summary of the Siemens Automation and Drives product base.

Here you will find everything that you need to solve tasks in the fields of automation, switchgear, installation and drives.

All information is linked into a user interface which is easy to work with and intuitive.

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

Information on the interactive catalog CA 01 can be found in the Internet under

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

or on CD-ROM or DVD.

Easy Shopping with the A&D Mall



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

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

Numerous functions are available to support you.

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

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

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

Appendix

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Conversion Tables

Rotary inertia (to convert from A to B, multiply by entry in table)

A \ B	lb-in ²	lb-ft ²	lb-in-s ²	lb-ft-s ² slug-ft ²	kg-cm ²	kg-cm-s ²	gm-cm ²	gm-cm-s ²	oz-in ²	oz-in-s ²
lb-in ²	1	6.94×10^{-3}	2.59×10^{-3}	2.15×10^{-4}	2.926	2.98×10^{-3}	2.92×10^3	2.984	16	4.14×10^{-2}
lb-ft ²	144	1	0.3729	3.10×10^{-2}	421.40	0.4297	4.21×10^5	429.71	2304	5.967
lb-in-s ²	386.08	2.681	1	8.33×10^{-2}	1.129×10^3	1.152	1.129×10^6	1.152×10^3	6.177×10^3	16
lb-ft-s ² slug-ft ²	4.63×10^3	32.17	12	1	1.35×10^4	13.825	1.355×10^7	1.38×10^4	7.41×10^4	192
kg-cm ²	0.3417	2.37×10^{-3}	8.85×10^{-4}	7.37×10^{-5}	1	1.019×10^{-3}	1000	1.019	5.46	1.41×10^{-2}
kg-cm-s ²	335.1	2.327	0.8679	7.23×10^{-2}	980.66	1	9.8×10^5	1000	5.36×10^3	13.887
gm-cm ²	3.417×10^{-4}	2.37×10^{-6}	8.85×10^{-7}	7.37×10^{-8}	1×10^{-3}	1.01×10^{-6}	1	1.01×10^{-3}	5.46×10^{-3}	1.41×10^{-5}
gm-cm-s ²	0.335	2.32×10^{-3}	8.67×10^{-4}	7.23×10^{-5}	0.9806	1×10^{-3}	980.6	1	5.36	1.38×10^{-2}
oz-in ²	0.0625	4.34×10^{-4}	1.61×10^{-4}	1.34×10^{-5}	0.182	1.86×10^{-4}	182.9	0.186	1	2.59×10^{-3}
oz-in-s ²	24.13	0.1675	6.25×10^{-2}	5.20×10^{-3}	70.615	7.20×10^{-2}	7.09×10^4	72.0	386.08	1

Torque (to convert from A to B, multiply by entry in table)

A \ B	lb-in	lb-ft	oz-in	N-m	kg-cm	kg-m	gm-cm	dyne-cm
lb-in	1	8.333×10^{-2}	16	0.113	1.152	1.152×10^{-2}	1.152×10^3	1.129×10^6
lb-ft	12	1	192	1.355	13.825	0.138	1.382×10^4	1.355×10^7
oz-in	6.25×10^{-2}	5.208×10^{-3}	1	7.061×10^{-3}	7.200×10^{-2}	7.200×10^{-4}	72.007	7.061×10^4
N-m	8.850	0.737	141.612	1	10.197	0.102	1.019×10^4	1×10^7
kg-cm	0.8679	7.233×10^{-2}	13.877	9.806×10^{-2}	1	10^{-2}	1000	9.806×10^5
kg-m	86.796	7.233	1.388×10^3	9.806	100	1	1×10^5	9.806×10^7
gm-cm	8.679×10^{-4}	7.233×10^{-5}	1.388×10^{-2}	9.806×10^{-5}	1×10^{-3}	1×10^{-5}	1	980.665
dyne-cm	8.850×10^{-7}	7.375×10^{-8}	1.416×10^{-5}	10^{-7}	1.0197×10^{-6}	1.019×10^{-8}	1.019×10^{-3}	1

Length (to convert from A to B, multiply by entry in table)

A \ B	inches	feet	cm	yd	mm	m
inches	1	0.0833	2.54	0.028	25.4	0.0254
feet	12	1	30.48	0.333	304.8	0.3048
cm	0.3937	0.03281	1	1.09×10^{-2}	10	0.01
yd	36	3	91.44	1	914.4	0.914
mm	0.03937	0.00328	0.1	1.09×10^{-3}	1	0.001
m	39.37	3.281	100	1.09	1000	1

Power (to convert from A to B, multiply by entry in table)

A \ B	HP	Watts
HP (English)	1	745.7
(lb-in) (deg./sec)	2.645×10^{-6}	1.972×10^{-3}
(lb-in) (rpm)	1.587×10^{-5}	1.183×10^{-2}
(lb-ft) (deg./sec)	3.173×10^{-5}	2.366×10^{-2}
(lb-ft) (rpm)	1.904×10^{-4}	0.1420
Watts	1.341×10^{-3}	1

Force (to convert from A to B, multiply by entry in table)

A \ B	lb	oz	gm	dyne	N
lb	1	16	453.6	4.448×10^5	4.4482
oz	0.0625	1	28.35	2.780×10^4	0.27801
gm	2.205×10^{-3}	0.03527	1	1.02×10^{-3}	N.A.
dyne	2.248×10^{-6}	3.59×10^{-5}	980.7	1	0.00001
N	0.22481	3.5967	N.A.	100000	1

Mass (to convert from A to B, multiply by entry in table)

A \ B	lb	oz	gm	kg	slug
lb	1	16	453.6	0.4536	0.0311
oz	6.25×10^{-2}	1	28.35	0.02835	1.93×10^{-3}
gm	2.205×10^{-3}	3.527×10^{-2}	1	10^{-3}	6.852×10^{-5}
kg	2.205	35.27	10^3	1	6.852×10^{-2}
slug	32.17	514.8	1.459×10^4	14.59	1

Rotation (to convert from A to B, multiply by entry in table)

A \ B	rpm	rad/sec.	degrees/sec.
rpm	1	0.105	6.0
rad/sec.	9.55	1	57.30
degrees/sec.	0.167	1.745×10^{-2}	1

Conversion Tables

Temperature Conversion

°F	°C	°C	°F
0	-17.8	-10	14
32	0	0	32
50	10	10	50
70	21.1	20	68
90	32.2	30	86
98.4	37	37	98.4
212	100	100	212
subtract 32 and multiply by $\frac{5}{9}$		multiply by $\frac{9}{5}$ and add 32	

Mechanism Efficiencies

Acme-screw with brass nut	~0.35–0.65
Acme-screw with plastic nut	~0.50–0.85
Ball-screw	~0.85–0.95
Chain and sprocket	~0.95–0.98
Preloaded ball-screw	~0.75–0.85
Spur or bevel-gears	~0.90
Timing belts	~0.96–0.98
Worm gears	~0.45–0.85
Helical gear (1 reduction)	~0.92

Friction Coefficients

Materials	μ
Steel on steel (greased)	~0.15
Plastic on steel	~0.15–0.25
Copper on steel	~0.30
Brass on steel	~0.35
Aluminum on steel	~0.45
Steel on steel	~0.58
Mechanism	μ
Ball bushings	<0.001
Linear bearings	<0.001
Dove-tail slides	~0.2++
Gibb ways	~0.5++

Material Densities

Material	lb-in ³	gm-cm ³
Aluminum	0.096	2.66
Brass	0.299	8.30
Bronze	0.295	8.17
Copper	0.322	8.91
Hard wood	0.029	0.80
Soft wood	0.018	0.48
Plastic	0.040	1.11
Glass	0.079–0.090	2.2–2.5
Titanium	0.163	4.51
Paper	0.025–0.043	0.7–1.2
Polyvinyl chloride	0.047–0.050	1.3–1.4
Rubber	0.033–0.036	0.92–0.99
Silicone rubber, without filler	0.043	1.2
Cast iron, gray	0.274	7.6
Steel	0.280	7.75

Wire Gauges ¹⁾

Cross-section mm ²	Standard Wire Gauge (SWG)	American Wire Gauge (AWG)
0.2	25	24
0.3	23	22
0.5	21	20
0.75	20	19
1.0	19	18
1.5	17	16
2.5	15	13
4	13	11
6	12	9
10	9	7
16	7	6
25	5	3
35	3	2
50	0	1/0
70	000	2/0
95	00000	3/0
120	0000000	4/0
150	–	6/0
185	–	7/0

1) The table shows approximate SWG/AWG sizes nearest to standard metric sizes; the cross-sections do not match exactly.

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