SIEMENS

SINUMERIK 828

Equipment for Machine Tools

Motion Control

Catalog NC 82

Edition 2014

Answers for industry.

Related catalogs

Motion Control NC 62
SINUMERIK 840D sl Type 1B
Equipment for Machine Tools

E86060-K4462-A101-A1-7600

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Training for Industry

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Interactive Catalog, DVD

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SINUMERIK 828
Equipment for Machine Tools

Motion Control

Catalog NC 82 · 2014

Supersedes:
Catalog NC 82 · 2013

Refer to the Industry Mall for current updates of this catalog:
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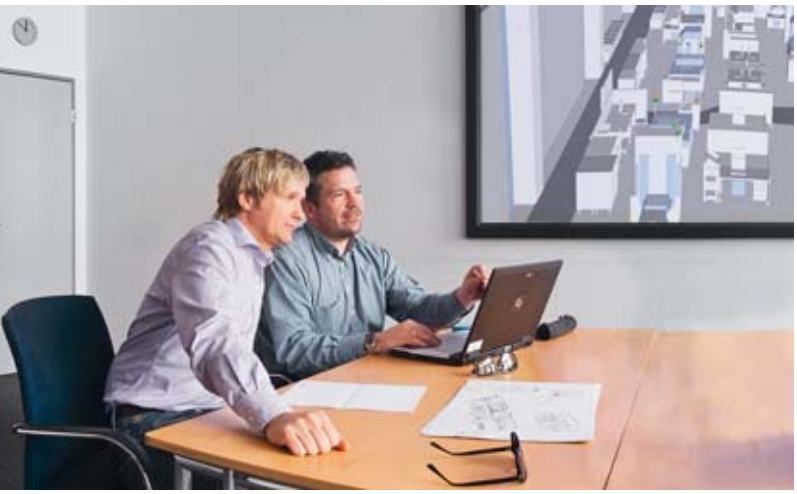
The products contained in this catalog can also be found in the Interactive Catalog CA 01.
Article No.: E86060-D4001-A510-D4-7600

Please contact your local Siemens branch.



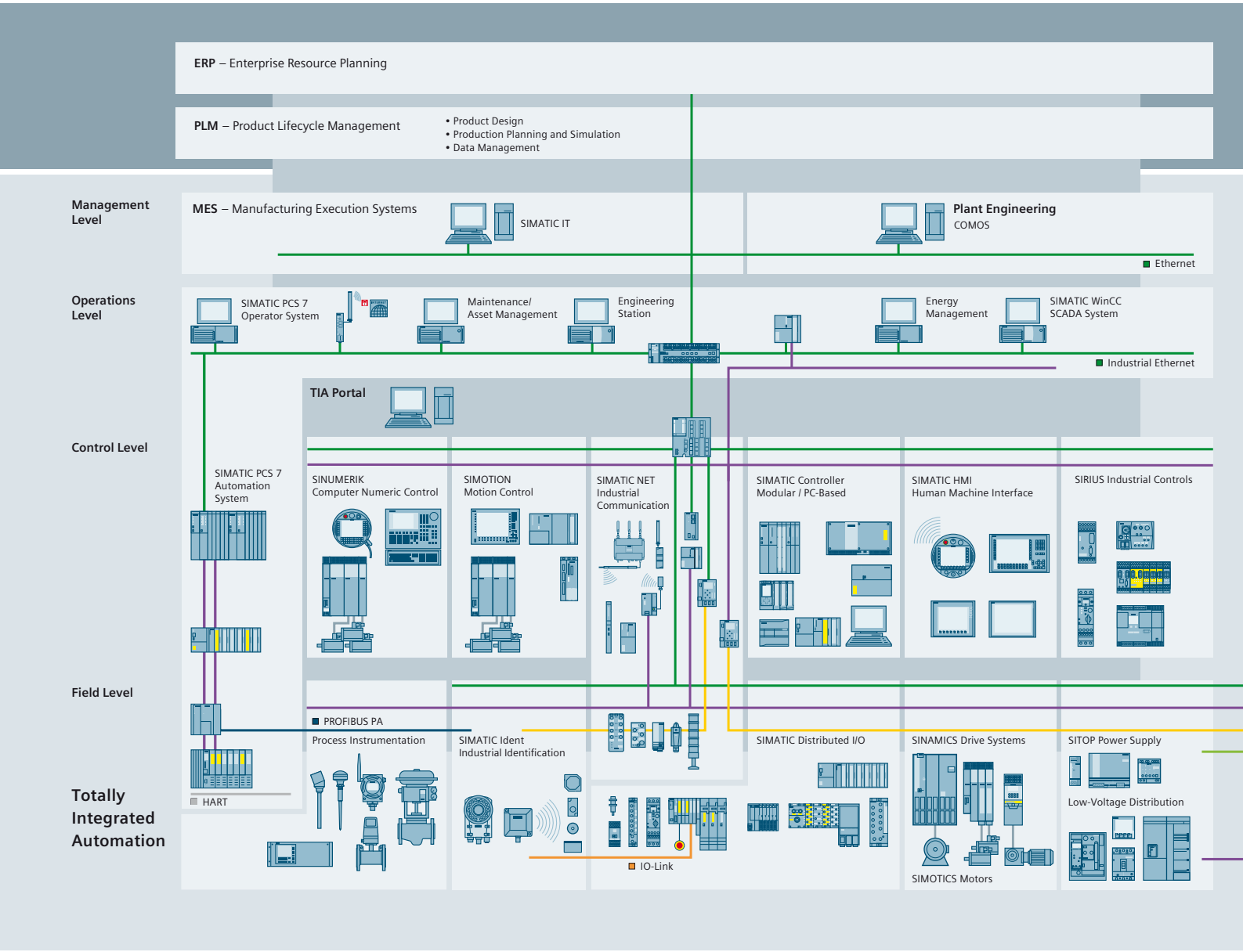
Answers for industry.

Integrated technologies, vertical market expertise and services for greater productivity, energy efficiency, and flexibility.

The Siemens Industry Sector is the world's leading supplier of innovative and environmentally friendly products and solutions for industrial companies. End-to-end automation technology and industrial software, solid market expertise, and technology-based services are the levers we use to increase our customers' productivity, efficiency and flexibility. With a global workforce of more than 100 000 employees, the Industry Sector comprises the Industry Automation, Drive Technologies, and Customer Services divisions, as well as the Metals Technologies Business Unit.

We consistently rely on integrated technologies and, thanks to our bundled portfolio, we can respond more quickly and flexibly to our customers' wishes. With our globally unmatched range of automation technology, industrial control and drive technology as well as industrial software, we equip companies with exactly what they need over their entire value chain – from product design and development to production, sales and service. Our industrial customers benefit from our comprehensive portfolio, which is tailored to their market and their needs.

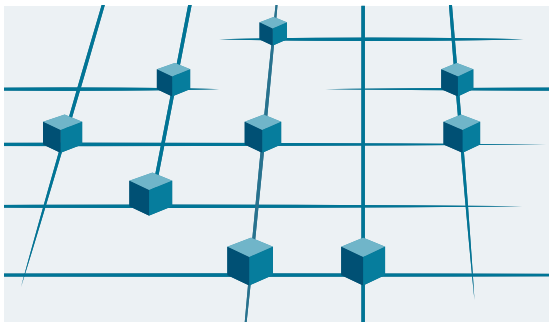
Market launch times can be reduced by up to 50% due to the combination of powerful automation technology and industrial software from Siemens Industry. At the same time, the costs for energy or waste water for a manufacturing company can be reduced significantly. In this way, we increase our customers' competitive strength and make an important contribution to environmental protection with our energy-efficient products and solutions.



Efficient automation starts with efficient engineering.

Totally Integrated Automation: Efficiency driving productivity.

Efficient engineering is the first step toward better production that is faster, more flexible, and more intelligent. With all components interacting efficiently, Totally Integrated Automation (TIA) delivers enormous time savings right from the engineering phase. The result is lower costs, faster time-to-market, and greater flexibility.



Totally Integrated Automation
Efficient interoperability of all automation components

- PROFINET
- Industrial Ethernet
- PROFIBUS
- AS-Interface
- KNX GAMMA instabus

Totally Integrated Power

A unique complete approach for all industries

As one of the world's leading automation suppliers, Siemens provides an integrated, comprehensive portfolio for all requirements in process and manufacturing industries. All components are mutually compatible and system-tested. This ensures that they reliably perform their tasks in industrial use and interact efficiently, and that each automation solution can be implemented with little time and effort based on standard products. The integration of many separate individual engineering tasks into a single engineering environment, for example, provides enormous time and cost savings.

With its comprehensive technology and industry-specific expertise, Siemens is continuously driving progress in manufacturing industries – and Totally Integrated Automation plays a key role.

Totally Integrated Automation creates real value added in all automation tasks, especially for:

- **Integrated engineering**
  Consistent, comprehensive engineering throughout the entire product development and production process
- **Industrial data management**
  Access to all important data occurring in productive operation – along the entire value chain and across all levels
- **Industrial communication**
  Integrated communication based on international cross-vendor standards that are mutually compatible
- **Industrial security**
  Systematic minimization of the risk of an internal or external attack on plants and networks
- **Safety Integrated**
  Reliable protection of personnel, machinery, and the environment thanks to seamless integration of safety technologies into the standard automation

Making things right with Totally Integrated Automation

Totally Integrated Automation, industrial automation from Siemens, stands for the efficient interoperability of all automation components. The open system architecture covers the entire production process and is based on end-to-end shared characteristics: consistent data management, global standards, and uniform hardware and software interfaces.

Totally Integrated Automation lays the foundation for comprehensive optimization of the production process:

- Time and cost savings due to efficient engineering
- Minimized downtime due to integrated diagnostic functions
- Simplified implementation of automation solutions due to global standards
- Better performance due to interoperability of system-tested components

Introduction

Overview

SINUMERIK – a CNC portfolio for the global world of machine tools

SINUMERIK 808D/ SINUMERIK 808D ADVANCED

- Panel-based compact CNC
- Technologies: turning and milling
- Up to 4 axes/spindles
- 1 machining channel
- 7.5" color display
- SIMATIC S7-200 based

SINAMICS V60 SIMOTICS S-1FL5	SINAMICS V70 SIMOTICS S-1FL6
SINUMERIK 808D	SINUMERIK 808D ADVANCED

Entry class

SINUMERIK 828D BASIC/ SINUMERIK 828D

- Panel-based compact CNC
- Technologies: turning and milling
- Up to 8 axes/spindles
- 1 machining channel
- 8.4"/10.4" color display
- SIMATIC S7-200 based

SINAMICS S120

SINAMICS S120 Combi

SINUMERIK 828D BASIC	SINUMERIK 828D

Compact class

SINUMERIK 840D sl

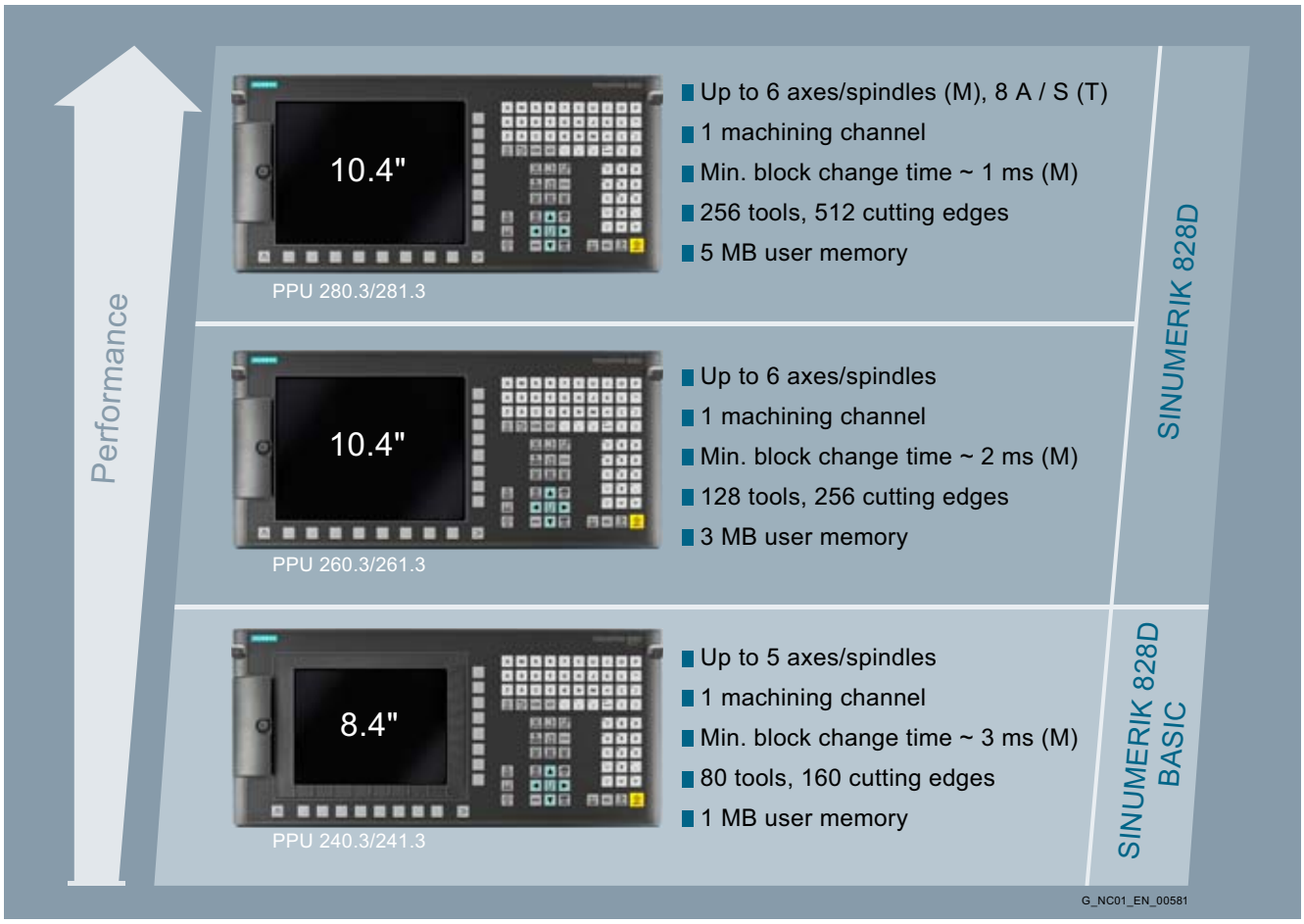
- Drive-based, modular CNC
- Multi-technology CNC
- Up to 93 axes/spindles
- Up to 30 machining channels
- Modular panel concept up to 19" color display
- SIMATIC S7-300 PLC

SINAMICS S120 Combi	SINAMICS S120
SINUMERIK 840D sl BASIC	SINUMERIK 840D sl

Premium class

G_NC01_EN_00547c

Overview



SINUMERIK 828 – Optimum scalability in the compact class

Alongside two high-performance CNC variants of SINUMERIK 828D, SINUMERIK 828D BASIC is a low-cost starter model in the compact class. SINUMERIK 828 therefore fits the performance requirements of standard machine concepts perfectly.

Compact, strong, simple – simply ingenious

The compact, operator-panel-based SINUMERIK 828 CNC systems are extremely rugged and very easy to maintain.

An operator panel front of die-cast magnesium, the panel-based CNC design with minimal interfaces and the high degree of protection make the SINUMERIK 828 CNC systems reliable partners even in harsh environments. Designed without a fan or hard disk, with NVRAM memory technology and no back-up battery, SINUMERIK 828 is a completely maintenance-free CNC.

Powerful CNC functions coupled with a unique 80 bit NANO^{FP} accuracy permit excellent workpiece precision to be achieved in very short machining times. Thanks to a flexible CNC programming language as well as the unique machining step programming package ShopTurn/ShopMill, it is possible to program and machine mass-production parts or single workpieces with highest efficiency. Preconfigured technology-specific system software and unique service functions reduce the commissioning costs and servicing to an absolute minimum.

Technology tailor-made for use in standard turning and milling machines

SINUMERIK 828D is perfectly adapted to use in standard machines and provides optimum support for turning and milling technology. With two preconfigured system software variants for machining technology, the SINUMERIK 828 CNC systems are ready for use in turning and milling machines on dispatch from the factory.

Overview

SINAMICS S120 Combi Power Module

The rugged drive class for compact machine concepts

The SINAMICS S120 Combi drive system offers the usual SINAMICS functionality in a multi-axis drive module tailored for compact turning and milling machines. With a host of technical highlights, the SINAMICS S120 Combi sets new standards in this drive class.

SINAMICS S120 Combi integrates a line infeed with regenerative feedback capability as well as 3 or 4 Motor Modules for spindle and feed motors in one Power Module. The power spectrum extends up to 16 kW spindle power (S1) and up to 12 A current (S1) for feed motors.

SINAMICS S120 Combi thus covers the typical range of power ratings of compact standard turning and milling machines and is the perfect drive partner for the SINUMERIK 828 CNC systems.

The solution for machines with more axes and higher power ratings

The SINAMICS S120 Combi Power Module can be extended by the SINAMICS S120 Motor Modules in booksize compact format if the machine has more axes.

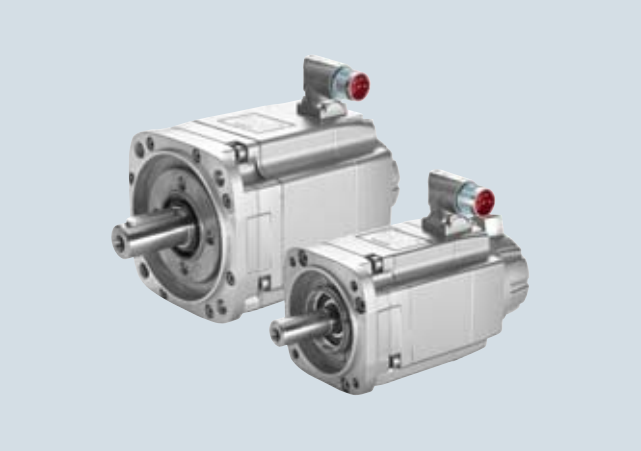
For machine concepts beyond the performance limit of the SINAMICS S120 Combi, the SINAMICS S120 modular drive system is available as an alternative for the SINUMERIK 828 CNC systems.

The SIZER for Siemens Drives engineering tool will provide you with support for configuring the equipment, or seek advice from your Siemens sales representative.

You will find further information in the Siemens Industry Mall:

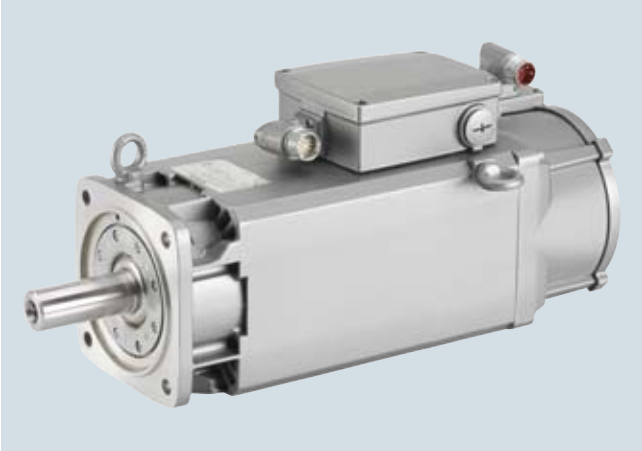
www.siemens.com/industrymall

Overview



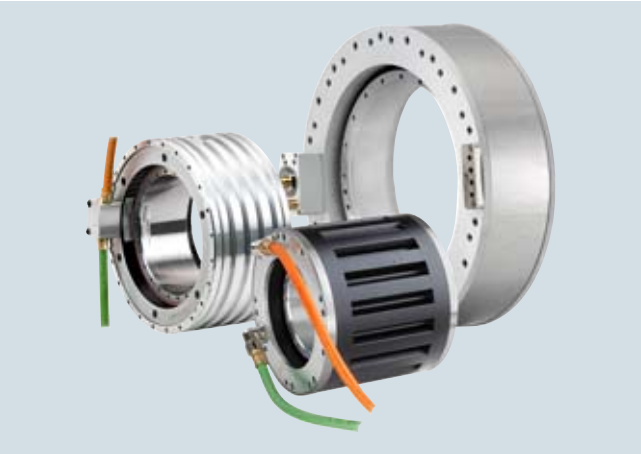
SIMOTICS S-1FK7 feed motors – maximum precision in the machine

The performance and accuracy of the CNC control and drive are useful only if they can be transferred to the machine axes. Thanks to their unique dynamic response and accuracy, SIMOTICS S-1FK7 feed motors are exactly suited for this purpose.



SIMOTICS M-1PH8 spindle motors – peak performance for the spindle

With the SIMOTICS M-1PH8 spindle motors we offer the perfect solution for this purpose. Very fast acceleration times and a wide speed range with high output guarantee maximum productivity of the machine – with speeds of up to 24000 rpm.



SIMOTICS T-1FW6 torque motors

The torque motors satisfy the most exacting demands in precision, performance and dynamic response. Permanent-magnet synchronous motors with a high number of poles are fully integrated in the machine, and mechanical transmission elements such as gear units are omitted, so you benefit from greater flexibility with regard to installation, easier servicing, higher availability and minimal space requirements.

We can also provide customized solutions

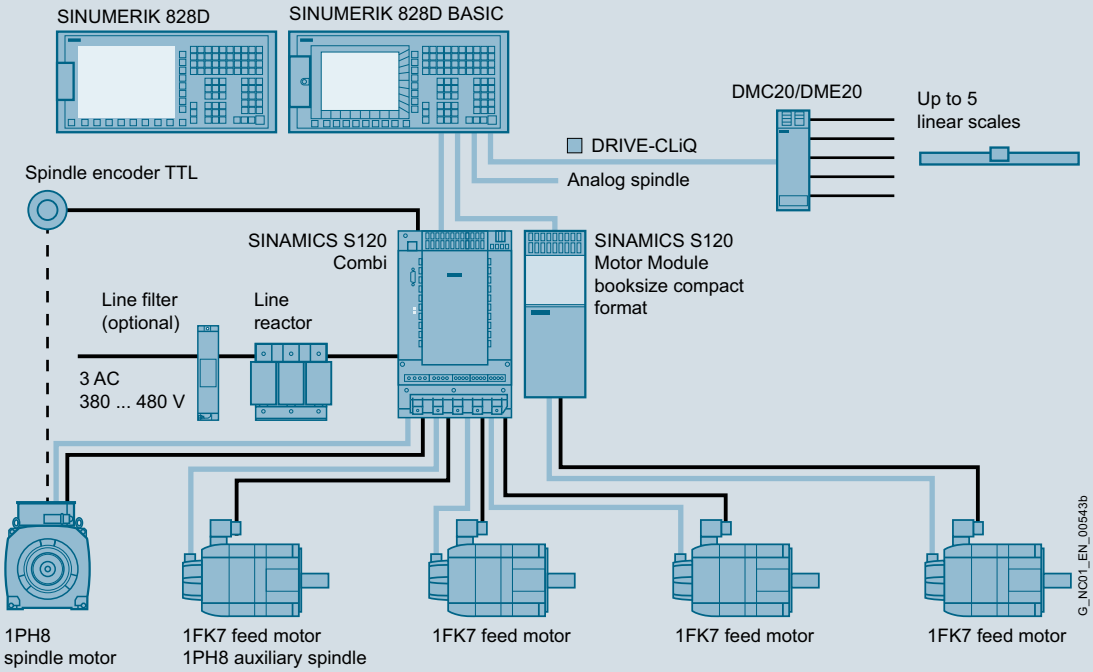
In addition to the range of motors described, we offer a comprehensive range of solutions for feed and spindle applications. Your Siemens sales representative will be happy to advise you on how to configure your individual equipment.

You will find further information, as well as the full range of available motors, in Catalog NC 62 or in the Siemens Industry Mall:

www.siemens.com/industrymall

SINUMERIK 828D BASIC/SINUMERIK 828D with SINAMICS S120 Combi and SIMOTICS motors

Overview



Configuration example

The perfect basis for safe machine concepts

With Safety Integrated, the SINUMERIK 828 CNC systems offer an optimum platform for the implementation of safe machine concepts. Operation when protective doors are open? A safe speed monitoring function makes it possible to manage requirements of this type.

The Safety Integrated functions of the SINUMERIK 828 conform to Machinery Directive 2006/42/EC. As a result, it is possible to comply cheaply and efficiently with the machine safety regulations applicable in Europe or other countries.

Perfectly coordinated configurations – Quick Packages

We have already combined the drive components for the SINUMERIK 828D BASIC/SINUMERIK 828D into Quick Packages:

- SIMOTICS S-1FK7 feed motors
- SIMOTICS M-1PH8 spindle motors
- SINAMICS S120 Combi

You can, of course, assemble your own individual equipment package. Use our engineering tool SIZER for Siemens Drives for this purpose, or seek advice from your Siemens sales representative.

Material warranty and on-site service

For the worst-case scenario, you will receive a free on-site service contract for a period of 24 months (36 months maximum) for the SINUMERIK 828D BASIC and SINUMERIK 828D and the associated components (except for complete motor spindles) from Siemens Industry Sector IA & DT.

You benefit because we eliminate any defects on our components free of charge on site, i.e. directly at the site of installation of your machine.

Further information about the conditions and the scope of the warranty and on-site service contract can be found at:

www.siemens.com/automation/oss

Overview

With Safety Integrated, SINUMERIK 828 CNC systems, in combination with the SINAMICS drive system, offer an optimum platform for the implementation of safe machine concepts.

The safety functions comply with the requirements of Category 3 as well as Performance Level PL d according to DIN EN ISO 13849-1 and safety integrity level SIL 2 according to DIN EN 61508. Consequently, important functional safety requirements can be implemented easily and economically.

Included in the functional scope:

- Functions for safe monitoring of standstill
- Functions for safe monitoring of speed

Benefits

- High level of safety:
  Complete implementation of the safety functions in Category 3/SIL 2/PL d
- High level of flexibility:
  Practical safety and operating concepts can be implemented
- Faster commissioning due to integrated safety functions

Function

The safety functions are available in all modes and can communicate with the process using safety-related input/output signals. These can be implemented individually for each axis and spindle. The following Safety Integrated functions are available (terms in accordance with IEC 61800-5-2):

Safety Integrated basic functions

- Safe Torque Off (**STO**)
  Prevention of unexpected startup by internal cancellation of the drive pulses
- Safe Brake Control (**SBC**)
  Safe brake control of holding brakes which are active in the de-energized state, e.g. motor holding brakes.
- Safe Stop 1 (**SS1**)
  Safe stopping of the drive with subsequent prevention of unexpected startup (STO).

Extended Safety Integrated functions

- Safe Operating Stop (**SOS**)
  Monitors drives for standstill. The drives remain fully functional for position control.
- Safe Stop 2 (**SS2**)
  Safe stopping of the drive with subsequent monitoring for standstill (SOS).
- Safely Limited Speed (**SLS**)
  Monitoring of configurable velocity limit values, e.g. during setup
- Safe Speed Monitor (**SSM**)
  Safe checkback signal when a value falls below a settable speed limit, e.g. for enabling a protective door
- Safe Acceleration Monitor (**SAM**)
  Safe monitoring of drive acceleration
- Safe Direction (**SDI**)
  Safe monitoring of the direction of motion

The Safety Integrated basic functions are controlled via existing terminals on the SINAMICS S120 Combi Power Modules or the SINAMICS S120 Motor Modules in booksize compact format and SINUMERIK 828.

A SINAMICS S120 TM54F Terminal Module is required for controlling the extended Safety Integrated functions.

We recommend the following safety relays for the configuration of the safe control logic for individual safety functions:

- SIRIUS 3SK1 safety relay for configuring a hardware link
- SIRIUS 3RK3 Modular Safety System for a graphically parameterizable solution

Notes

Overview of functions

The functionality of the SINUMERIK 828 CNC controls complies with the export list restrictions. Accordingly, these CNC controls do not require official approval as a result of their type in accordance with EU or German law.

The following overview lists all the functions which are available with the SINUMERIK 828 controls.
The information in the overview of functions of SINUMERIK 828 is based on the following software versions:

CNC control	Software version
SINUMERIK 828D BASIC	4.5
SINUMERIK 828D	4.5

Overview of functions
CNC controls SINUMERIK 828

Control structure and configuration

✓ Basic version O Option – Not available	Article No. Notes	SINUMERIK 828D BASIC PPU 240/ PPU 241	PPU 260/ PPU 261	PPU 280/ PPU 281
Control structure and configuration				
Panel-based compact CNC comprising:		✓	✓	✓
• Compact operator-panel CNC		✓	✓	✓
• CNC/PLC Control Unit		✓	✓	✓
• Closed-loop control for drives		5	6	6
Design, drive-based/PC-based		–	–	–
Operator-panel CNC, horizontal/vertical:		✓/✓	✓/✓	✓/✓
• Color display		8.4"	10.4"	10.4"
• Integrated QWERTY keyboard		✓	✓	✓
System software, export version, on CF card, with license				
• SINUMERIK 828D with PPU 240/241				
- Turning	**6FC5835-1GY40-2YA0**	O	–	–
- Milling	**6FC5835-2GY40-2YA0**	O	–	–
• SINUMERIK 828D with PPU 260/261				
- Turning	**6FC5834-1GY40-2YA0**	–	O	–
- Milling	**6FC5834-2GY40-2YA0**	–	O	–
• SINUMERIK 828D with PPU 280/281				
- Turning	**6FC5833-1GY40-2YA0**	–	–	O
- Milling	**6FC5833-2GY40-2YA0**	–	–	O
SINUMERIK Operate embedded HMI		✓	✓	✓
Windows-based HMI		–	–	–
DRIVE-CLiQ drive interface		3	3	3
Numeric Control Extension NX10.3 for applications with up to 8 axes	**6SL3040-1NC00-0AA0**			
• Turning		–	–	O
• Milling (current controller cycle clock reduced to 62.5 µs)		–	O	O
Mode group, maximum		1	1	1
Machining channel, maximum		1	1	1
CNC user memory (buffered) for CNC part programs		1 MB	3 MB	5 MB
CNC user memory, maximum configuration		1 MB	3 MB	5 MB
Additional CNC user memory on user CompactFlash card	CompactFlash card must be ordered separately.	✓	✓	✓
HMI user memory, additional 256 MB on CompactFlash card of the PPU		–	–	–
Axes/spindles or positioning axes/auxiliary spindle:				
• Basic quantity of axes/spindles				
- Turning		3	3	3
- Milling		4	4	4
• Maximum configuration axes/spindles				
- Turning		5	6	8
- Milling		5	6	6
Axis/spindle, each additional	**6FC5800-0AC20-0YB0**	O	O	O
Positioning axis/auxiliary spindle, each additional	**6FC5800-0AC30-0YB0**	O	O	O
PLC-controlled axis		✓	✓	✓
PLC positioning axis via PROFIBUS		–	–	–

✓ Basic version O Option – Not available	Article No. Notes	SINUMERIK 828D BASIC PPU 240/ PPU 241	PPU 260/ PPU 261	PPU 280/ PPU 281
Drives				
SINAMICS S120 Combi		O	O	O
SINAMICS S120 Motor Modules via DRIVE-CLiQ	See Catalog NC 62	O	O	O
SINAMICS S120 DRIVE-CLiQ on motor		O	O	O
SINAMICS S120 SMC Sensor Module Cabinet:				
• SMC20	**6SL3055-0AA00-5BA3**	O	O	O
• SMC30	**6SL3055-0AA00-5CA2**	O	O	O
• SMC40	**6SL3055-0AA00-5DA0**	O	O	O
SINAMICS S120 SME Sensor Module External:	See Catalog NC 62			
• SME20		O	O	O
• SME25		O	O	O
• SME120		O	O	O
• SME125	**6SL3055-0AA00-5KA3**	O	O	O
SINAMICS S120 expansion modules:				
• DMC20 DRIVE-CLiQ Hub Module	**6SL3055-0AA00-6AA0**	O	O	O
• DME20 DRIVE-CLiQ Hub Module	**6SL3055-0AA00-6AB0**	O	O	O
SINAMICS S120 Motor Modules in booksize compact format:	See SINAMICS S120 drive system			
• Internal air cooling	3SL3420-...	O	O	O
SINAMICS S120 Motor Modules in booksize format:	See SINAMICS S120 drive system			
• Internal air cooling	6SL3120-...	O	O	O
• External air cooling	6SL3121-...	O	O	O
• Cold plate cooling	6SL3126-...	O	O	O
SINAMICS S120 Active Line Modules in booksize format:	See SINAMICS S120 drive system			
• Internal air cooling	6SL3130-...	O	O	O
• External air cooling	6SL3131-...	O	O	O
• Cold plate cooling	6SL3136-...	O	O	O
SINAMICS S120 Smart Line Modules in booksize format:	See SINAMICS S120 drive system			
• Internal air cooling	6SL3130-...	O	O	O
• External air cooling	6SL3131-...	O	O	O
• Cold plate cooling	6SL3136-...	O	O	O
SINAMICS S120 Motor Modules in chassis format, internal air cooling (rated pulse frequency 2 kHz)	On request.	O	O	O
Connectable measuring systems				
Number of measuring systems per axis, maximum		2	2	2
Incremental encoder installed in motors SIMOTICS S-1FT7/S-1FK7/M-1PH8		O	O	O
Absolute encoder installed in motors SIMOTICS S-1FT7/S-1FK7/M-1PH8		O	O	O
Absolute encoder with SSI interface via SMC20/SMC30/SMC40		O	O	O
Third-party rotary and linear measuring systems with DRIVE-CLiQ interface support.automation.siemens.com/WW/view/en/65402168		O	O	O
Rotary measuring systems with:				
• RS422 (TTL)	6FX2001-2...	O	O	O
• sin/cos 1 V_{pp}	6FX2001-3...	O	O	O
• Distance-coded reference marks		O	O	O
• EnDat 2.1/EnDat 2.2		O	O	O
• DRIVE-CLiQ	6FX2001-5...	O	O	O
Linear measuring systems LMS with sin/cos 1 V_{pp}, distance-coded reference marks or EnDat 2.1	See Catalog NC 62	O	O	O

Overview of functions
CNC controls SINUMERIK 828

Connectable motors/Axis functions/Spindle functions

✓ Basic version
O Option
– Not available

	Article No. / Notes	SINUMERIK 828D BASIC PPU 240/ PPU 241	PPU 260/ PPU 261	PPU 280/ PPU 281
Connectable motors (preferred versions)				
SIMOTICS S-1FK7 servomotor		O	O	O
SIMOTICS S-1FT7 servomotor		O	O	O
SIMOTICS M-1PH8 spindle motor		O	O	O
SIMOTICS M-1FE1 built-in motor	Not with SINAMICS S120 Combi.	O	O	O
SIMOTICS L-1FN3/L-1FN6 linear motor		–	–	–
SIMOTICS T-1FW6 built-in torque motor	Not with SINAMICS S120 Combi.	O	O	O
Hybrid spindle/motor spindle 2SP1	www.siemens.com/spindles	O	O	O
Third-party motor	On request.	O	O	O
Axis functions				
Feedrate override of 0 % ... 200 %		✓	✓	✓
Feedrate override, axis-specific of 0 % ... 200 %		✓	✓	✓
Traversing range, decades		± 9	± 9	± 9
Rotary axis, turning endlessly		✓	✓	✓
Velocity, maximum		300 m/s	300 m/s	300 m/s
Acceleration with jerk limitation		✓	✓	✓
Programmable acceleration		✓	✓	✓
Follow-up mode		✓	✓	✓
Measuring systems 1 and 2, selectable		✓	✓	✓
Feedrate interpolation		✓	✓	✓
Separate feedrate for roundings and chamfers		✓	✓	✓
Travel to fixed stop		✓	✓	✓
Travel to fixed stop with Force Control	**6FC5800-0AM01-0YB0**	O	O	O
Analog axis/spindle, max.		1	1	1
Setpoint exchange		–	–	–
Tangential control		–	–	–
Position switching signals/cam controller		–	–	–
Advanced Position Control APC		–	–	–
Spindle functions				
Spindle speed, analog setpoint, max.		1	1	1
Spindle speed, digital setpoint		✓	✓	✓
Spindle speed, max. programmable value range: 10^6 ... 10^{-4} (display: ± 999999999.9999)		✓	✓	✓
Spindle override from 0 % ... 200 %		✓	✓	✓
Gear stages		5	5	5
Intermediate gear		✓	✓	✓
Gear stage selection, automatic		✓	✓	✓
Oriented spindle stop		✓	✓	✓
Spindle speed limitation min./max.		✓	✓	✓
Constant cutting rate		✓	✓	✓
Spindle speed control via PLC (oscillation)		✓	✓	✓
Changeover to axis mode		✓	✓	✓
Axis synchronization on-the-fly		✓	✓	✓
Thread run-in and run-out, programmable		✓	✓	✓
Thread cutting with constant or variable pitch		✓	✓	✓
Tapping with compensating chuck/rigid tapping		✓	✓	✓

✓ Basic version O Option – Not available	Article No. Notes	SINUMERIK 828D BASIC PPU 240/ PPU 241	PPU 260/ PPU 261	PPU 280/ PPU 281
Interpolations				
Linear interpolating axes, maximum		4	4	4
Circle via center point and end point		✓	✓	✓
Circle via interpolation point		✓	✓	✓
Helical interpolation		✓	✓	✓
Universal interpolator NURBS (non-uniform rational B splines)		✓	✓	✓
Continuous-path mode with programmable rounding clearance		✓	✓	✓
Multi-axis interpolation > 4 interpolating axes		–	–	–
Advanced Surface (included in SINUMERIK MDynamics)	Only for milling.	✓	✓	✓
Spline interpolation (A, B and C splines)	**6FC5800-0AS16-0YB0**	O	O	O
Compressor for 3-axis machining	Only for milling.	✓	✓	✓
Polynomial interpolation		–	–	–
Involute interpolation		–	–	–
Crank interpolation CRIP		–	–	–
Couplings				
Pair of synchronized axes (gantry axes), Basic	**6FC5800-0AS51-0YB0**	O	O	O
• Gantry line-up		1	1	1
Master-Slave for drives, basic	**6FC5800-0AS52-0YB0**	O	O	O
Generic coupling Static, CP-Static[1] (e.g. counterspindle):	**6FC5800-0AM75-0YB0**			
• 1 × simple synchronous spindle, coupling ratio 1:1, no multi-edge machining				
- Turning		–	–	O
- Milling		O	O	O
Generic coupling Basic, CP-Basic[2] (e.g. multi-edge turning):	**6FC5800-0AM72-0YB0**			
• 4 axis pairs in simultaneous coupled motion	Only for turning.	O	O	O
• 1 x synchronous spindle/multi-edge turning	Only for turning.	O	O	O
• Master-value coupling/curve table interpolation		–	–	–
Generic coupling Comfort, CP-Comfort (e.g. electronic gear):	**6FC5800-0AM73-0YB0**			
• 4 axis pairs in simultaneous coupled motion	Only for turning.	O	O	O
• 1 x synchronous spindle/multi-edge turning	Only for turning.	O	O	O
• Electronic gear for 3 leading axes, without curve table, without cascading	Only for turning.	O	O	O
• Axial coupling in the machine coordinate system		–	–	–
• Master-value coupling/curve table interpolation		–	–	–
Transformations				
Cartesian point-to-point travel PTP		✓	✓	✓
TRANSMIT/cylinder surface transformation	**6FC5800-0AM27-0YB0**	O	O	O
TRANSMIT/TRACYL without Y axis	**6FC5800-0AS50-0YB0**	O	O	O
Inclined axis[3]	**6FC5800-0AM28-0YB0** Only for turning.	–	–	O
Concatenated transformations (inclined axis TRAANG after TRAORI/ cardanic milling head/TRANSMIT/TRACYL)	Only for turning.	–	–	✓
Measuring functions and measuring cycles				
Measuring stage 1 2 probes (switching) with/without deletion of distance-to-go		✓	✓	✓
Measuring cycles for drilling/milling and turning (calibrate workpiece probe, workpiece measurement, tool measurement)	**6FC5800-0AP28-0YB0**	O	O	O
Measure kinematics (determine transformation data of rotary axes)	**6FC5800-0AP18-0YB0** Only for milling.	O	O	O

[1] Tapping center with two spindles or counterspindle turning machines.
[2] For multi-edge turning in turning machines.
[3] For non-orthogonal Y axis in turning machines.

Overview of functions
CNC controls SINUMERIK 828

Technologies/Motion-synchronous actions/Open Architecture/CNC programming language

✓ Basic version O Option – Not available	Article No. Notes	SINUMERIK 828D BASIC PPU 240/ PPU 241	 PPU 260/ PPU 261	 PPU 280/ PPU 281
Technologies				
Handwheel override		✓	✓	✓
Contour handwheel	**6FC5800-0AM08-0YB0**	O	O	O
SINUMERIK MDynamics:				
• Advanced Surface	Only for milling.	✓	✓	✓
• High Speed Settings	Only for milling.	✓	✓	✓
• Expanded user memory via the user CompactFlash card	CompactFlash card must be ordered separately. Only for milling.	✓	✓	✓
Motion-synchronous actions				
CNC inputs/outputs, high-speed:				
• Digital inputs drives onboard		12	12	12
• Digital inputs/outputs drives onboard, parameterizable		8	8	8
• Digital inputs/outputs CNC onboard		8/8	8/8	8/8
Synchronized actions and high-speed auxiliary function output incl. 3 synchronous functions		✓	✓	✓
Positioning axes and spindles via synchronized actions (command axes)		✓	✓	✓
Analog value control in the interpolation cycle		–	–	–
Evaluation of internal drive variables, basic	**6FC5800-0AS53-0YB0**	O	O	O
Asynchronous subprograms ASUB		✓	✓	✓
Interrupt routines with fast retraction from the contour (with subprogram/ASUB)		✓	✓	✓
Cross-mode actions (ASUBs and synchronized actions in all operating modes)		✓	✓	✓
Display active synchronized actions in HMI	Included in option: Extended operator functions. 6FC5800-0AP16-0YB0	O	O	O
Open Architecture				
SINUMERIK Integrate Run MyScreens (Easy Screen):				
• Free screens		5	5	5
• > 5 screens, extended functions	**6FC5800-0AP64-0YB0**	O	O	O
CNC programming language				
Programming language DIN 66025 and high-level language expansion		✓	✓	✓
Main program call from main program and subprogram		✓	✓	✓
Subprogram levels/interrupt routines, max.		11/4	11/4	11/4
Number of subprogram passes		≤ 9999	≤ 9999	≤ 9999
Number of levels for skip blocks		2	2	2
Number of levels for skip blocks, maximum	Included in option: Extended operator functions. 6FC5800-0AP16-0YB0	O 10	O 10	O 10
Polar coordinates		✓	✓	✓
1/2/3-point contours		✓	✓	✓
Dimensions metric/inch, changeover manually or via program		✓	✓	✓
Inverse-time feedrate		✓	✓	✓
Auxiliary function output via:				
• M word, max. programmable value range: INT 2^{31} -1 ... 2^{31}		✓	✓	✓
• H word, max. programmable value range REAL ± 3.4028 ex 38 (display ± 999999999,9999) INT -2^{31} ... 2^{31} -1		✓	✓	✓

✓ Basic version O Option – Not available	Article No. Notes	SINUMERIK 828D BASIC PPU 240/ PPU 241	PPU 260/ PPU 261	PPU 280/ PPU 281
CNC programming language (continued)				
CNC high-level language with:				
• User variables, configurable		✓	✓	✓
• Predefined user variables (arithmetic parameters)		✓	✓	✓
• Predefined user variables (arithmetic parameters), configurable		✓	✓	✓
• Read/write system variables		✓	✓	✓
• Indirect programming		✓	✓	✓
• Program jumps and branches		✓	✓	✓
• Program coordination with WAIT, START, INIT		✓	✓	✓
• Arithmetic and trigonometric functions		✓	✓	✓
• Comparison operations and logic operations		✓	✓	✓
• Macro techniques		✓	✓	✓
• Control structures IF-ELSE-ENDIF		✓	✓	✓
• Control structures WHILE, FOR, REPEAT, LOOP		✓	✓	✓
• Commands to HMI		✓	✓	✓
• STRING functions		✓	✓	✓
Program functions:				
• Preprocessing memory, dynamic FIFO		✓	✓	✓
• Look Ahead, recorded part program blocks	Milling with MDynamics, Advanced Surface (COMPCAD) active			
- Turning		1	1	1
- Milling		>150	>300	>450
• Look Ahead, IPO blocks, buffered				
- Turning		1	1	1
- Milling		50	100	150
• Frame concept		✓	✓	✓
• Inclined-surface machining with swivel cycle	Only for milling.	✓	✓	✓
• Axis/spindle interchange		✓	✓	✓
• Geometry axes, switchable online in the CNC program		✓	✓	✓
• Program preprocessing		✓	✓	✓
Online ISO dialect interpreter		✓	✓	✓
Program/workpiece management:				
• Part programs on PPU, maximum number	In total maximum 512 files per directory.	750	750	750
• Workpieces on PPU, maximum number	In total maximum 256 directories.	250	250	250
• On additional plug-in CompactFlash card		✓	✓	✓
• On USB storage medium, e.g. memory stick		✓	✓	✓
• On network drive (Windows Share/FTP)	Included in option: Network drive management via Ethernet. 6FC5800-0AP01-0YB0	O	O	O
• Templates for workpieces, programs and INI files		✓	✓	✓
• Job lists		✓	✓	✓

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CNC programming language/Programming support/Simulations

✓ Basic version O Option – Not available	Article No. Notes	SINUMERIK 828D BASIC PPU 240/ PPU 241	PPU 260/ PPU 261	PPU 280/ PPU 281
CNC programming language (continued)				
Basic frames, max. number		1	1	1
Settable offsets, max. number		50	100	100
Work offsets, programmable (frames)		✓	✓	✓
Scratching, determining work offset		✓	✓	✓
Work offsets, external via PLC		✓	✓	✓
Global and local user data		✓	✓	✓
Global program user data		✓	✓	✓
Display system variables (also via online configurable display) and log them		–	–	–
Programming support				
Program editor:				
• Programming support for cycles, programGUIDE		✓	✓	✓
• CNC editor with editing functions: selecting, copying, deleting		✓	✓	✓
• Geometry processor with programming graphics/free contour input (contour calculator)		✓	✓	✓
• Screens for 1/2/3-point contours (contour definition programming)		–	–	–
• Machining step programming ShopTurn/ShopMill	**6FC5800-0AP17-0YB0**	O	O	O
- Manual machine (included in option: Machining step programming ShopTurn/ShopMill)	Only for milling.	✓	✓	✓
- Multiple clamping of various workpieces (included in option: Machining step programming ShopTurn/ShopMill)	Only for milling.	✓	✓	✓
• Backup workpiece setup data	Included in option: Extended operator functions. 6FC5800-0AP16-0YB0	O	O	O
Technology cycles for drilling/milling/turning	Basic scope	✓	✓	✓
Advanced technology functions[1] (expansion of the technology cycles for turning and milling)	**6FC5800-0AP58-0YB0**	O	✓	✓
• Pocket milling with free contour definition and islands		O	✓	✓
• Stock removal cycles with free contour definition	Only for turning.	O	✓	✓
Residual material detection and machining for contour pockets and stock removal	**6FC5800-0AP13-0YB0** Requirement: Advanced technology functions option.	O	O	O
Access protection for cycles		–	–	–
Programming support can be extended, e.g. customer cycles		✓	✓	✓
CAD Reader for PC on CD-ROM, current software version	**6FC5260-0AY00-0AG0**	O	O	O
Simulations				
Simulation of program X, while program Y is being executed (simulation parallel to machining)		–	–	–
2D simulation		✓	✓	✓
3D simulation, finished part	**6FC5800-0AP25-0YB0**	O	O	O
3D simulation, finished part and working area		–	–	–
3D simulation, finished part with collision check		–	–	–
Simultaneous recording (real-time simulation of current machining operation)	**6FC5800-0AP22-0YB0**	O	O	O

[1] The CNC option Advanced technology functions provides you with technology cycles for the following additional machining operations:
- Asymmetric grooves (only turning)
- Drill and thread milling
- Thread milling
- Multi-edge milling
- Engraving
- Extended stock removal along contour with segmentation of blank (only turning)
- Contour grooving and plunge turning (only turning)
- Milling of contour pockets and spigots (with up to 12 islands)
- Position pattern - hide position
- Asymmetrically turn a shoulder
- DIN thread undercut

✓ Basic version O Option – Not available	Article No. Notes	SINUMERIK 828D BASIC PPU 240/ PPU 241	 PPU 260/ PPU 261	 PPU 280/ PPU 281
Operating modes				
JOG:				
• Handwheel selection		✓	✓	✓
• Inch/metric changeover		✓	✓	✓
• Manual measurement of work offset		✓	✓	✓
• Additional measuring version via standard scope - Standard scope workpiece zero: Set edge, align edge, right-angled corner, 1 hole, and 1 circular spigot - Expansion of the measurement window via combo box	Included in option: Extended operator functions. 6FC5800-0AP16-0YB0 Only for milling.	O	O	O
• Manual measurement of tool offset		✓	✓	✓
• Automatic tool/workpiece measurement		✓	✓	✓
• Reference point approach, automatic/via CNC program		✓	✓	✓
MDI:				
• Input in text editor		✓	✓	✓
• Load/save MDI program	Included in option: Extended operator functions. 6FC5800-0AP16-0YB0	O	O	O
• Input screen forms for technology and positioning, cycle support		✓	✓	✓
Teach-in	Included in option: Extended operator functions. 6FC5800-0AP16-0YB0	O	O	O
Automatic:				
• Execution from storage medium connected to CompactFlash card interface on the operator panel front		✓	✓	✓
• Execution from storage medium connected to USB interface on the operator panel front (e.g. card reader, memory stick)		✓	✓	✓
• Execution from network drive	Included in option: Network drive management via Ethernet. 6FC5800-0AP01-0YB0	O	O	O
• Program control		✓	✓	✓
• Program editing		✓	✓	✓
• Overstoring	Included in option: Extended operator functions. 6FC5800-0AP16-0YB0	O	O	O
• DRF offset	Included in option: Extended operator functions. 6FC5800-0AP16-0YB0	O	O	O
• Block search with/without calculation		✓	✓	✓
• Extended block search (program, search pointer, step up and down, interrupt function)	Included in option: Extended operator functions. 6FC5800-0AP16-0YB0	O	O	O
Repos (repositioning on the contour):				
• With operator command/semi-automatically		✓	✓	✓
• Program-controlled		✓	✓	✓
Preset:				
• Set actual value		✓	✓	✓

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✓ Basic version O Option – Not available	Article No. Notes	SINUMERIK 828D BASIC PPU 240/ PPU 241	PPU 260/ PPU 261	PPU 280/ PPU 281
Tools				
Tool types:				
• Turning		✓	✓	✓
• Drilling/milling		✓	✓	✓
• Groove sawing		✓	✓	✓
Tool radius compensations in plane with:				
• Approach and retract strategies		✓	✓	✓
• Transition circle/ellipse on outer edges		✓	✓	✓
Configurable intermediate blocks with tool radius compensation active		✓	✓	✓
3D tool radius compensation		–	–	–
Tool carrier with orientation capability	Only for milling.	✓	✓	✓
Look-ahead detection of contour violations		✓	✓	✓
Tool management				
Operation with tool management:		✓	✓	✓
• Real magazines, maximum number		1	1	2
• Tool list		✓	✓	✓
• Expandable tool list		–	–	–
• Tools/cutting edges in tool list		80/160	128/256	256/512
• Tool offset selection via T and D numbers		✓	✓	✓
• Magazine list		✓	✓	✓
• Configurable magazine list		✓	✓	✓
• Magazine data		✓	✓	✓
• Empty location search and location positioning		✓	✓	✓
• Easy empty location search via softkey		✓	✓	✓
• Loading and unloading of tools		✓	✓	✓
• Tool cabinet and tool catalog		–	–	–
• Loading and unloading via code carrier system		–	–	–
• Adapter data	Only for turning.	✓	✓	✓
• Location-dependent offsets		–	–	–
• Tool life monitoring and workpiece count		✓	✓	✓
• Replacement tools for tool management	**6FC5800-0AM78-0YB0**	O	O	O
Manage MyTools tool management functions		–	–	–

✓ Basic version O Option – Not available	Article No. Notes	SINUMERIK 828D BASIC PPU 240/ PPU 241	PPU 260/ PPU 261	PPU 280/ PPU 281
Communication and data management				
Data on storage medium on rear USB interface of operator panel, e.g. card reader, memory stick		✓	✓	✓
Data on storage medium on front USB interface of operator panel, e.g. card reader, memory stick		✓	✓	✓
Data on the front CF card interface of the operator panel		✓	✓	✓
Process data transfer (WRITE ISOPRINT) to the CF card, USB stick or via RS232C		✓	✓	✓
Manage additional drives via Windows Share/FTP:				
• Ethernet, maximum	**6FC5800-0AP01-0YB0**	O 4	O 4	O 4
• USB interface		✓	✓	✓
• CF card interface on the operator panel front		✓	✓	✓
RS232C serial interface		✓	✓	✓
Data backup of the system software and user data (backup/restore) on the user CF card		✓	✓	✓
I/O interfacing via PROFINET	Only via PP 72/48D PN or PP 72/48D 2/2A PN I/O modules.	✓	✓	✓
Connection to an external PROFINET network with SIMATIC DP PN/PN coupler	**6ES7158-3AD01-0XA0**	O	O	O
SINUMERIK Integrate Create MyInterface		–	–	–
SINUMERIK Integrate Access MyBackup		–	–	–
Production data evaluation:				
• SINUMERIK Integrate Analyze MyPerformance		–	–	–
Host computer connection Server for OPC unified architecture:				
• SINUMERIK Integrate Access MyMachine /OPC UA	**6FC5800-0AP67-0YB0**	O	O	O
Operation				
SINUMERIK 828D operator-panel CNC, vertical/horizontal:		✓/✓	✓/✓	✓/✓
• Color display		8.4"	10.4"	10.4"
• Integrated QWERTY keyboard, short-stroke keys		✓	✓	✓
Extended operator functions[1)]	**6FC5800-0AP16-0YB0**	O	O	O
SINUMERIK operator-panel CNC with TCU		–	–	–
SINUMERIK operator-panel CNC with PCU		–	–	–
SINUMERIK PCU 50.5		–	–	–
Connection for:				
• Standard monitor (DVI), VGA via ext. adapter, as for PCU 50.5		–	–	–
• SIMATIC OPs		–	–	–
Control unit management:				
• One operator panel per CNC		✓	✓	✓
• Combination of multiple operator panels and CNCs		–	–	–

[1)] The operator functions in the basic scope of the SINUMERIK 828D are designed for standard applications. With the CNC option Extended operator functions, the following additional operator functions can be enabled:

- Overstoring
- Teach-in
- DRF offset
- Extended block search
- Backup workpiece setup data
- Additional measuring version via standard scope (only milling)
  - Standard scope workpiece zero: Set edge, align edge, right-angled corner, 1 hole, and 1 circular spigot
  - Expansion of the measurement window via combo box
- Display active synchronized actions in HMI
- Number of levels for skip blocks 10
- Load/save MDI program

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Operation

✓ Basic version O Option – Not available	Article No. Notes	SINUMERIK 828D BASIC PPU 240/ PPU 241	PPU 260/ PPU 261	PPU 280/ PPU 281
Operation (continued)				
Handheld units:				
• SINUMERIK HT 8 handheld terminal		–	–	–
• SINUMERIK HT 2 handheld terminal		–	–	–
• Mini handheld unit with coiled connecting cable	**6FX2007-1AD03**	O	O	O
• Mini handheld unit with straight cable	**6FX2007-1AD13**	O	O	O
• Connection kit for mini handheld unit, non-assembled without Industrial Ethernet	**6FX2006-1BG03**	O	O	O
• Connection kit for mini handheld unit, assembled with PROFINET	**6FX2006-1BG20**	O	O	O
• Holder for mini handheld unit	**6FX2006-1BG70**	O	O	O
• Handwheel connection module for PROFIBUS		–	–	–
Machine control panels:				
• SINUMERIK MCP 802D sl		–	–	–
• SINUMERIK MCPA module		–	–	–
• SINUMERIK MCP 310C PN	**6FC5303-0AF23-0AA1**	O	O	O
• SINUMERIK MCP 483C PN	**6FC5303-0AF22-0AA1**	O	O	O
• SINUMERIK MCP Interface PN	**6FC5303-0AF03-0AA0**	O	O	O
• SINUMERIK MPP Machine Push Button Panel		–	–	–
Electronic handwheels:				
• With 120 mm × 120 mm front panel, 5 V DC	**6FC9320-5DB01**	O	O	O
• With 76.2 mm × 76.2 mm front panel, 5 V DC	**6FC9320-5DC01**	O	O	O
• With 76.2 mm × 76.2 mm front panel, 24 V DC	**6FC9320-5DH01**	–	–	–
• Without front panel, without setting wheel, 5 V DC	**6FC9320-5DF01**	O	O	O
• Without front panel, with setting wheel, 5 V DC	**6FC9320-5DM00**	O	O	O
• Portable in housing, coiled cable	**6FC9320-5DE02**	O	O	O
• Flange socket for portable handwheel	**6FC9341-1AQ**	O	O	O
Connection for electronic handwheels to, max.:		3	3	3
• PPU 24x/PPU 26x/PPU 28x		2	2	2
• SINUMERIK MCP 310C PN, MCP 483C PN or MCP Interface PN	Application: Manual machine Only for milling.	1	1	1
Keyboards:				
• Integrated QWERTY keyboard		✓	✓	✓
• External SINUMERIK keyboards		–	–	–
• KBPC CG US standard PC keyboard		–	–	–
Connection for external storage devices via USB:				
• Card reader for CF/SD storage media	**6FC5335-0AA00-0AA0**	O	O	O
- CompactFlash card, 2 GB	**6FC5313-5AG00-0AA2**	O	O	O
• Memory stick				
- e.g. SIMATIC USB FlashDrive 8 GB	**6ES7648-0DC50-0AA0**	O	O	O

✓ Basic version O Option – Not available	Article No. Notes	SINUMERIK 828D BASIC PPU 240/ PPU 241	PPU 260/ PPU 261	PPU 280/ PPU 281
Functions				
Plain text display of user variables		✓	✓	✓
Multi-channel display		–	–	–
2D representation of 3D protection areas/work areas		–	–	–
Workpiece-related actual value system		✓	✓	✓
Menu selection via the PLC		✓	✓	✓
CNC program messages		✓	✓	✓
Online help for programming, alarms and machine data, expandable		✓	✓	✓
Screen blanking		✓	✓	✓
Access protection		7 levels	7 levels	7 levels
Operating software languages:				
• Chinese Simplified, Chinese Traditional, English, French, German, Italian, Korean, Portuguese, Spanish		✓	✓	✓
• Additional languages, use of language extensions		✓	✓	✓
• Additional languages for operating software SINUMERIK Operate on DVD, without license, e.g. Czech, Danish, Dutch, Finnish, Hungarian, Japanese, Polish, Romanian, Russian, Slovakian, Slovenian, Swedish, Thai, Turkish	**6FC5860-0YC40-0YA8**	O	O	O
Monitoring functions				
Working area limitation		✓	✓	✓
Limit switch monitoring Software and hardware limit switches		✓	✓	✓
Position monitoring		✓	✓	✓
Standstill monitoring		✓	✓	✓
Clamping monitoring		✓	✓	✓
2D/3D protection areas		✓	✓	✓
Contour monitoring		✓	✓	✓
Contour monitoring with tunnel function		–	–	–
Path length evaluation		–	–	–
Axis limitation from the PLC		✓	✓	✓
Spindle speed limitation		✓	✓	✓
Collision check		–	–	–
Generator operation		✓	✓	✓
Extended stop and retract ESR, incl. generator operation		–	–	–
Drive-autonomous extended stop and retract ESR, including generator operation	**6FC5800-0AM60-0YB0**	O	O	O
IDM integrated tool monitoring and diagnostics		–	–	–
Compensations				
Backlash compensation		✓	✓	✓
Leadscrew error compensation		✓	✓	✓
Leadscrew error compensation, bidirectional	**6FC5800-0AM54-0YB0** The correctable tolerance band is restricted to 1 mm.	O	O	O
Measuring system error compensation		✓	✓	✓
Sag compensation, multi-dimensional	**6FC5800-0AM55-0YB0** The correctable tolerance band is restricted to 1 mm.	O	O	O
Quadrant error compensation via operator input		✓	✓	✓
Graphic monitoring of the quadrant error compensation using circularity test		✓	✓	✓
Temperature compensation		✓	✓	✓
Feedforward control, velocity-dependent		✓	✓	✓
Feedforward control, acceleration-dependent		✓	✓	✓

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PLC area/Safety functions

✓ Basic version O Option – Not available	Article No. Notes	SINUMERIK 828D BASIC PPU 240/ PPU 241	PPU 260/ PPU 261	PPU 280/ PPU 281
PLC area				
SIMATIC S7-300		–	–	–
SIMATIC S7-200 based (integrated)		✓	✓	✓
Fixed cycle time for PLC		9 ms	6 ms	6 ms
Reaction time to process interrupts (terminal to terminal)		7.5 ms	7.5 ms	4.5 ms
Memory expansion Ladder Steps		24000	24000	24000
PLC programming language:				
• Ladder diagram LAD		✓	✓	✓
• Function block diagram FBD		–	–	–
• Statement list STL		–	–	–
PLC programming tool for integrated PLC	On toolbox DVD-ROM.	✓	✓	✓
PLC ladder add-on editor on PPU		✓	✓	✓
I/O modules:				
• PP 72/48D PN digital I/O module, max. number	**6FC5311-0AA00-0AA0**	O 3	O 4	O 5
• PP 72/48D 2/2A PN I/O module digital/analog, max. number	**6FC5311-0AA00-1AA0**	O 3	O 4	O 5
• General I/Os via PROFIBUS/PROFINET		–	–	–
• General SIMATIC PROFINET PLC I/Os		–	–	–
• ADI 4 (Analog Drive Interface for 4 Axes)		–	–	–
Digital inputs, max. number		216	288	360
Digital outputs, max. number		144	192	240
Analog inputs, max. number		6	8	10
Analog outputs, max. number		6	8	10
PLC alarms/messages, max. number		248	248	248
Bit memories, number		512 bytes	512 bytes	512 bytes
Timers, number		128	128	128
Counters, number		64	64	64
Subroutines		256	256	256
FB, FC		–	–	–
DB, highest number, max. number		64	64	64
Cyclic function block		✓	✓	✓
Cyclic function block, servo-synchronous		✓	✓	✓
User machine data for configuring the PLC user program		✓	✓	✓
Safety functions				
SINUMERIK Safety Integrated Safety functions for personnel and machine protection:				
• Safe Torque Off (STO)		✓	✓	✓
• Safe Brake Control (SBS)		✓	✓	✓
• Safe Stop 1 (SS1)		✓	✓	✓
• Safety Integrated, extended functions for one CNC axis - Safe Operating Stop (SOS) - Safe Stop 2 (SS2) - Safely Limited Speed (SLS) - Safe Speed Monitor (SSM) - Safe Acceleration Monitor (SAM) - Safe Direction (SDI)	**6FC5800-0AC50-0YB0**	O	O	O
• SINAMICS S120 Terminal Module Cabinet TM54F to control the extended Safety Integrated functions	**6SL3055-0AA00-3BA0**	O	O	O

✓ Basic version O Option – Not available	Article No. Notes	SINUMERIK 828D BASIC PPU 240/ PPU 241	PPU 260/ PPU 261	PPU 280/ PPU 281
Commissioning				
Commissioning software for drive system is integrated:				
• SINAMICS S120		✓	✓	✓
Auto Servo Tuning AST fully automatic speed and position controller optimization		✓	✓	✓
Commissioning trace (drive optimization without an additional oscilloscope):				
• Integrated		✓	✓	✓
• Commissioning software for SINAMICS S120	On toolbox DVD-ROM.	✓	✓	✓
Standard commissioning via:				
• RS232C serial interface		–	–	–
• USB interface with storage medium, e.g. memory stick	Read in/out INI file	✓	✓	✓
• Network drive		✓	✓	✓
• User CF card		✓	✓	✓
• SINUMERIK Integrate Access MyMachine /P2P for PC/PG	**6FC5860-7YC00-0YA0**	O	O	O
STARTER commissioning tool for PC/PG for SINAMICS S120	**6SL3072-0AA00-0AG0**	O	O	O
SinuCom commissioning/service tools for SINUMERIK 840Di sl/840D sl		–	–	–
Diagnostic functions				
Alarms and messages		✓	✓	✓
Action log can be activated for diagnostic purposes		✓	✓	✓
PLC status		✓	✓	✓
LAD display		✓	✓	✓
PLC remote diagnostics via modem		✓	✓	✓
PLC remote diagnostics via Ethernet		✓	✓	✓
Easy Message Machine status transfer using text messages (SMS) requires an optional SINAUT system with antenna and modem cable	**6NH9720-3AA00** **6NH9860-1AA00** **6NH7701-5AN**	O	O	O
Remote diagnostics and file transfer:				
• SINUMERIK Integrate Access MyMachine /P2P (connection of a modem router to X127)	**6FC5800-0AP30-0YB0**	O	O	O
• SINUMERIK Integrate Access MyMachine /P2P for PC/PG file transfer between PC/PG and CNCs.	**6FC5860-7YC00-0YA0**	O	O	O
Service and maintenance				
SINUMERIK Integrate Access MyMachine		–	–	–
SINUMERIK Integrate Manage MyMaintenance		–	–	–
Integrated service planner for the monitoring of service intervals		✓	✓	✓
Easy Extend Simply extend optional machine components		✓	✓	✓
SINUMERIK Ctrl-Energy				
Intelligent standby control of the machine		✓	✓	✓
Measurement and evaluation of the energy usage of the drive system		✓	✓	✓
Flux reduction		✓	✓	✓
Reactive current compensation	Only with SINAMICS S120 Active Line Module.	O	O	O
Measurement and evaluation of the total energy usage of the machine:				
• SENTRON PAC3200 Power Monitoring Device for front panel mounting records 50 measured values	**7KM2112-0BA00-3AA0**	O	O	O
• SENTRON PAC4200 Power Monitoring Device for front panel mounting records 200 measured values	**7KM4212-0BA00-3AA0**	O	O	O

Overview of functions
CNC controls SINUMERIK 828

Overview of CNC options – Manufacturer options

✓ Basic version O Option – Not available	Article No. Notes	SINUMERIK 828D BASIC PPU 240/ PPU 241	 PPU 260/ PPU 261	 PPU 280/ PPU 281
Manufacturer options				
Axis/spindle, each additional	**6FC5800-0AC20-0YB0**	O	O	O
Positioning axis/auxiliary spindle, each additional	**6FC5800-0AC30-0YB0**	O	O	O
TRANSMIT/cylinder surface transformation	**6FC5800-0AM27-0YB0**	O	O	O
TRANSMIT/TRACYL without Y axis	**6FC5800-0AS50-0YB0**	O	O	O
Inclined axis[1]	**6FC5800-0AM28-0YB0** Only for turning.	–	–	O
Pair of synchronized axes (gantry axes), basic	**6FC5800-0AS51-0YB0**	O	O	O
Travel to fixed stop with Force Control	**6FC5800-0AM01-0YB0**	O	O	O
Generic coupling Static, CP-Static[2]	**6FC5800-0AM75-0YB0**			
• Turning		–	–	O
• Milling		O	O	O
Generic coupling Basic, CP-Basic[3]	**6FC5800-0AM72-0YB0** Only for turning.	O	O	O
Generic coupling Comfort, CP-Comfort	**6FC5800-0AM73-0YB0** Only for turning.	O	O	O
Leadscrew error compensation, bidirectional	**6FC5800-0AM54-0YB0**	O	O	O
Sag compensation, multi-dimensional	**6FC5800-0AM55-0YB0**	O	O	O
Master-Slave for drives, basic	**6FC5800-0AS52-0YB0**	O	O	O
Evaluation of internal drive variables, basic	**6FC5800-0AS53-0YB0**	O	O	O
SINUMERIK Integrate Run MyScreens	**6FC5800-0AP64-0YB0**	O	O	O
Host computer connection Server for OPC unified architecture:				
• SINUMERIK Integrate Access MyMachine /OPC UA	**6FC5800-0AP67-0YB0**	O	O	O
Safety Integrated extended functions for one CNC axis	**6FC5800-0AC50-0YB0**	O	O	O

1) For non-orthogonal Y axis in turning machines.

2) Tapping center with two spindles or counterspindle turning machines.

3) For multi-edge turning in turning machines.
No master value coupling/curve table interpolation.

✓ Basic version O Option – Not available	Article No. Notes	SINUMERIK 828D BASIC PPU 240/ PPU 241	PPU 260/ PPU 261	PPU 280/ PPU 281
User options				
Advanced technology functions (expansion of the technology cycles for turning and milling)[1]	**6FC5800-0AP58-0YB0**	O	✓	✓
Extended operator functions[2]	**6FC5800-0AP16-0YB0**	O	O	O
Machining step programming ShopTurn/ShopMill	**6FC5800-0AP17-0YB0**	O	O	O
• Manual machine (included in option: Machining step programming ShopTurn/ShopMill)	Only for milling.	✓	✓	✓
• Multiple clamping of various workpieces (included in option: Machining step programming ShopTurn/ShopMill)	Only for milling.	✓	✓	✓
Residual material detection and machining for contour pockets and stock removal[3]	**6FC5800-0AP13-0YB0**	O	O	O
3D simulation, finished part	**6FC5800-0AP25-0YB0**	O	O	O
Simultaneous recording (real-time simulation of current machining operation)	**6FC5800-0AP22-0YB0**	O	O	O
Measuring cycles for drilling/milling and turning (calibrate workpiece probe, workpiece measurement, tool measurement)	**6FC5800-0AP28-0YB0**	O	O	O
Network drive management via Ethernet	**6FC5800-0AP01-0YB0**	O	O	O
Replacement tools for tool management	**6FC5800-0AM78-0YB0**	O	O	O
SINUMERIK Integrate Access MyMachine /P2P (connection of a modem router to X127)	**6FC5800-0AP30-0YB0**	O	O	O
Contour handwheel	**6FC5800-0AM08-0YB0**	O	O	O
Spline interpolation (A, B and C splines)	**6FC5800-0AS16-0YB0**	O	O	O
Measure kinematics (determine transformation data of rotary axes)	**6FC5800-0AP18-0YB0** Only for milling.	O	O	O
Drive-autonomous extended stop and retract ESR, including generator operation	**6FC5800-0AM60-0YB0**	O	O	O

[1] The CNC option Advanced technology functions provides you with technology cycles for the following additional machining operations:
- Asymmetric grooves (only turning)
- Drill and thread milling
- Thread milling
- Multi-edge milling
- Engraving
- Extended stock removal along contour with segmentation of blank (only turning)
- Contour grooving and plunge turning (only turning)
- Milling of contour pockets and spigots (with up to 12 islands)
- Position pattern - hide position
- Asymmetrically turn a shoulder
- DIN thread undercut

[2] The operator functions in the basic scope of the SINUMERIK 828D are designed for standard applications. With the CNC option Extended operator functions, the following additional operator functions can be enabled:
- Overstoring
- Teach-in
- DRF offset
- Extended block search
- Backup workpiece setup data
- Additional measuring version via standard scope (only milling)
  - Standard scope workpiece zero: Set edge, align edge, right-angled corner, 1 hole, and 1 circular spigot
  - Expansion of the measurement window via combo box
- Display active synchronized actions in HMI
- Number of levels for skip blocks 10
- Load/save MDI program

[3] Requirement: Advanced technology functions option

System overview

Product name	SINUMERIK 828D BASIC PPU 240/PPU 241	PPU 260/PPU 261	PPU 280/PPU 281
Number of DRIVE-CLiQ ports	3	3	3
Number of axes/spindles (basic scope)			
• Turning	3	3	3
• Milling	4	4	4
Number of axes/spindles, max.			
• Turning	5	6	6/8[1)]
• Milling	5	6	6
Number of axes with Drive Based Safety Integrated (extended Safety Integrated functions)**, max.**			
• Turning	5	6	6/8[1)]
• Milling	5	6	6
IPO cycle for max. configuration			
• Turning	9 ms	6 ms	6 ms
• Milling	9 ms	6 ms	3 ms
Minimum block change time, approx.			
• Turning	9 ms	6 ms	6 ms
• Milling	9 ms	6 ms	3 ms
- With compressor	3 ms	2 ms	1 ms
Position control cycle			
• Turning	3 ms	3 ms	1.5 ms
• Milling	3 ms	3 ms	3 ms
Velocity/current controller cycle	125 µs	125 µs	125 µs
Velocity/current controller clock cycle for a high-speed spindle			
• Milling Mixed operation 4 × 125 µs and 1 × 62.5 µs (max. number of axes = 5) With NX10.3 (max. number of axes = 6)	–	62.5 µs	62.5 µs
Non-Volatile Random-Access Memory (NVRAM) for:			
• OEM	512 KB	512 KB	512 KB
• User data	3 MB	5 MB	8 MB
Number of Numeric Control Extensions NX10.3			
• Turning	–	–	1
• Milling	–	1	1
Number of I/O modules			
• PP 72/48D PN, max.	3	4	5
• PP 72/48D 2/2A PN, max.	3	4	5

1) A Numeric Control Extension NX10.3 can be used to achieve the following:
- The maximum number of axes can be increased to 8, 6 of which can be connected to the PPU and 2 to the NX10.3.
- One high-speed spindle, e.g. 24000 rpm with four pole pairs, can be connected to the NX10.3 and five axes can be connected to the PPU.

Overview

SINUMERIK 828D BASIC PPU 241.3, horizontal

SINUMERIK 828D BASIC PPU 240.3, vertical

The SINUMERIK 828D BASIC is an operator-panel CNC, tailored for modern standard turning and milling machines.

The operator-panel CNC is mounted from the rear using special clamps included in the scope of supply.

Benefits

- Compact, rugged and maintenance-free operator-panel CNC with dedicated system software for turning and milling technologies
- Highest machining precision with 80 bit NANO^{FP} accuracy
- New user interface SINUMERIK Operate – same look and feel as SINUMERIK 840D sl
- Intelligent kinematic transformations for:
  - Milling and drilling on the front and peripheral surfaces of the workpiece
  - Machining cylindrical workpieces
- ShopTurn/ShopMill: Very fast programming time in the production of individual parts and small batches
- Technology package SINUMERIK MDynamics with the new function Advanced Surface: Perfect workpiece surfaces and very fast machining times in molded part production
- programGUIDE: Very fast machining times and maximum flexibility in the manufacture of mass-production parts
- Unique spectrum of technology cycles – ranging from the machining of any turning and milling contours with residual material detection to in-process measurements
- Animated Elements: Unique operating and programming support with moving picture sequences
- State-of-the-art data transmission via CompactFlash card, USB stick and plant networks (Ethernet)
- Easy Message: Maximum machine availability thanks to process monitoring based on text messaging (SMS)
- Easy Extend: Flexible handling of machine aggregates, e.g. an A axis/parts machine
- Maintenance scheduler: Signaling of pending maintenance tasks in accordance with specified maintenance intervals

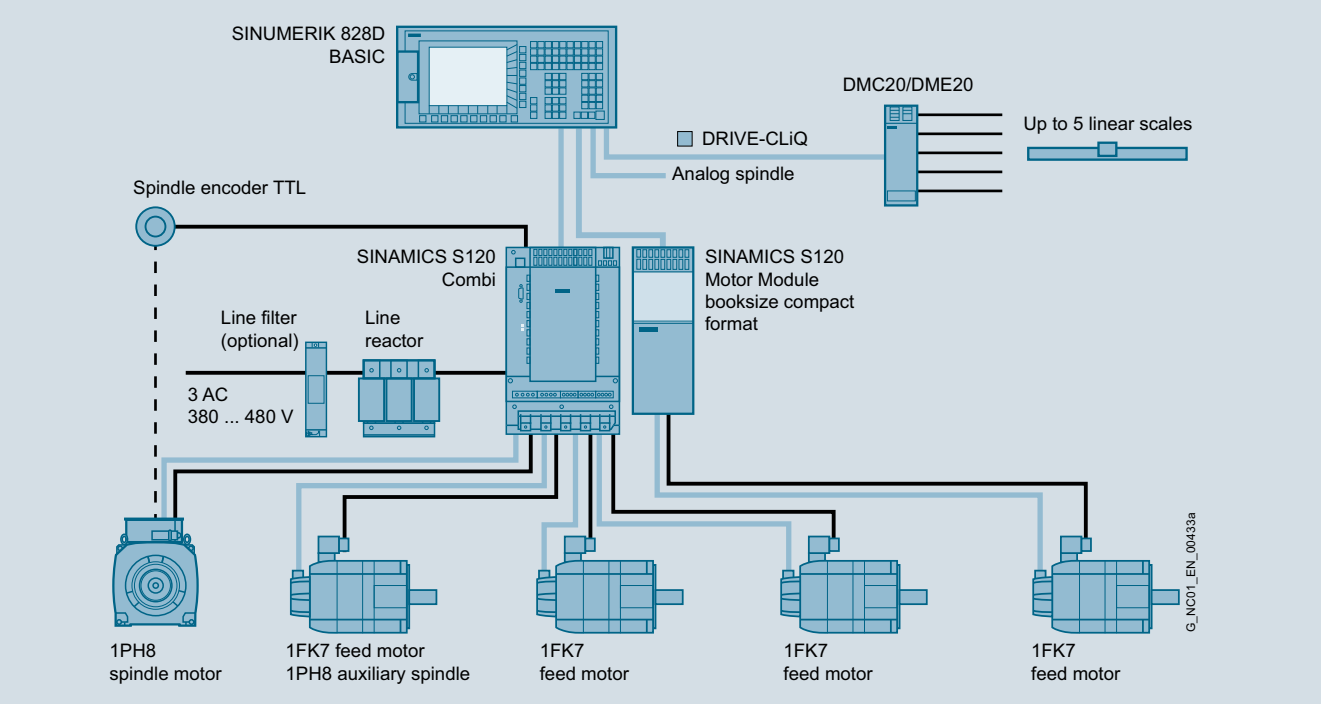
Function

- Operator panel variants for horizontal or vertical operator panel housings
- Integrated QWERTY full CNC keyboard with short-stroke keys
- CompactFlash card, USB and Ethernet interfaces on the operator panel front
- Additional Ethernet interface on rear of CNC for connection to factory network
- Integrated PLC based on the SIMATIC S7-200 command set with ladder logic programming
- I/O interface based on PROFINET for the connection of PLC I/O devices and a machine control panel
- Connection for a GSM/GPRS modem: Easy Message (option)
- CNC options subject to license
- Up to 5 axes/spindles for turning and milling applications
- 1 analog spindle
- 1 machining channel/mode group
- Integrated tool management with tool life monitoring
- Management of replacement tools (option)
- Graphical machining step programming ShopTurn/ShopMill (option)
- Configurable user screens with SINUMERIK Integrate Run MyScreens (Easy Screen)
- Integrated data archiving procedure for simple data updates
- Faults will be remedied for a period of 24 months following 2nd commissioning on all system components in accordance with the on-site service contract performance description.

Integration

The following components can be connected to the SINUMERIK 828D BASIC:

- 2 electronic handwheels[1)]
- Mini handheld unit with handwheel
- 3 SINUMERIK PP 72/48D PN or PP 72/48D 2/2A PN I/O modules
- SINUMERIK MCP 310C PN or MCP 483C PN machine control panel
- SINUMERIK MCP Interface PN
- GSM/GPRS modem
- SENTRON PAC Power Monitoring Devices
- SINAMICS S120 Combi drive system via DRIVE-CLiQ



Configuration example for SINUMERIK 828D BASIC with SINAMICS S120 Combi

[1)] Third handwheel possible via SINUMERIK MCP 310C PN, MCP 483C PN or MCP Interface PN. Application: Manual machine for milling.

Technical specifications

Product name	SINUMERIK 828D BASIC PPU 241.3 horizontal 6FC5370-3AA30-0AA0	SINUMERIK 828D BASIC PPU 240.3 vertical 6FC5370-4AA30-0AA0
Input voltage	24 V DC, + 20 %/- 15 %	24 V DC, + 20 %/- 15 %
Power consumption, max.	60 W	60 W
Mains buffering time	3 ms (20 ms with SITOP smart power supply)	3 ms (20 ms with SITOP smart power supply)
Degree of protection acc. to DIN EN 60529 (IEC 60529)		
• Operator panel front	IP65 (with closed front cover)	IP65 (with closed front cover)
• PPU	IP20 (rear)	IP20 (rear)
Relative atmospheric humidity		
• Storage	5 … 95 % at 25 °C	5 … 95 % at 25 °C
• Transport	5 … 95 % at 25 °C	5 … 95 % at 25 °C
• Operation	5 … 90 % at 25 °C (no condensation)	5 … 90 % at 25 °C (no condensation)
Ambient temperature		
• Storage	-20 … +55 °C	-20 … +55 °C
• Transport	-20 … +70 °C	-20 … +70 °C
• Operation	0 ... 45 °C (rear 0 ... 55 °C)	0 ... 45 °C (rear 0 ... 55 °C)
Dimensions		
• Width	483 mm	310 mm
• Height	220 mm	380 mm
• Depth	105 mm	105 mm
Weight, approx.	4.5 kg	4.5 kg

Selection and ordering data

Description	Article No.
Hardware components	
SINUMERIK 828D BASIC PPU 241.3 horizontal[1)] Without system software	6FC5370-3AA30-0AA0
SINUMERIK 828D BASIC PPU 240.3 vertical[1)] Without system software	6FC5370-4AA30-0AA0
Software components	
System software for SINUMERIK 828D BASIC PPU 240.3/PPU 241.3[1)] On CompactFlash card with license software version 4.5 SP3, export	
• Turning	6FC5835-1GY40-2YA0
• Milling	6FC5835-2GY40-2YA0
SINUMERIK 828D toolbox On DVD-ROM	**6FC5830-0CY40-0YA8**
SINUMERIK Integrate Access MyMachine /P2P For PC/PG on CD-ROM current software version	**6FC5860-7YC00-0YA0**
Language extensions for SINUMERIK Operate operating software On DVD-ROM up to software version 4.5	**6FC5860-0YC40-0YA8**
SIZER for Siemens Drives engineering tool For SINAMICS and MICROMASTER on DVD-ROM Languages: English, French, German, Italian	**6SL3070-0AA00-0AG0**
STARTER commissioning tool For SINAMICS and MICROMASTER on DVD-ROM Languages: English, French, German, Italian, Spanish	**6SL3072-0AA00-0AG0**
Accessories	
CompactFlash card, 2 GB, empty To expand user memory and replace a defective system CompactFlash card	**6FC5313-5AG00-0AA2**
Set of clamps (9 units) For operator components with 2.5 mm profile, length 20 mm	**6FC5248-0AF14-0AA0**
Front cover With fixture (included in scope of delivery)	**6FC5348-2AA00-0AA0**

More information

The following hardware components are only available in packages and cannot be ordered separately:

- SINUMERIK 828D BASIC PPU 24x.3

When the package is delivered, the CompactFlash card containing the system software is installed in the SINUMERIK.

For more information, please contact your Siemens branch.

[1)] Not available individually, see More information.

Overview

SINUMERIK 828D PPU 261.3/PPU 281.3, horizontal

SINUMERIK 828D PPU 260.3/PPU 280.3, vertical

The SINUMERIK 828D is an operator-panel CNC which combines all the components of a CNC in one unit:

- CNC, PLC, HMI
- Full CNC keyboard
- Closed-loop control for 6 drives

The motors can easily be connected to the digital drive system via DRIVE-CLiQ. In combination with the modular structure of the SINAMICS S120 drive system, this design is conceived to ensure very simple and rugged installation with minimum wiring overhead.

The performance range of the CNC has been precisely selected to meet the requirements of standard turning and milling machines – from one-off production runs to industrial scale manufacture. Thanks to the technology-specific variants for turning and milling, the system parameters are optimized for the machine, making the commissioning process much quicker and easier.

The operator-panel CNC is mounted from the rear using special clamps included in the scope of supply.

Benefits

Benefits for the machine operator

- High-quality, rugged, magnesium die-cast operator panels
- Extremely user-friendly operation through integrated QWERTY keyboard with short-stroke keys
- Easy data exchange thanks to USB and Ethernet interfaces on the panel front
- Simple operation using ShopTurn and ShopMill software
- Advanced Surface: Innovative, high-performance CNC functions provide top quality of workpiece surface with minimum machining times
- Animated Elements: Optimum operator guidance thanks to CNC input screens with animated elements
- Easy input via CNC direct keys on the CNC keyboard
- Easy Message: Integrated mobile radio modem for optimum process monitoring via mobile telephone
- Easy Extend: Flexible handling of machine aggregates, e.g. an A axis/parts machine
- Maintenance scheduler: Signaling of pending maintenance tasks in accordance with specified maintenance intervals

Benefits for the machine manufacturer

- High system quality through reduction in hardware interfaces
- Drive-based Safety Integrated for compliance with the machinery directive
- Less complex system thanks to technology-specific system software
- Faster, easier commissioning thanks to preset system parameters
- Automatic system configuration by means of single PLC I/Os
- Service Planner: Integrated planner for machine maintenance intervals
- Easy Archive: Integrated archiving procedure for optimum handling of commissioning updates
- Easy Extend: Integrated wizard for optional machine units
- Simple PLC programming with symbols and comments on the CNC
- No outlay required by dealers and machine manufacturers thanks to free PLC programming tool
- Faults will be remedied for a period of 24 months following 2nd commissioning on all system components in accordance with the on-site service contract performance description.

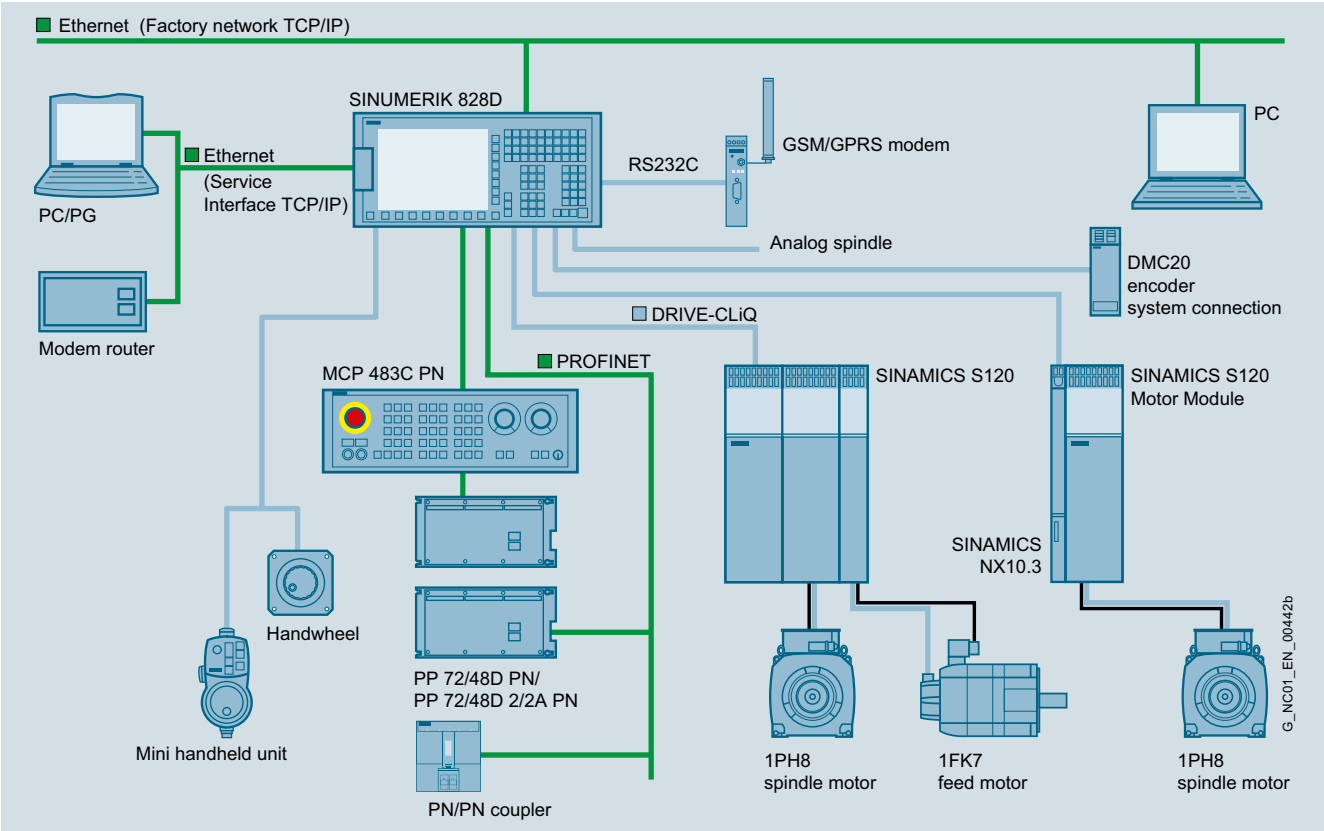
Function

- Operator-panel CNC with dedicated system software versions for turning and milling technologies
- Operator panel variants for horizontal or vertical operator panel housings
- Integrated QWERTY full CNC keyboard with short-stroke keys
- CompactFlash card, USB and Ethernet interfaces on the operator panel front
- Additional Ethernet interface on rear of CNC for connection to factory network
- Integrated PLC based on the SIMATIC S7-200 command set with ladder logic programming
- I/O interface based on PROFINET for the connection of PLC I/O devices and a machine control panel
- Connection of a GSM/GPRS modem: Easy Message (option)
- CNC options subject to license
- Up to 6 axes/spindles for turning and milling applications
- Up to 8 axes/spindles for turning applications with PPU 280/PPU 281 and NX10.3
- 1 analog spindle
- 1 machining channel/mode group
- Integrated tool management with tool life monitoring
- Graphical machining step programming ShopTurn/ShopMill (option)
- User interface SINUMERIK Operate – same look and feel as SINUMERIK 840D sl
- Configurable user screens with SINUMERIK Integrate Run MyScreens (Easy Screen)
- Integrated data archiving procedure for simple data updates

Integration

The following components can be connected to the SINUMERIK 828D:

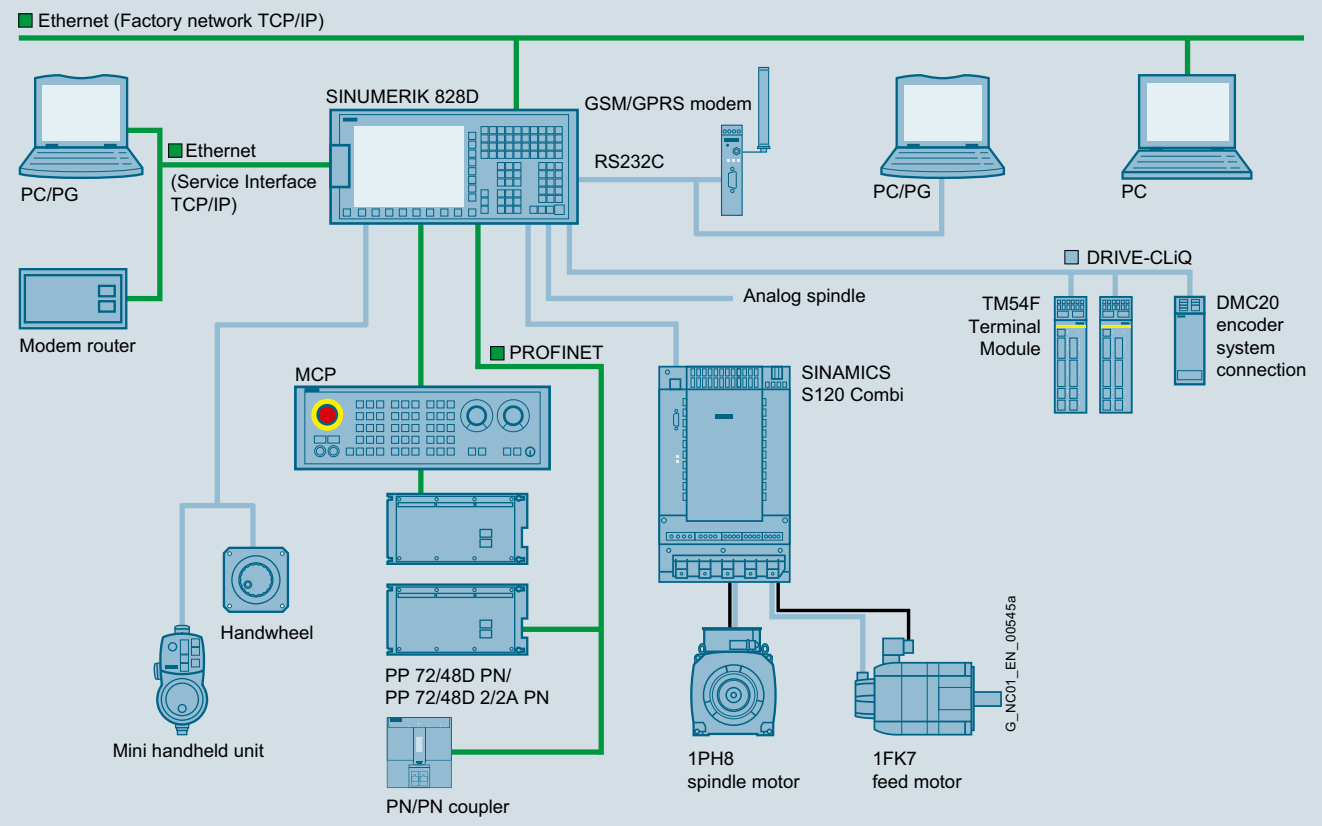
- 2 electronic handwheels[1)]
- Mini handheld unit with handwheel
- 3 SINUMERIK PP 72/48D PN or PP 72/48D 2/2A PN I/O modules
- SINUMERIK MCP 310C PN or MCP 483C PN machine control panel
- SINUMERIK MCP Interface PN
- GSM/GPRS modem
- SENTRON PAC Power Monitoring Devices
- SINAMICS S120 drive system via DRIVE-CLiQ
- SINAMICS Numeric Control Extension NX10.3 (not with PPU 260/PPU 261 for turning)



Configuration example for SINUMERIK 828D with SINAMICS S120

[1)] Third handwheel possible via SINUMERIK MCP 310C PN, MCP 483C PN or MCP Interface PN. Application: Manual machine for milling.

Integration (continued)



Configuration example for SINUMERIK 828D with SINAMICS S120 Combi

Technical specifications

Product name	SINUMERIK 828D PPU 261.3 horizontal 6FC5370-5AA30-0AA0	SINUMERIK 828D PPU 260.3 vertical 6FC5370-6AA30-0AA0	SINUMERIK 828D PPU 281.3 horizontal 6FC5370-7AA30-0AA0	SINUMERIK 828D PPU 280.3 vertical 6FC5370-8AA30-0AA0
Input voltage	24 V DC + 20 %/- 15 %			
Power consumption, max.	60 W			
Mains buffering time	3 ms (20 ms with SITOP smart power supply)			
Degree of protection acc. to DIN EN 60529 (IEC 60529)				
• Operator panel front	IP65 (with closed front cover)			
• PPU	IP20 (rear)			
Relative atmospheric humidity				
• Storage	5 … 95 % at 25 °C			
• Transport	5 … 95 % at 25 °C			
• Operation	5 … 90 % at 25 °C (no condensation)			
Ambient temperature				
• Storage	-20 … +55 °C			
• Transport	-20 … +70 °C			
• Operation	0 ... 45 °C (rear 0 ... 55 °C)			
Dimensions				
• Width	483 mm	310 mm	483 mm	310 mm
• Height	220 mm	380 mm	220 mm	380 mm
• Depth	105 mm	105 mm	105 mm	105 mm
Weight, approx.	4.5 kg	4.5 kg	4.5 kg	4.5 kg

Selection and ordering data

Description	Article No.
Hardware components	
SINUMERIK 828D PPU 261.3 horizontal[1)] Without system software	6FC5370-5AA30-0AA0
SINUMERIK 828D PPU 260.3 vertical[1)] Without system software	6FC5370-6AA30-0AA0
SINUMERIK 828D PPU 281.3 horizontal[1)] Without system software	6FC5370-7AA30-0AA0
SINUMERIK 828D PPU 280.3 vertical[1)] Without system software	6FC5370-8AA30-0AA0
Software components	
System software for SINUMERIK 828D PPU 260.3/PPU 261.3[1)] On CompactFlash card with license software version 4.5 SP3, export	
• Turning	6FC5834-1GY40-2YA0
• Milling	6FC5834-2GY40-2YA0
System software for SINUMERIK 828D PPU 280.3/PPU 281.3[1)] On CompactFlash card with license software version 4.5 SP3, export	
• Turning	6FC5833-1GY40-2YA0
• Milling	6FC5833-2GY40-2YA0
SINUMERIK 828D toolbox On DVD-ROM	**6FC5830-0CY40-0YA8**
SINUMERIK Integrate Access MyMachine /P2P For PC/PG on CD-ROM current software version	**6FC5860-7YC00-0YA0**
Language extensions for SINUMERIK Operate operating software On DVD-ROM up to software version 4.5	**6FC5860-0YC40-0YA8**
SIZER for Siemens Drives engineering tool For SINAMICS and MICROMASTER on DVD-ROM Languages: English, French, German, Italian	**6SL3070-0AA00-0AG0**
STARTER commissioning tool For SINAMICS and MICROMASTER on DVD-ROM Languages: English, French, German, Italian, Spanish	**6SL3072-0AA00-0AG0**

Description	Article No.
Additional hardware components	
SINAMICS Numeric Control Extension NX10.3	**6SL3040-1NC00-0AA0**
SINAMICS TM54F Terminal Module	**6SL3055-0AA00-3BA0**
SIMATIC DP PN/PN coupler Coupling module for connecting two PROFINET networks	**6ES7158-3AD01-0XA0**
DRIVE-CLiQ signal cable For PROFINET connection Pre-assembled cable Connector with degree of protection IP20	
• Sold by the meter[2)]	6FX2002-1DC00-1..0
• In fixed lengths[2)]	6SL3060-4A..0-0AA0
Accessories	
CompactFlash card, 2 GB, empty To expand user memory and replace a defective system CompactFlash card	**6FC5313-5AG00-0AA2**
Set of clamps (9 units) For operator components with 2.5 mm profile, length: 20 mm	**6FC5248-0AF14-0AA0**
Front cover With fixture (included in scope of delivery)	**6FC5348-2AA00-0AA0**

More information

The following hardware components are only available in packages and cannot be ordered separately:
- SINUMERIK 828D PPU 26x.3
- SINUMERIK 828D PPU 28x.3

When the package is delivered, the CompactFlash card containing the system software is installed in the SINUMERIK.

For more information, please contact your Siemens branch.

1) Not available individually, see More information.
2) For length code, see MOTION-CONNECT connection systems.

SINUMERIK MCP 310C PN

Overview

SINUMERIK MCP 310C PN machine control panel

The SINUMERIK MCP 310C PN machine control panel with mechanical keys is designed to permit user-friendly, well-structured operation of the machine functions. It is suitable for machine-level operation of milling, turning, grinding and special machines.

In addition to PROFINET functionality, SINUMERIK MCP 310C PN has also retained its complete Industrial Ethernet functionality. The network technology can be changed over using DIP switches.

All keys are designed with replaceable key covers for machine-specific adaptations. The key covers can be freely inscribed using a laser. Transparent key covers can be used as an alternative.

The machine control panel is mounted from the rear using special clamps.

Included in the scope of delivery are the clamps, key caps (30 × ergo gray, 30 × clear, 9 × labeled) and a backing plate for emergency stop.

Design

Control elements:

- Mode selectors and function keys
  - 49 keys with LEDs
  - Direction keys for milling machines with rapid traverse override (key covers for direction keys for turning machines are supplied in the accessories pack)
  - Default key assignment includes 16 freely assignable customer keys
- Feed control with feed/rapid traverse override (rotary switch with 23 positions)
- Key switch (4 positions and 3 different keys)

Key type:

- Mechanical keys

Interfaces:

- PROFINET/Industrial Ethernet
- 9 inputs/6 outputs for 9 control devices (additional cable set required for control devices)

Expansion facilities:

- 6 slots for control devices (d = 16 mm)
- 1 slot for emergency stop button or rotary override switch (up to d = 22 mm)

Integration

The SINUMERIK MCP 310C PN machine control panel can be used for:

- SINUMERIK 828D BASIC
- SINUMERIK 828D

Technical specifications

Product name	SINUMERIK MCP 310C PN machine control panel
	6FC5303-0AF23-0AA1
Input voltage	24 V DC
Power consumption, max.	5 W
Degree of protection acc. to DIN EN 60529 (IEC 60529)	
• Front	IP54
• Rear	IP00
Humidity rating based on DIN EN 60721-3-3	Class 3K5 condensation and icing excluded. Low air temperature 0 °C.
Relative atmospheric humidity	
• Storage	5 ... 95 % at 25 °C
• Transport	5 ... 95 % at 25 °C
• Operation	5 ... 80 % at 25 °C
Ambient temperature	
• Storage	-25 ... +55 °C
• Transport	-40 ... +70 °C
• Operation	
- Front	0 ... 45 °C
- Rear	0 ... 55 °C
Distance, max.	100 m
Dimensions	
• Width	310 mm
• Height	175 mm
• Depth	54 mm
Panel cutout	
• Width	285 mm
• Height	155 mm
• Tolerance	+ 1 mm
Weight, approx.	1.2 kg
Approvals, according to	CE, cULus

Selection and ordering data

Description	Article No.
SINUMERIK MCP 310C PN machine control panel PROFINET/Industrial Ethernet Width 310 mm, with mechanical keys	**6FC5303-0AF23-0AA1**
Accessories	
Square key cover, for labeling 1 set comprising: 90 × ergo gray, 20 × red, 20 × yellow, 20 × green, 20 × mid-gray	**6FC5248-0AF12-0AA0**
Square key cover, for labeling 90 × transparent	**6FC5248-0AF21-0AA0**
Set of key caps SINUMERIK key covers, square, for inscription	
• 500 × ergo gray (light basic)	**6FC5348-0AF00-0AA0**
• 500 × mid-gray (medium basic)	**6FC5348-0AF01-0AA0**
Emergency stop mushroom pushbutton, 22 mm Round, plastic, red, 40 mm, positive latching, rotate to unlatch, complete with holder	**3SB3000-1HA20**
Contact block with 2 contacts 1 NO + 1 NC, 2-pin, screw terminal	**3SB3400-0A**
Key set (10 sets) For machine control panel	**6FC5148-0AA03-0AA0**
Spindle/rapid traverse override electronic rotary switch 1 × 16G, T=24, cap, button, pointer, and rapid traverse and spindle dials[1)]	**6FC5247-0AF12-1AA0**
Feed/rapid traverse override electronic rotary switch 1 × 23G, T=32, cap, button, pointer, and rapid traverse and feed dials[1)]	**6FC5247-0AF13-1AA0**
Cable set (60 units) For additional machine control panel control devices Length 500 mm	**6FC5247-0AA35-0AA0**
Signal cable, pre-assembled For connecting electronic handwheel Length, max. 25 m[2)]	6FX8002-2CP00-….
Set of clamps (9 units) For operator components with 2.5 mm profile length 20 mm	**6FC5248-0AF14-0AA0**

Overview

SINUMERIK MCP 483C PN machine control panel

The SINUMERIK MCP 483C PN machine control panel permits user-friendly operation of the machine functions. It is suitable for machine-level operation of milling, turning, grinding and special machines.

In addition to PROFINET, SINUMERIK MCP 483C PN has also retained its complete Industrial Ethernet functionality. The network technology can be changed over using DIP switches.

All keys are designed with replaceable key covers for machine-specific adaptations. The key covers can be freely inscribed using a laser. Transparent key covers can be used as an alternative.

The machine control panel is mounted from the rear using special clamps supplied with the panel.

Design

Control elements:

- Mode selectors and function keys
  - 50 keys with LEDs
  - Direction keys for milling machines with rapid traverse override (key covers for direction keys for turning machines are supplied in the accessories pack)
- Spindle control with spindle override (rotary switch with 16 positions)
- Feed control with feed/rapid traverse override (rotary switch with 23 positions)
- Key switch (4 positions and 3 different keys)
- Emergency stop pushbutton (2 × (1 NO + 1 NC))

Key type:

- Mechanical keys

Interfaces:

- PROFINET/Industrial Ethernet
- 9 inputs/6 outputs for 9 control devices (additional cable set required for control devices)

Expansion facility:

- 2 slots for control devices (d = 16 mm)

1) 16G: Latching at position 16; T=24: 24 positions for 360°
23G: Latching at position 23; T=32: 32 positions for 360°

2) For length code, see MOTION-CONNECT connection systems.

Integration

The SINUMERIK MCP 483C PN machine control panel can be used for:

- SINUMERIK 828D BASIC
- SINUMERIK 828D

Technical specifications

Product name	SINUMERIK MCP 483C PN machine control panel 6FC5303-0AF22-0AA1
Input voltage	24 V DC
Power consumption, max.	5 W
Degree of protection acc. to DIN EN 60529 (IEC 60529)	
• Front	IP54
• Rear	IP00
Humidity rating based on DIN EN 60721-3-3	Class 3K5 condensation and icing excluded. Low air temperature 0 °C.
Relative atmospheric humidity	
• Storage	5 ... 95 % at 25 °C
• Transport	5 ... 95 % at 25 °C
• Operation	5 ... 85 % at 25 °C
Ambient temperature	
• Storage	-25 ... +55 °C
• Transport	-25 ... +55 °C
• Operation	
- Front	0 ... 45 °C
- Rear	0 ... 55 °C
Distance, max.	100 m
Dimensions	
• Width	483 mm
• Height	155 mm
• Depth	55 mm
Panel cutout	
• Width	450 mm
• Height	135 mm
• Tolerance	+ 1 mm
Weight, approx.	2 kg
Approvals, according to	CE, cULus

Selection and ordering data

Description	Article No.
SINUMERIK MCP 483C PN machine control panel PROFINET/Industrial Ethernet, width 19", with mechanical keys, emergency stop button 22 mm	**6FC5303-0AF22-0AA1**
Accessories	
Square key cover, for labeling 1 set comprising: 90 × ergo gray, 20 × red, 20 × yellow, 20 × green, 20 × mid-gray	**6FC5248-0AF12-0AA0**
Square key cover, for labeling 90 × transparent	**6FC5248-0AF21-0AA0**
Set of key caps SINUMERIK key covers, square, for inscription	
• 500 × ergo gray (light basic)	**6FC5348-0AF00-0AA0**
• 500 × mid-gray (medium basic)	**6FC5348-0AF01-0AA0**
Emergency stop mushroom pushbutton, 22 mm Round, plastic, red, 40 mm, positive latching, rotate to unlatch, complete with holder	**3SB3000-1HA20**
Contact block with 2 contacts 1 NO + 1 NC, 2-pin, screw terminal	**3SB3400-0A**
Key set (10 sets) For machine control panel	**6FC5148-0AA03-0AA0**
Rapid traverse dial (1 set = 20 units) for MCP 483C 16-position rotary switch	**6FC5248-0AF30-0AA0**
Spindle/rapid traverse override electronic rotary switch 1 × 16G, T=24, cap, button, pointer, and rapid traverse and spindle dials[1)]	**6FC5247-0AF12-1AA0**
Feed/rapid traverse override electronic rotary switch 1 × 23G, T=32, cap, button, pointer, and rapid traverse and feed dials[1)]	**6FC5247-0AF13-1AA0**
Cable set (60 units) For additional machine control panel control devices Length 500 mm	**6FC5247-0AA35-0AA0**
Set of clamps (9 units) For operator components with 2.5 mm profile length 20 mm	**6FC5248-0AF14-0AA0**

1) 16G: Latching at position 16; T=24: 24 positions for 360°
23G: Latching at position 23; T=32: 32 positions for 360°

Overview

SINUMERIK MCP Interface PN

The SINUMERIK MCP Interface PN enables customer-specific machine control panels to be connected via PROFINET.

On the SINUMERIK MCP Interface PN, digital inputs, outputs, connections for override rotary switches and handwheels are provided as well as two Industrial Ethernet interfaces for communication.

Design

You can connect the following operator controls to the SINUMERIK MCP Interface PN:

- 80 single keys
- 64 LEDs
- 1 handwheel
- 2 override switches

The following inputs/outputs are also available:

- 9 digital inputs (5 V)
- 6 digital inputs (24 V)
- 15 digital outputs (24 V/each 0.15 A)

Integration

The SINUMERIK MCP Interface PN can be used for:

- SINUMERIK 828D BASIC
- SINUMERIK 828D

Technical specifications

Product name	SINUMERIK MCP Interface PN
	6FC5303-0AF03-0AA0
Input voltage	24 V DC
Power consumption, max.	2.4 W
Degree of protection acc. to DIN EN 60529 (IEC 60529)	
• Front	IP00
• Rear	IP00
Humidity rating based on DIN EN 60721-3-3	Class 3K5 condensation and icing excluded. Low air temperature 0 °C.
Relative atmospheric humidity	
• Storage	5 ... 95 % at 25 °C
• Transport	5 ... 95 % at 25 °C
• Operation	5 ... 80 % at 25 °C
Ambient temperature	
• Storage	-25 … +55 °C
• Transport	-25 … +55 °C
• Operation	
- Front	0 … 45 °C
- Rear	0 … 55 °C
Dimensions	
• Width	242 mm
• Height	152 mm
• Depth	36 mm
Weight, approx.	0.6 kg
Approvals, according to	CE, cULus

Selection and ordering data

Description	Article No.
SINUMERIK MCP Interface PN For connecting to customized machine control panels over PROFINET	**6FC5303-0AF03-0AA0**
Accessories	
Feed/rapid traverse override electronic rotary switch 1 × 23G, T=32, cap, button, pointer, and rapid traverse and feed dials[1)]	**6FC5247-0AF13-1AA0**
Spindle/rapid traverse override electronic rotary switch 1 × 16G, T=24, cap, button, pointer, and rapid traverse and spindle dials[1)]	**6FC5247-0AF12-1AA0**
Cable set (60 units) For additional control devices Length: 500 mm	**6FC5247-0AA35-0AA0**

1) 16G: Latching at position 16; T=24: 24 positions for 360°
23G: Latching at position 23; T=32: 32 positions for 360°

Mini handheld unit

Overview

Mini handheld unit with coiled cable, complete with connection kit and holder

The convenient, ergonomically designed mini handheld unit with rugged metal connector is suitable for setting up and operating standard machines in the jobshop area.

Benefits

- Mobile positioning of axes
- Since coarse, medium and fine infeed can easily be graduated, the operator control concept offers fast, increment-precise positioning
- Rugged and compact

Design

- Emergency stop implemented in 2 channels with 4-wire connection
- The 2-channel, 3-step enabling button has a 3-wire connection.
- Rapid traverse key and two ± keys
- 1 handwheel to traverse the axes in jog mode
- Facility to connect rotary switches for the selection of up to 5 axes
- Customer-specific applications can be implemented via 3 user-assignable function keys. If necessary, the customer can use slide-in labels to mark the keys specifically.
- Connection by means of a connection kit.
- Optional angle socket for a 90° rotated cable outlet direction (the angle socket can only be used in conjunction with the non-assembled connection kit)
- Secured by means of integrated magnetic clamps or optional holder

Integration

The mini-handheld unit can be used for:

- SINUMERIK 828D BASIC
- SINUMERIK 828D

Technical specifications

Product name	Mini handheld unit with coiled cable/straight cable 6FX2007-1AD03/ 6FX2007-1AD13
Handwheel operating voltage	5 V DC
Input voltage (emergency stop and enabling)	24 V DC
Handwheel	100 S/R, RS422
Degree of protection to DIN EN 60529 (IEC 60529) (without shaft input)	IP65
Humidity rating based on DIN EN 60721-3-3	Class 3K5 condensation and icing excluded. Low air temperature 0 °C.
Ambient temperature	
• Storage	-20 … +60 °C
• Transport	-20 … +60 °C
• Operation	0 … 55 °C
Distance between handwheel and PPU, max. (when using the handwheel)	25 m
Dimensions	
• Length (with emergency stop button)	175 mm
• Width	85 mm
• Height	70 mm
Weight, approx. (without connecting cable)	0.5 kg
Approvals, according to	CE, UL

Selection and ordering data

Description	Article No.
Mini handheld unit 3-step enabling button incl. magnetic clamps and connecting cable with metal connector	
• Coiled connecting cable Length 2.1 m, stretches to 3.5 m	**6FX2007-1AD03**
• Straight cable, length 5 m	**6FX2007-1AD13**
Accessories	
Connection kit for mini handheld unit, assembled Version with metal connector for connection to machine control panel with PROFINET, with terminator for SINUMERIK 828D	**6FX2006-1BG20**
Connection kit for mini handheld unit, non-assembled (connection socket for assembly by user) Version with metal connector for connection to machine control panel without Industrial Ethernet, with terminator	**6FX2006-1BG03**
90° angle socket For connection kit, non-assembled 6FX2006-1BG03, metal version	**6FX2006-1BG56**
Holder For mini handheld units 6FX2007-1AD.3 and electronic handwheel in housing 6FC9320-5DE02	**6FX2006-1BG70**

Overview

Electronic handwheels with front panel and setting wheel, as well as portable in housing

Electronic handwheels are used for manually traversing axes.

Benefits

- Positioning of axes
- Rugged and compact (housing variant)

Design

- Handwheels for assembly by user – the front panel can be removed.
- Handwheels with housing and coiled cable, secured by means of the integrated magnetic clamps or the optional holder.

Function

The handwheels are equipped with a magnetic latching mechanism that supports traversing with incremental accuracy.

The handwheels generate 5 V DC TTL signals.

Selection and ordering data

Description	Article No.
Electronic handwheel	
• With front panel 120 mm × 120 mm, with setting wheel, 5 V DC, RS422	**6FC9320-5DB01**
• With front panel 76.2 mm × 76.2 mm, with setting wheel, 5 V DC, RS422	**6FC9320-5DC01**
• Without front panel, with small setting wheel 5 V DC, RS422	**6FC9320-5DM00**
• Without front panel, without setting wheel, for installation, 5 V DC, RS422	**6FC9320-5DF01**
• Portable in housing, with setting wheel, 5 V DC, RS422 coiled cable, length 2.5 m	**6FC9320-5DE02**
Adapter set For installation in front panel with 3-hole fixing	**6FC9320-5DN00**
Flange socket Installation socket, 9-pin, socket for portable handwheel	**6FC9341-1AQ**
Holder For mini handheld units 6FX2007-1AD.3 and electronic handwheel in housing 6FC9320-5DE02	**6FX2006-1BG70**

Technical specifications

Product name	Electronic handwheel 6FC9320-5DB01	Electronic handwheel 6FC9320-5DC01 6FC9320-5DF01 6FC9320-5DM00	Portable electronic handwheel 6FC9320-5DE02
Rated voltage	5 V DC ± 5%		
Rated current, max.	60 mA		
Interface	RS422 (TTL)		
Phase angle of pulse sequence A to B	90° electrical		
Pulses	2 × 100 S/R		
Actuating force	8 Ncm	4 Ncm	4 Ncm
Output frequency, max.	2 kHz		
Distance to PPU, max.	25 m	25 m	20 m
Degree of protection acc. to DIN EN 60529 (IEC 60529) • Front • Rear	 IP65 IP50		
Relative atmospheric humidity • Storage • Transport • Operation	 10 ... 95 % at 25 °C 10 ... 95 % at 25 °C 5 ... 80 % at 25 °C		
Ambient temperature • Storage • Transport • Operation	 -40 ... +85 °C -40 ... +85 °C 0 ... 70 °C		
Weight, approx.	0.6 kg	0.4 kg	1.3 kg
Approvals, according to	cULus		

SINUMERIK PP 72/48D PN and PP 72/48D 2/2A PN I/O modules

Overview

SINUMERIK PP 72/48D PN I/O module

The SINUMERIK PP 72/48D PN I/O module is available in a digital variant with 72 inputs and 48 outputs, and in a digital/analog variant PP 72/48D 2/2A PN with an additional 2 analog inputs and 2 analog outputs.

The I/O modules are connected to the CNC via a PROFINET-based I/O interface. The digital inputs and outputs are connected by means of three 50-pin ribbon cables. Terminal strip converters can be used or the direct connection of distribution boards, for example, is possible.

Benefits

- Easy connection via a PROFINET-based I/O interface
- Mounting plate for easy module installation in the control cabinet
- Automatic module detection by the CNC, no complex configuring required
- Easy connection of terminal strip converters to plug connectors
- Integrated 24 V DC power supply with electrical isolation between the inputs and outputs and PROFINET

Integration

The SINUMERIK PP 72/48D PN and PP 72/48D 2/2A PN I/O modules can be used for the following CNCs:

- SINUMERIK 828D BASIC
- SINUMERIK 828D

Selection and ordering data

Description	Article No.
SINUMERIK PP 72/48D PN I/O module 72 digital inputs 48 digital outputs	**6FC5311-0AA00-0AA0**
SINUMERIK PP 72/48D 2/2A PN I/O module 72 digital inputs 48 digital outputs 2 analog inputs 2 analog outputs	**6FC5311-0AA00-1AA0**
Accessories	
Terminal strip converter 50-pin	**6EP5406-5AA00**
Cable set Ribbon cable, 50-pin, length 6 m 8 insulation displacement connectors, 50-pin	**6EP5306-5BG00**
DRIVE-CLiQ signal cable, pre-assembled For PROFINET connection Connector with degree of protection IP20	
• In exact meter lengths[1)]	6FX2002-1DC00-1..0
• In fixed lengths[1)] of 0.11 ... 5 m	6SL3060-4A..0-0AA0

[1)] For length code, see MOTION-CONNECT connection systems.

Technical specifications

Product name	SINUMERIK PP 72/48D PN I/O module	SINUMERIK PP 72/48D 2/2A PN I/O module
	6FC5311-0AA00-0AA0	6FC5311-0AA00-1AA0
Input voltage	24 V DC + 20 %/- 15 %	24 V DC + 20 %/- 15 %
Power consumption, max.	17 W	19 W
Digital I/Os	72/48	72/48
• Connection method	Connector acc. to MIL-C-83-503/DIN 41-651	Connector acc. to MIL-C-83-503/DIN 41-651
• Demand factor of outputs	100 % at I_{out} = 250 mA per output	100 % at I_{out} = 250 mA per output
Analog inputs	–	2
• Connection method	–	PHOENIX MINI COMBICON, spring cage connector, core cross-section 0.5 mm^2
• Type of analog inputs	–	± 10 V, 0 ... 10 V, ± 20 mA, 4 ... 20 mA, PT100
• Resolution	–	16 bit, including sign
Analog outputs	–	2
• Connection method	–	PHOENIX MINI COMBICON, spring cage connector, core cross-section 0.5 mm^2
• Type of analog outputs	–	± 10 V, ± 20 mA (max. 600 Ω)
• Resolution	–	16 bit, including sign
Degree of protection acc. to DIN EN 60529 (IEC 60529)	IP00	IP00
Relative atmospheric humidity		
• Storage	5 … 95 % at 25 °C	5 … 95 % at 25 °C
• Transport	5 … 95 % at 25 °C	5 … 95 % at 25 °C
• Operation	10 … 80 % at 25 °C	10 … 80 % at 25 °C
Ambient temperature		
• Storage	-40 ... +70 °C	-40 ... +70 °C
• Transport	-40 ... +70 °C	-40 ... +70 °C
• Operation	0 ... 55 °C	0 ... 55 °C
Dimensions		
• Width	300 mm	300 mm
• Height	150 mm	150 mm
• Depth	35 mm	35 mm
Weight, approx.	0.9 kg	0.9 kg

SINAUT MD 720-3 GSM/GPRS modem

Overview

SINAUT MD720-3 GSM/GPRS modem

The SINAUT MD720-3 GSM/GPRS modem transmits the text messages into the GSM network of the mobile radio operator. By inserting the appropriate SIM card into the SINAUT MD720-3 GSM/GPRS modem, it is possible to freely select the required mobile radio operator.

With Easy Message the SINUMERIK 828D BASIC/828D CNCs provide a means of transmitting process data using text messages (SMS). This makes it possible to send messages to various mobile phones of the operating and maintenance personnel to notify them, for example, of the workpiece counter reading or the fact that a tool has reached its wear limit.

Benefits

- Rugged GSM modem for industrial use
- High-quality signal transmission thanks to powerful external antenna
- Simple mounting on standard mounting rails in the control cabinet or operator panel housing

Design

The SINAUT MD720-3 GSM/GPRS modem features the following interfaces as standard:

- 9-pin sub D socket for connection to the CNC (RS232C interface)
- 4-pin screw terminal for connection to a 24 V DC supply voltage
- SMA antenna connection socket for GSM/GPRS antenna
- Slot for inserting a GSM-SIM card

The SINAUT MD720-3 modem has diagnostic LEDs for modem status, field strength and connection control.

Easy Message provides the following functions:

- Input of PIN number
- Configuration of user profiles
- Display of modem status and field strength
- Generation of outgoing text messages (SMS)
- Processing of incoming text messages (SMS)
- Visualization of transmission protocol

Integration

The SINAUT MD720-3 GSM/GPRS modem can be used for the following CNCs:

- SINUMERIK 828D BASIC
- SINUMERIK 828D

The following components can be connected:

- Modem cable for RS232C interface
- SINAUT ANT 794-4MR antenna

Technical specifications

Product name	SINAUT MD720-3 GSM/GPRS modem
	6NH9720-3AA00
Input voltage	12 ... 30 V DC
Power loss	
• Typical	5 W
• Maximum	6.2 W
Frequency ranges (quad band)	850/900/1800/1900 MHz
Transmit output power	
• At 850/900 MHz	2 W
• At 1800/1900 MHz	1 W
Interfaces	
• RS232C	9-pin sub D socket connector
• Antenna	SMA antenna socket (50 Ω)
Degree of protection acc. to DIN EN 60529 (IEC 60529)	IP40
Relative atmospheric humidity, max.	95 % at 25 °C
Ambient temperature	
• Storage	-25 ... +85 °C
• Transport	-25 ... +85 °C
• Operation	-20 ... +60 °C
Dimensions	
• Width	22.5 mm
• Height	99 mm
• Depth	114 mm
Weight, approx.	150 g
Approvals, according to	You will find the latest approvals on the Internet at www.siemens.com/simatic-net/ik-info

Selection and ordering data

Description	Article No.
SINAUT MD720-3 GSM/GPRS modem	**6NH9720-3AA00**
Accessories	
SINAUT ANT 794-4MR antenna	**6NH9860-1AA00**
Modem cable For RS232C interface Length 2.5 m	**6NH7701-5AN**

More information

You can find additional information on the Internet at:

www.siemens.com/industrymall

Overview

SITOP smart power supply PSU100S, 24 V DC/10 A

The 24 V power supply units from the SITOP range are optimized for industrial use and operate 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.

SITOP smart

SITOP smart does not require much space on the standard mounting rail and offers a high level of functionality.

Thanks to the extra power, 1.5 times the rated current for 5 seconds, large loads can also be switched on without any problems.

Benefits

- High efficiency
- Narrow width and easy installation
- Exact output voltage and low residual ripple
- Integrated short circuit protection and safe electrical separation
- National and international approvals
- No release of silicone

Selection and ordering data

Description	Article No.
SITOP smart **PSU100S 24 V DC/10 A, 1-phase** Input voltage: 120/230 V AC (85 ... 132/170 ... 264 V AC)	**6EP1334-2BA20**
SITOP smart **PSU100S 24 V DC/20 A, 1-phase** Input voltage: 120/230 V AC (85 ... 132/176 ... 264 V AC)	**6EP1336-2BA10**
SITOP smart **PSU300S 24 V DC, 3-phase** Input voltage: 400 ... 500 V 3 AC (340 … 550 V 3 AC)	
• 10 A	**6EP1434-2BA10**
• 20 A	**6EP1436-2BA10**

More information

You can find additional information in Catalog KT 10.1, in the Siemens Industry Mall, or on the Internet at:

www.siemens.com/industrymall

www.siemens.com/sitop

Technical specifications

Product name	SITOP smart power supply		
	6EP1334-2BA20	6EP1336-2BA10	6EP1434-2BA10 6EP1436-2BA10
Output voltage	24 V DC ± 3 %	24 V DC ± 3 %	24 V DC ± 3 %
Line frequency range	47 ... 63 Hz	47 ... 63 Hz	47 ... 63 Hz
Degree of protection according to EN 60529	IP20	IP20	IP20
Humidity class according to EN 60721	Climate class 3K3, without condensation	Climate class 3K3, without condensation	Climate class 3K3, without condensation
Ambient temperature			
• Storage	-40 ... +85 °C	-40 ... +85 °C	-40 ... +85 °C
• Transport	-40 ... +85 °C	-40 ... +85 °C	-40 ... +85 °C
• Operation	-10 ... +70 °C	0 ... 70 °C	0 ... 70 °C
Dimensions			
• Width	70 mm	115 mm	90 mm
• Height	125 mm	145 mm	145 mm
• Depth	125 mm	150 mm	150 mm
Weight, approx.	0.8 kg	2.4 kg	1.6 kg
Approvals, according to	CE, cULus, CSA	CE, cULus, CSA	CE, cULus, CSA

SENTRON PAC Power Monitoring Devices

Overview

SENTRON PAC3200 and PAC4200 Power Monitoring Devices

The 7KM PAC Power Monitoring Devices ensure precise, reproducible and reliable measurement of energy values for infeed, outgoing feeders or individual loads. The measuring devices not only supply comprehensive information about your electrical installation and power distribution system, but also provide important measured values to help you assess the status of your system and the power quality. For further processing of the measured data, the devices can easily be integrated into higher-level automation and energy management systems.

The devices can be used for both single-phase and multi-phase measurements in 3- and 4-conductor power supply systems (TN, TT, IT).

Benefits

- Simple mounting and commissioning
- High IP65 degree of protection (front side, when installed) permits usage in extremely dusty and wet environments
- Intuitive operation using 4 function buttons and multilingual plain text displays
- Easy to adapt to different systems using integrated and optional
  - Digital inputs and outputs
  - Communication interfaces
- Global application
  - At least 8 languages
  - International approvals
  - Developed and tested in accordance with European and international standards
- Limited mounting depth

More information

More information is available in the Siemens Industry Mall or on the Internet at:

www.siemens.com/industrymall

www.siemens.com/lowvoltage/powermonitoring

Technical specifications

Product name	SENTRON PAC3200 7KM2112-0BA00-3AA0	SENTRON PAC4200 7KM4212-0BA00-3AA0
Slots for expansion modules	1	2
Continuous signal acquisition	✔	✔
Measuring inputs for voltage, max. UL-L/UL-N; CAT III	690 V/400 V 3 AC	
• Wide-range power supply	95 ... 240 V AC 50/60 Hz ±10 % 110 ... 340 V DC ±10 %	
Measurement at voltage transformers for voltages > 500 V or 690 V	✔	✔
Measuring inputs for current CAT III	3 AC x/1 A or x/5 A	
Current direction programmable	✔	✔ per phase
Measurement using current transformers	✔	✔
Safety class	II	II
Degree of protection		
• Front	IP65	IP65
• Rear	IP20	IP20
Relative atmospheric humidity in operation without condensation	5 ... 95 % at 25 °C	5 ... 95 % at 25 °C
Degree of pollution	2	2
Ambient temperature		
• Storage	-25 ... +70 °C	-25 ... +70 °C
• Transport	-25 ... +70 °C	-25 ... +70 °C
• Operation	-10 ... +55 °C	-10 ... +55 °C
Dimensions (W × H × D)	96 × 96 × 56 mm	96 × 96 × 82 mm
Overall depth		
• Without module	51 mm	77 mm
• With module	73 mm	99 mm
Weight, approx.	0.54 kg	0.46 kg
Approvals	CE, cULus, C-Tick, GOST	

Selection and ordering data

Description	Article No.
SENTRON PAC3200 **Power Monitoring Device** With screw terminals Records 50 measured values	**7KM2112-0BA00-3AA0**
SENTRON PAC4200 **Power Monitoring Device** With screw terminals Records 200 measured values	**7KM4212-0BA00-3AA0**

CAD CREATOR
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4

Overview

SINAMICS S120 Combi Power Module

SINAMICS S120 Combi is a very compact and rugged drive concept tailored for compact turning and milling machines. SINAMICS S120 Combi integrates a line infeed with regenerative feedback capability, power units for spindle and feed motors as well as a TTL encoder interface into a single Power Module. The SINAMICS S120 Combi Power Modules are optimized as a drive for machine tools with 3 to 6 axes. The Power Modules are available with external air cooling. SINAMICS Motor Modules in the booksize compact format are used as expansion axes.

Benefits

- Compact multi-axis module with line infeed with regenerative feedback capability and power units for 3 or 4 axes
- Customized drive system for compact standard turning and milling machines
- Requires very little mounting space in control cabinet (incl. fan module, shield terminals and ventilation clearances)
- Optimized for weak supply networks with frequent undervoltage, network imbalances and large frequency fluctuations
- Optimized for harsh operating conditions with increased cabinet temperature and increased humidity
- Rugged Power Modules resistant to short circuits, overvoltage and ground faults
- Rugged and easy-to-fit screw-type terminals with integrated shield connection for the power cables
- Perfect expendability using additional Motor Modules in booksize compact format
- Low energy consumption thanks to state-of-the-art 400-V technology
- Excellent dynamic response and machining precision thanks to Dynamic Servo Control (DSC)
- Simple cabling due to intelligent DRIVE-CLiQ interface
- Very simple commissioning thanks to predefined topologies

Function

- Power Module with 3 or 4 integrated power units
- Integrated line infeed with regenerative feedback capability
- Integrated TTL encoder interface
- Integrated motor brake control for one axis
- Integrated fan power supply
- Line supply voltage 380 to 480 V 3 AC
- Supply types TT, TN and IT
- Integrated shield terminals
- Heat dissipation concept with an external heatsink for extremely low power loss in the control cabinet
- Easy-to-mount fan module optimized for harsh environments
- Increased availability thanks to fan monitoring
- Derating only from 45 °C cabinet temperature
- Power cables are connected by means of screw-type terminals

Integration

The following components can be connected to the SINAMICS S120 Combi drive system:

- SINUMERIK 828D BASIC
- SINUMERIK 828D
- 3 or 4 spindles/feed motors
- 3 or 4 motor encoders
- 3 or 4 direct encoders via DMC20
- Direct spindle encoder with TTL directly or sin/cos via SMC20
- External fan module
- Up to two additional SINAMICS S120 Motor Modules in booksize compact format via DC link connection and 24 V DC busbars
- Braking Module with braking resistor via DC link connection
- Control Supply Module via DC link connection and 24 V DC busbars
- One safe motor brake control
- 5 or 6 DRIVE-CLiQ sockets
- 24 V electronics power supply via connector
- 1 safe standstill input for the infeed (Enable Pulses)
- 1 safe standstill input for the spindle and feeds (Enable Pulses)
- 1 temperature sensor input for the spindle (KTY84-130 or PTC)
- PE/protective conductor connections

The scope of supply of the SINAMICS S120 Combi Power Modules includes:

- SINAMICS S120 Combi Power Module
- Accessories pack consisting of:
  - 4 DRIVE-CLiQ dust-proof blanking plugs
  - Connector X224 for the electronics power supply
  - Connector X11 for motor brake control
  - Connector X21 Enable Pulses infeed
  - Connector X22 Enable Pulses drives/temp.
  - 5 shield terminals for power cables
  - Shield terminal for signal cable

Selection and ordering data

SINAMICS S120 Combi Power Modules					
Rated power Infeed	Rated output current Spindle	Rated output current Feedrate 1	Rated output current Feedrate 2	Rated output current Feedrate 3	
kW	A	A	A	A	Article No.
3-axis Power Module					
16	18	5	5	–	**6SL3111-3VE21-6FA0**
16	24	9	9	–	**6SL3111-3VE21-6EA0**
20	30	9	9	–	**6SL3111-3VE22-0HA0**
4-axis Power Module					
10	24 (Pulse frequency 4/8 kHz)	12	12	12	**6SL3111-4VE21-0EA0**
16	18	9	5	5	**6SL3111-4VE21-6FA0**
16	24	9	9	9	**6SL3111-4VE21-6EA0**
20	30	12	9	9	**6SL3111-4VE22-0HA0**

Accessories

Description	Article No.
SINAMICS S120 Combi accessories pack for re-ordering, as already included in the scope of supply of the SINAMICS S120 Combi Power Modules Comprising: 4 × DRIVE-CLiQ dust-proof blanking plugs Connector X224 for electronics power supply Connector X11 for motor brake control Connector X21 Enable Pulses infeed Connector X22 Enable Pulses drives/temp. 5 × shield terminals for power cables Shield terminal for signal cable	**6SL3161-8AP00-0AA0**

Technical specifications

Product name	SINAMICS S120 Combi 6SL3111-...
DC link voltage	1.35 × line voltage[1)]
Output voltage	0 ... 0.7 × DC link voltage[1)]
Line power factor at rated power	
• Fundamental (cos φ_1)	> 0.96
• Total (λ)	0.65 … 0.90
Radio interference suppression	
• Standard	No radio interference suppression
• With line filter	Category C2 according to EN 61800-3
Degree of protection	IP20
Installation altitude	Up to 1000 m above sea level without derating, > 1000 ... 4000 m with derating
Approvals, according to	CE, cURus
Safety Integrated	Safety Integrity Level 2 (SIL 2) acc. to IEC 61508, Performance Level d (PLd) acc. to ISO 13849-1, Control Category 3 acc. to ISO 13849-1

1) The DC link voltage adjusts itself to the mean value of the rectified line voltage.

Technical specifications (continued)

Product name		3-axis Power Module		
External air cooling		6SL3111-3VE21-6FA0	6SL3111-3VE21-6EA0	6SL3111-3VE22-0HA0
Infeed				
• Rated power P_{rated} (S1)	**kW**	**16**	**16**	**20**
• Infeed power P_{S6} (S6-40 %)	kW	21	21	26.5
• Peak infeed power P_{max}	kW	35	35	40
Regenerative feedback				
• Rated power P_{rated} (S1)	kW	16	16	20
• Peak regenerative feedback power P_{max}	kW	35	35	40
Supply voltages				
• Line voltage	V	380 -10 % ... 480 3 AC +10 %		
• Line frequency	Hz	45 ... 66		
• Electronics power supply DC	V	24 (20.4 ... 28.8)		
Rated input current				
• At 400 V 3 AC	A	28	28	34
• At 380 V/480 V 3 AC	A	29/25	29/25	35/30
• At 400 V 3 AC (S6-40 %)	A	35.5	35.5	44
• At 400 V 3 AC peak current	A	56	56	63.5
Pulse frequency	kHz	4	4	4
Output voltage AC	V	0 ... 0.7 × DC link voltage		
Spindle				
• Rated output current AC I_{rated}	**A**	**18**	**24**	**30**
• Base-load current AC I_H	A	15.3	20.4	25.5
• Intermittent-duty operating current AC $I_{S6\text{-}40\ \%}$	A	24	32	40
• Peak current AC I_{max}	A	36	48	56
Rated power				
• At 540 V DC link voltage	kW	8.7	11.7	14.4
• At 600 V DC link voltage	kW	9.7	13	16
Feedrate 1/Feedrate 2				
• Rated output current AC I_{rated}	**A**	**5**	**9**	**9**
• Base-load current AC I_H	A	4.3	7.7	7.7
• Intermittent-duty operating current AC $I_{S6\text{-}40\ \%}$	A	6.5	12	12
• Peak current AC I_{max}	A	10	18	18
Rated power				
• At 540 V DC link voltage	kW	2.4	4.3	4.3
• At 600 V DC link voltage	kW	2.7	4.8	4.8
Output for expansion axis				
• DC link output current DC I_{rated}	A	40	40	40
• DC link voltage	V	460 ... 720	460 ... 720	460 ... 720
• Electronics output current for an expansion axis 24 V DC	A	20	20	20
Electronics current consumption at 24 V DC				
• Without external fan module	A	1.5	1.5	1.5
• With external fan module	A	2.3	2.3	2.3
Total power loss (incl. electronics losses)	W	425	537	634
• Internal	W	81	91	102
• External	W	344	446	532

Technical specifications (continued)

Product name		3-axis Power Module (continued)		
External air cooling		6SL3111-3VE21-6FA0	6SL3111-3VE21-6EA0	6SL3111-3VE22-0HA0
Ambient temperature, max.				
• Without derating	°C	45	45	45
• With derating	°C	55	55	55
DC link voltage	V	460 ... 720		
• Overvoltage trip DC	V	820 ± 2 %		
• Undervoltage trip DC	V	380 ± 2 %		
DC link capacitance	µF	1645	1880	2115
Circuit breaker (UL)				
• Type		3VL2105-2KN30-....	3VL2105-2KN30-....	3VL2106-2KN30-....
• Rated current	A	35	35	60
• Rated short-circuit current SCCR at 480 V 3 AC, resulting	kA	65	65	65
Safety fuses (UL)				
• Type		AJT35	AJT35	AJT60
• Rated current	A	35	35	60
• Rated short-circuit current SCCR, resulting				
- At 480 V 3 AC	kA	65	65	65
- At 600 V 3 AC	kA	200	200	200
Cooling air requirement	m^3/h	160	160	160
Dimensions				
• Width	mm	260	260	260
• Height	mm	380	380	380
• Depth	mm	304	304	304
Weight, approx.	kg	18.4	18.4	18.5

Technical specifications (continued)

Product name		4-axis Power Module			
External air cooling		6SL3111-4VE21-0EA0	6SL3111-4VE21-6FA0	6SL3111-4VE21-6EA0	6SL3111-4VE22-0HA0
Infeed					
• Rated power P_{rated} (S1)	**kW**	**10**	**16**	**16**	**20**
• Infeed power P_{S6} (S6-40 %)	kW	13	21	21	26.5
• Peak infeed power P_{max}	kW	35	35	35	40
Regenerative feedback					
• Rated power P_{rated} (S1)	kW	10	16	16	20
• Peak regenerative feedback power P_{max}	kW	35	35	35	40
Supply voltages					
• Line voltage	V	380 -10 % ... 480 3 AC +10 %			
• Line frequency	Hz	45 ... 66			
• Electronics power supply DC	V	24 (20.4 ... 28.8)			
Rated input current					
• At 400 V 3 AC	A	16.2	28	28	34
• At 380 V/480 V 3 AC	A	17/12.8	29/25	29/25	35/30
• At 400 V 3 AC (S6-40 %)	A	21.1	35.5	35.5	44
• At 400 V 3 AC peak current	A	56.7	56	56	63.5
Pulse frequency	kHz	4/8	4	4	4
Output voltage AC	V	0 ... 0.7 × DC link voltage			
Spindle					
• Rated output current AC I_{rated}	**A**	**24**	**18**	**24**	**30**
• Base-load current AC I_H	A	20.4	15.3	20.4	25.5
• Intermittent-duty operating current AC $I_{S6-40\ \%}$	A	32 at 4 kHz 19.2 at 8 kHz	24	32	40
• Peak current AC I_{max}	A	60	36	48	56
Rated power					
• At 540 V DC link voltage	kW	11.7	8.7	11.7	14.4
• At 600 V DC link voltage	kW	13	9.7	13	16
Feedrate 1					
• Rated output current AC I_{rated}	**A**	**12**	**9**	**9**	**12**
• Base-load current AC I_H	A	10.8	7.7	7.7	10.3
• Intermittent-duty operating current AC $I_{S6-40\ \%}$	A	16	12	12	16
• Peak current AC I_{max}	A	36	18	18	24
Rated power					
• At 540 V DC link voltage	kW	5.8	4.3	4.3	5.8
• At 600 V DC link voltage	kW	6.5	4.8	4.8	6.5
Feedrate 2/Feedrate 3					
• Rated output current AC I_{rated}	**A**	**12**	**5**	**9**	**9**
• Base-load current AC I_H	A	10.8	4.3	7.7	7.7
• Intermittent-duty operating current AC $I_{S6-40\ \%}$	A	16	6.5	12	12
• Peak current AC I_{max}	A	36	10	18	18
Rated power					
• At 540 V DC link voltage	kW	5.8	2.4	4.3	4.3
• At 600 V DC link voltage	kW	6.5	2.7	4.8	4.8
Output for expansion axis					
• DC link output current DC I_{rated}	A	18.5	40	40	40
• DC link voltage	V	510 ... 720	510 ... 720	460 ... 720	460 ... 720
• Electronics output current for an expansion axis 24 V DC	A	5	20	20	20
Electronics current consumption at 24 V DC					
• Without external fan module	A	1.6	1.6	1.6	1.6
• With external fan module	A	2.4	2.4	2.4	2.4
Total power loss (incl. electronics losses)	W	770	492	607	733
• Internal	W	115	87	100	113
• External	W	655	405	507	620

Technical specifications (continued)

Product name		4-axis Power Module (continued)			
External air cooling		6SL3111-4VE21-0EA0	6SL3111-4VE21-6FA0	6SL3111-4VE21-6EA0	6SL3111-4VE22-0HA0
Ambient temperature, max.					
• Without derating	°C	45	45	45	45
• With derating	°C	55	55	55	55
DC link voltage	V	460 ... 720			
• Overvoltage trip DC	V	820 ± 2 %			
• Undervoltage trip DC	V	380 ± 2 %			
DC link capacitance	µF	2520	1645	2115	2520
Circuit breaker (UL)					
• Type		3VL2105-2KN30-....	3VL2105-2KN30-....	3VL2105-2KN30-....	3VL2106-2KN30-....
• Rated current	A	50	50	50	60
• Rated short-circuit current SCCR at 480 V 3 AC, resulting	kA	65	65	65	65
Safety fuses (UL)					
• Type		AJT35	AJT35	AJT35	AJT60
• Rated current	A	35	35	35	60
• Rated short-circuit current SCCR, resulting					
- At 480 V 3 AC	kA	65	65	65	65
- At 600 V 3 AC	kA	200	200	200	200
Cooling air requirement	m^3/h	160	160	160	160
Dimensions					
• Width	mm	260	260	260	260
• Height	mm	380	380	380	380
• Depth	mm	304	304	304	304
Weight, approx.	kg	19.4	18.9	19	19

4

Overview

External fan module

External fan module

The external fan module combined with the reinforcement plates is employed to provide perfect cooling of a SINAMICS S120 Combi Power Module.

To cool the SINAMICS S120 Combi Power Modules, a volumetric flow of air through the heatsink of at least 160 m^3/h is required.

The external fan module supplies a maximum volumetric flow of 290 m^3/h. This dimensioning ensures an adequate air flow rate, even with a lower supply voltage or with a slightly soiled heatsink.

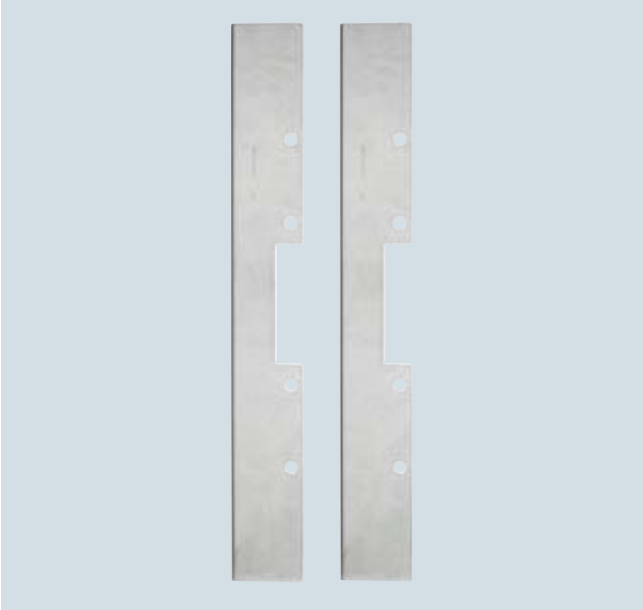
Due to the encapsulated electronics and the ball-bearing-mounted closed rotor, the fan module can be used even under exacting environmental conditions. The fans are equipped with electronic reverse-polarity, blocking and overload protection systems. To ensure maximum machine availability, the fan speed is monitored. A user alarm is displayed if the fan stops.

Technical specifications

Product name	External fan module 6SL3161-0EP00-0AA0
Rated voltage	24 V DC
Voltage range	20.4 … 28.8 V DC
Volumetric flow, max.	290 m^3 / h
Current consumption	0.8 A
Power consumption	18 W
Ambient temperature, permissible	-20 ... +70 °C
Service life	
• At 55 °C	50000 h
• At 70 °C	20000 h
Degree of protection	IP54
Dimensions	
• Height	258 mm
• Width	104 mm
• Depth	86 mm
Weight, approx.	1.5 kg
Approvals, according to	VDE, CSA, UL

Overview

Reinforcement plates



Reinforcement plates

It is essential to ensure that the air actually flows through the heatsink. The gap between the fan module and heatsink must therefore be closed. The reinforcement plates must be used for this purpose where possible.

The reinforcement plates

- Close the gap between the fan module and heatsink
- Reinforce the rear wall of the control cabinet for sealed installation
- Guarantee ideal ventilation spaces

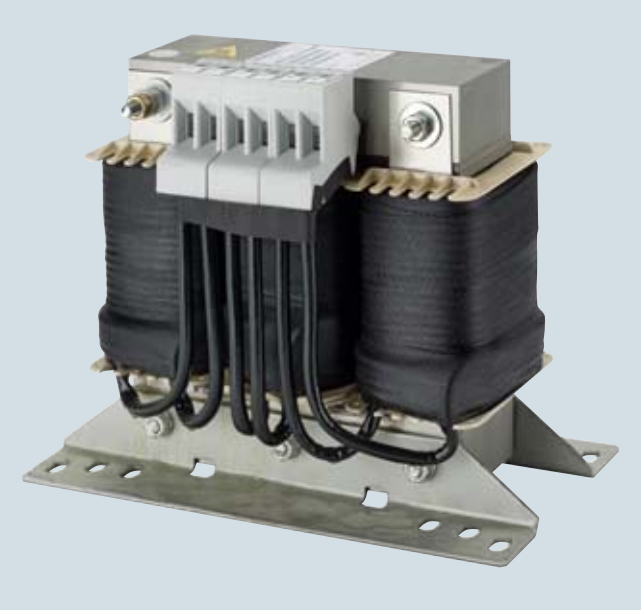
Technical specifications

Product name	Reinforcement plates 6SL3161-1LP00-0AA0
Dimensions	
• Height	575 mm
• Width	15 mm
• Depth	75 mm
Weight, approx.	0.75 kg

Selection and ordering data

Description	Article No.
SINAMICS S120 Combi External fan module	**6SL3161-0EP00-0AA0**
Accessories	
SINAMICS S120 Combi Reinforcement plates (2 units)	**6SL3161-1LP00-0AA0**

Overview



Line reactor

SINAMICS S120 Combi Power Modules cannot operate without line reactors. The use of other makes of line reactor can lead to malfunctions or irreparable damage to equipment.

Selection and ordering data

Rated power Infeed	Suitable for SINAMICS S120 Combi Power Module	**Line reactor**
kW	Type	Article No.
16	6SL3111-3VE21-6FA0	**6SL3100-0EE21-6AA0**
16	6SL3111-3VE21-6EA0	
10	6SL3111-4VE21-0EA0	
16	6SL3111-4VE21-6FA0	
16	6SL3111-4VE21-6EA0	
20	6SL3111-3VE22-0HA0	**6SL3100-0EE22-0AA0**
20	6SL3111-4VE22-0HA0	

Technical specifications

Product name		Line reactor	
		6SL3100-0EE21-6AA0	6SL3100-0EE22-0AA0
Rated power	kW	16	20
Rated current	A	28	33
Power loss	W	75	98
Line/load connection 1U1, 1V1, 1W1/1U2, 1V2, 1W2		Screw-type terminals	Screw-type terminals
• Conductor cross-section	mm^2	4	10
PE connection		Screw-type terminals	Screw-type terminals
• Conductor cross-section	mm^2	4	10
Degree of protection		IP20	IP20
Dimensions			
• Width	mm	219	219
• Height	mm	176	176
• Depth	mm	120	130
Weight, approx.	kg	10.7	10.9
Approvals, according to		cURus	cURus

Overview

Line filter

In plants with strict EMC requirements, line filters work together with line reactors to restrict the conducted interference emanating from the Power Modules to the limit values of Class A1 as defined in EN 55011 and Category C2 as defined in EN 61800-3. Line filters are suited only for direct connection to TN systems.

Technical specifications

Product name	Line filter
	6SL3000-0BE21-6DA0
Rated current	36 A
Rated infeed power	10 kW, 16 kW, 20 kW
Power loss at rated operation	12 W, 15 W, 16 W
Line/load connection L1, L2, L3/U, V, W	Screw-type terminals
• Conductor cross-section	10 mm^2
PE connection	M6 screw stud
Degree of protection	IP20
Dimensions	
• Width	50 mm
• Height	429 mm
• Depth	226 mm
Weight, approx.	5 kg
Approvals, according to	cURus

Selection and ordering data

Rated power Infeed	Suitable for SINAMICS S120 Combi Power Module	**Line filter**
kW	Type	Article No.
16	6SL3111-3VE21-6FA0	**6SL3000-0BE21-6DA0**
16	6SL3111-3VE21-6EA0	
20	6SL3111-3VE22-0HA0	
10	6SL3111-4VE21-0EA0	
16	6SL3111-4VE21-6FA0	
16	6SL3111-4VE21-6EA0	
20	6SL3111-4VE22-0HA0	

Overview

The SINAMICS S120 Combi Power Module can be extended by the SINAMICS S120 Motor Modules in booksize compact format.

Benefits

- Simple addition of supplementary machine components when using the SINAMICS S120 Combi drive system
- Expansion axes can interpolate freely with the SINAMICS S120 Combi axes
- Connection of the Motor Modules by simple connection of DC link busbars and 24 V busbars
- Motor Modules are supplied via the infeed integrated in the SINAMICS S120 Combi
- Energy exchange between Motor Modules and the SINAMICS S120 Combi Power Module through a common DC link
- Simple connection to the DRIVE-CLiQ interface

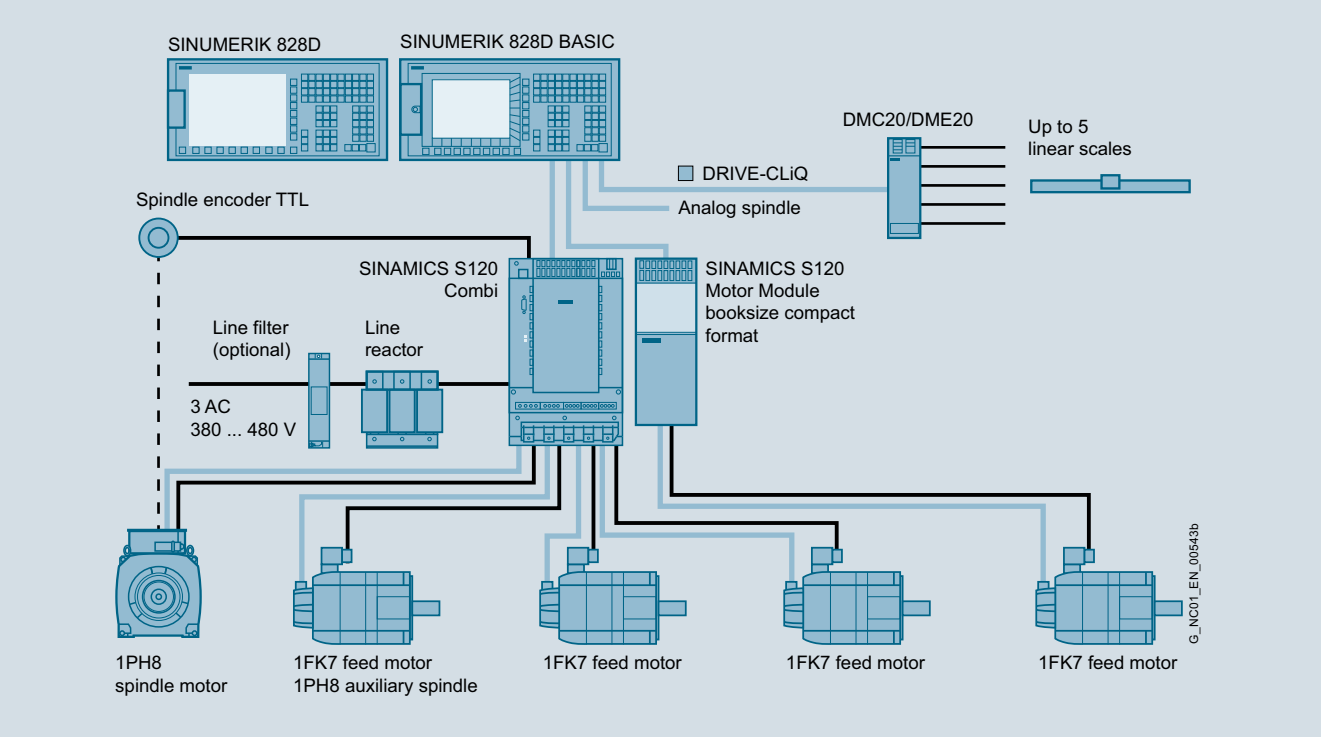
Function

- Up to 6 axes/spindles in one drive line-up[1)]
- Up to 6 motor encoders[1)]
- Up to 6 direct encoders (5 by means of DMC20 + 1 on the SINAMICS S120 Combi)[1)]
- Connection of up to two SINAMICS S120 Motor Modules in booksize compact format to the integrated line infeed of the SINAMICS S120 Combi Power Modules[2)]

Technical specifications

Product name	SINAMICS S120 booksize compact format Single Motor Module 6SL3420-1TE... Double Motor Module 6SL3420-2TE...
DC link voltage Up to 2000 m above sea level	510 ... 720 V DC (line voltage 380 ... 480 V 3 AC)
Electronics power supply	24 V DC -15 %/+20 %
Cooling method	Internal air cooling (power units with increased air cooling by built-in fans)
Ambient or coolant temperature (air) In operation for line-side components, Line Modules and Motor Modules	0 … 40 °C without derating, > 40 … 55 °C with derating
Installation altitude	Up to 1000 m above sea level without derating, > 1000 ... 4000 m above sea level with derating
Degree of protection	IP20
Approvals, according to	CE, cURus
Safety Integrated	Safety Integrity Level 2 (SIL2) acc. to IEC 61508, Performance Level d (PLd) acc. to ISO 13849-1, Control Category 3 acc. to ISO 13849-1

Integration



Configuration example

[1)] The number of axes and spindles that can be controlled in combination with SINUMERIK 828D BASIC is limited to 5.

[2)] The simultaneity factor of the axis grouping for the infeed power of the SINAMICS S120 Combi Power Modules must be observed.

4

Design

Single Motor Modules in booksize compact format

The Single Motor Modules in booksize compact format feature the following connections and interfaces as standard:

- 2 DC link connections via integrated DC link busbars
- 1 electronics power supply connection via integrated 24 V DC bars
- 3 DRIVE-CLiQ sockets
- 1 motor connection via connector
- 1 safe standstill input (Enable Pulses)
- 1 safe motor brake control
- 1 temperature sensor input (KTY84-130 or PTC)
- 2 PE/protective conductor connections

Design (continued)

The status of the Motor Modules is indicated via two multi-color LEDs.

The shield of the motor cable is routed over the connector to the motor connection.

The signal cable shield can be connected to the Motor Module by means of a shield terminal, e.g. type KLBÜ 3-8 SC by Weidmüller.

The scope of supply of the Motor Modules includes:

- DRIVE-CLiQ cable appropriate to the width of the Motor Module for connection to the adjacent Motor Module, length 0.11 m for 50 mm wide Motor Modules or length 0.16 m for 75 mm wide Motor Modules.
- 2 blanking plugs for sealing unused DRIVE-CLiQ sockets
- Jumper for connecting the 24 V DC busbar to the adjacent Motor Module
- Connector X21
- Connector X11 for motor brake connection
- Connector X1 for motor connection
- 1 set of warning labels in 30 languages
- 1 heat conducting foil

Selection and ordering data

Single Motor Modules in booksize compact format		
Rated output current	Type rating	Internal air cooling
A	kW	Article No.
DC link voltage 510 ... 720 V DC		
3	1.6	**6SL3420-1TE13-0AA1**
5	2.7	**6SL3420-1TE15-0AA1**
9	4.8	**6SL3420-1TE21-0AA1**
18	9.7	**6SL3420-1TE21-8AA1**

Technical specifications

Product name		Single Motor Modules in booksize compact format Internal air cooling			
		6SL3420-1TE13-0AA1	6SL3420-1TE15-0AA1	6SL3420-1TE21-0AA1	6SL3420-1TE21-8AA1
DC link voltage 510 ... 720 V DC					
Output current					
• Rated current I_{rated}	A	3	5	9	18
• I_{max}	A	9	15	27	54
Rated power	kW	1.6	2.7	4.8	9.7
DC link current I_d[1]	A	3.6	6	11	22
Current requirement At 24 V DC, max.	A	0.85	0.85	0.85	0.85
Power loss[2]					
• With internal air cooling in control cabinet	kW	0.07	0.1	0.1	0.18
Dimensions					
• Width	mm	50	50	50	75
• Height	mm	270	270	270	270
• Depth	mm	226	226	226	226
Weight, approx.	kg	2.7	2.7	2.7	3.4

1) Rated DC link current for dimensioning an external DC connection.

2) Power loss of Motor Module at rated power including losses of 24 V DC electronics power supply.

Design

Double Motor Modules in booksize compact format

The Double Motor Modules in booksize compact format feature the following connections and interfaces as standard:

- 2 DC link connections via integrated DC link busbars
- 2 electronics power supply connections via integrated 24 V DC bars
- 4 DRIVE-CLiQ sockets
- 2 motor connections via connector
- 2 safe standstill inputs (1 input per axis)
- 2 safe motor brake controls
- 2 temperature sensor inputs (KTY84-130 or PTC)
- 3 PE/protective conductor connections

Design (continued)

The status of the Motor Modules is indicated via two multi-color LEDs.

The shield of the motor cables is routed over the connectors to the motor connection.

The signal cable shield can be connected to the Motor Module by means of a shield terminal, e.g. type KLBÜ 3-8 SC by Weidmüller.

The scope of supply of the Motor Modules includes:

- DRIVE-CLiQ cable for connection to the adjacent Motor Module, length 0.16 m
- 2 blanking plugs for sealing unused DRIVE-CLiQ sockets
- Jumper for connecting the 24 V DC busbar to the adjacent Motor Module
- Connectors X21 and X22
- Connectors X1 and X2 for motor connection
- 1 set of warning labels in 30 languages
- 1 heat conducting foil

Selection and ordering data

Double Motor Modules in booksize compact format		
Rated output current	Type rating	Internal air cooling
A	kW	Article No.
DC link voltage 510 … 720 V DC		
2 × 1.7	2 × 0.9	**6SL3420-2TE11-7AA1**
2 × 3	2 × 1.6	**6SL3420-2TE13-0AA1**
2 × 5	2 × 2.7	**6SL3420-2TE15-0AA1**

Technical specifications

Product name		Double Motor Modules in booksize compact format Internal air cooling		
		6SL3420-2TE11-7AA1	6SL3420-2TE13-0AA1	6SL3420-2TE15-0AA1
DC link voltage 510 … 720 V DC				
Output current				
• Rated current I_{rated}	A	2 × 1.7	2 × 3	2 × 5
• I_{max}	A	2 × 5.1	2 × 9	2 × 15
Rated power	kW	2 × 0.9	2 × 1.6	2 × 2.7
DC link current I_d[1]	A	4.1	7.2	12
Power loss[2]				
• With internal air cooling in control cabinet	kW	0.11	0.13	0.19
Dimensions				
• Width	mm	75	75	75
• Height	mm	270	270	270
• Depth	mm	226	226	226
Weight, approx.	kg	3.4	3.4	3.4

[1] Rated DC link current for dimensioning an external DC connection.

[2] Power loss of Motor Module at rated power including losses of 24 V DC electronics power supply.

4

Overview

Smart Line Module

Smart Line Modules are non-regulated, line-commutated feed/feedback units (diode bridge for incoming supply; line-commutated feedback via IGBTs) with 100 % continuous regenerative feedback power. The regenerative feedback capability of the modules can be deactivated by means of a digital input (Smart Line Modules 5 kW and 10 kW) or by means of parameterization (Smart Line Modules 16 kW and 36 kW). Smart Line Modules are designed for connection to grounded, star TN, TT and non-grounded, symmetrical IT systems.

The DC link is pre-charged via integrated pre-charging resistors.

The associated line reactor is absolutely essential for operating a Smart Line Module.

Design

Smart Line Modules in booksize format feature the following connections and interfaces as standard:

- 1 power connection via screw-type terminals
- 1 connection for the 24 V DC electronics power supply via the 24 V terminal adapter included in the scope of supply
- 1 DC link connection via integrated DC link busbars
- 2 PE/protective conductor connections
- 2 digital inputs (only on 5 kW and 10 kW Smart Line Modules)
- 1 digital output (only on 5 kW and 10 kW Smart Line Modules)
- 3 DRIVE-CLiQ sockets (only on 16 kW und 36 kW on Smart Line Modules)

The status of the Smart Line Modules is indicated via two multi-color LEDs.

The signal cable shield can be connected to the Line Module by means of a shield terminal, e.g. Weidmüller type KLBÜ 3-8 SC.

Design (continued)

The scope of supply of the Smart Line Modules includes:

- DRIVE-CLiQ cable for connection to the adjacent Control Unit on the left for drive control (on 16 kW and 36 kW Smart Line Modules only)
- 2 blanking plugs for sealing unused DRIVE-CLiQ sockets (on 16 kW and 36 kW Smart Line Modules only)
- DRIVE-CLiQ cable (length depends on module width) to connect Smart Line Modules to adjacent Motor Module
- Jumper for connecting the 24 V DC busbar to the adjacent Motor Module
- 24 V terminal adapter (X24)
- Connector X21 for digital inputs/outputs
- Connector X22 for digital inputs and outputs (on 5 kW and 10 kW Smart Line Modules only)
- Connector X1 for line supply connection (on 5 kW and 10 kW Smart Line Modules only)
- 1 set of warning labels in 30 languages
- 1 heat conducting foil (for Smart Line Modules with cold plate cooling only)

Technical specifications

Product name	Smart Line Modules in booksize format 6SL313.-6....-....
Line supply voltage Up to 2000 m above sea level	380 ... 480 V 3 AC ± 10 % (-15 % < 1 min)
Line frequency	47 … 63 Hz
SCCR (**S**hort **C**ircuit **C**urrent **R**ating)	65 kA in conjunction with the recommended fuses class *J* or circuit breakers in accordance with UL489/CSA 22.2 No. 5-02 see recommended line-side components
Line power factor At rated power	
• Fundamental (cos φ_1)	> 0.96
• Total (λ)	0.65 … 0.90
Overvoltage category In accordance with EN 60664-1	Class III
DC link voltage, approx.	1.35 × line voltage[1)]
Electronics power supply	24 V DC, -15 %/+20 %
Radio interference suppression	
• Standard	No radio interference suppression
• With line filter	Category C2 according to EN 61800-3 up to 350 m total cable length (shielded)
Cooling method	Internal air cooling External air cooling, power units with increased air cooling by built-in fans Cold-plate cooling (5 kW/10 kW)
Ambient or coolant temperature (air) In operation for line-side components, Line Modules and Motor Modules	0 … 40 °C without derating, > 40 … 55 °C with derating
Installation altitude	Up to 1000 m above sea level without derating, > 1000 ... 4000 m above sea level with derating
Declarations of conformity	CE (Low Voltage and EMC Directives)
Approvals, according to	cULus

1) The DC link voltage is maintained at the mean value of the rectified line voltage.

Technical specifications (continued)

Product name		Smart Line Module in booksize format				
Internal air cooling	6SL3130-...	6AE15-0AB1	6AE21-0AB1	6TE21-6AA4	6TE23-6AA3	6TE25-5AA3
External air cooling	6SL3131-...	6AE15-0AA1	6AE21-0AA1	6TE21-6AA3	6TE23-6AA3	6TE25-5AA3
Cold plate cooling	6SL3136-...	6AE15-0AA1	6AE21-0AA1	–	–	–
Line voltage 380 … 480 V 3 AC						
Feed/feedback power						
• Rated power P_{rated} at 380 V 3 AC	kW	5	10	16	36	55
• For S6 duty P_{S6} (40 %)	kW	6.5	13	21	47	71
• P_{max}	kW	10	20	35	70	91
DC link current						
• At 540/600 V DC	A	9.3/8.3	18.5/16.6	30/27	67/60	105/92
• For S6 duty (40 %)	A	11	22	35	79	138
• Maximum	A	16.6	33.2	59	117	178
Input current						
• Rated current at 380/400/480 V 3 AC	A	8.6/8.1/6.7	17/16.2/12.8	26/25/21	58/55/46	94/90/77
• For S6 duty (40 %) at 400 V	A	10.6	21.1	33	72	106
• At 400 V max.	A	15.7	31.2	54	107	130
Current requirement 24 V DC electronics power supply, max.	A	0.8	0.9	0.95	1.5	1.9
Current carrying capacity						
• 24 V DC busbars	A	20	20	20	20	20
• DC link busbars	A	100	100	100	200	200
DC link capacitance						
• Smart Line Module	µF	220	330	710	1410	1880
• Drive line-up, max.	µF	6000	6000	20000	20000	20000
Internal/external air cooling						
• Power loss[1]						
- Internal air cooling	kW	0.08	0.14	0.19	0.405	0.665
- External air cooling int.[2]/ext./total	kW	0.04/0.04/0.08	0.065/0.075/0.14	0.065/0.125/0.19	0.115/0.29/0.405	0.185/0.48/0.665
• Cooling air requirement	m^3/s	0.008	0.008	0.016	0.031	0.044
• Sound pressure level L_{pA} (1 m)	dB	< 60	< 60	< 60	< 60	< 60
Cold plate cooling						
• Power loss[1] int.[2]/ext.	kW	0.035/0.04	0.055/0.08	–	–	–
• Thermal resistance R_{th}	K/W	0.175	0.175	–	–	–
Line connection U1, V1, W1		Screw-type terminals (X1)	Screw-type terminals (X1)	Screw-type terminals (X1)	M6 screw studs (X1)	M6 screw studs (X1)
• Conductor cross-section	mm^2	2.5 … 6	2.5 … 6	2.5 … 10	2.5 … 50	2.5 … 95
Shield connection		Cable shield connection plate integrated into the connector	Cable shield connection plate integrated into the connector	Cable shield connection plate integrated into the connector	See Accessories	See Accessories
PE connection		M5 screw	M5 screw	M5 screw	M6 screw	M6 screw
Cable length, max. Total of all motor cables and DC link						
• Shielded	m	350	350	350	350	350
• Unshielded	m	560	560	560	560	560
Degree of protection		IP20	IP20	IP20	IP20	IP20

1) Power loss of Smart Line Module at rated power including losses of 24 V DC electronics power supply.
2) Power loss of the power electronics + power loss of the 24 V electronics.

Technical specifications (continued)

Product name		Smart Line Module in booksize format				
Internal air cooling	6SL3130-...	6AE15-0AB1	6AE21-0AB1	6TE21-6AA4	6TE23-6AA3	6TE25-5AA3
External air cooling	6SL3131-...	6AE15-0AA1	6AE21-0AA1	6TE21-6AA3	6TE23-6AA3	6TE25-5AA3
Cold plate cooling	6SL3136-...	6AE15-0AA1	6AE21-0AA1	–	–	–
Line voltage 380 … 480 V 3 AC						
Dimensions						
• Width	mm	50	50	100	150	200
• Height	mm	380	380	380	380	380
• Depth						
- With internal air cooling	mm	270	270	270	270	270
- With external air cooling on/behind mounting surface	mm	226/66.5	226/66.5	226/66.5	226/71	226/92
- With cold plate cooling	mm	226	226	–	–	–
Weight, approx.						
• With internal air cooling	kg	4.7	4.8	7	10.3	17
• With external air cooling	kg	5.3	5.4	8.8	13.8	18.5
• With cold plate cooling	kg	4	4	–	–	–

Selection and ordering data

Description	Article No.
Smart Line Module in booksize format	
Internal air cooling Rated power:	
• 5 kW	**6SL3130-6AE15-0AB1**
• 10 kW	**6SL3130-6AE21-0AB1**
• 16 kW	**6SL3130-6TE21-6AA4**
• 36 kW	**6SL3130-6TE23-6AA3**
• 55 kW	**6SL3130-6TE25-5AA3**
External air cooling Rated power:	
• 5 kW	**6SL3131-6AE15-0AA1**
• 10 kW	**6SL3131-6AE21-0AA1**
• 16 kW	**6SL3131-6TE21-6AA3**
• 36 kW	**6SL3131-6TE23-6AA3**
• 55 kW	**6SL3131-6TE25-5AA3**
Cold plate cooling Rated power:	
• 5 kW	**6SL3136-6AE15-0AA1**
• 10 kW	**6SL3136-6AE21-0AA1**

Description	Article No.
Accessories	
Shield connection kit For Line Modules and Motor Modules in booksize format with a width of 150 mm	**6SL3162-1AF00-0AA1**
DC link rectifier adapter For direct infeed of DC link voltage	
• Screw-type terminals 0.5 ... 10 mm^2 For Line Modules and Motor Modules in booksize format with a width of 50 mm or 100 mm	**6SL3162-2BD00-0AA0**
• Screw-type terminals 35 ... 95 mm^2 For Line Modules and Motor Modules in booksize format with a width of 150 mm, 200 mm and 300 mm	**6SL3162-2BM00-0AA0**
DC link adapter (2 units) For multi-tier configuration Screw-type terminals 35 … 95 mm^2 For all Line Modules and Motor Modules in booksize format	**6SL3162-2BM01-0AA0**
24 V terminal adapter For all Line Modules and Motor Modules in booksize format	**6SL3162-2AA00-0AA0**
Warning labels in 30 languages This set of foreign language warning labels can be placed on top of the standard German or English signs. A set of labels is supplied with the units. One sign in each of the following languages is provided in each set: BG, CN, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, JP, KR, LT, LV, MT, NL, NO, PL, PT, RO, RU, SE, SI, SK, TR	**6SL3166-3AB00-0AA0**
Accessories for re-ordering	
Accessories pack (plug-in terminals, DRIVE-CLiQ jumper, dust-proof blanking plugs) For DRIVE-CLiQ port	
• For modules with a width of 50 mm/100 mm	**6SL3163-8KB00-0AA0**
• For modules with a width of 100 mm	**6SL3163-8FD00-0AA0**
• For modules with a width of 150 mm	**6SL3163-8GF00-0AA0**
SINAMICS/SINUMERIK/SIMOTION dust-proof blanking plugs (50 units) For DRIVE-CLiQ port	**6SL3066-4CA00-0AA0**
24 V jumper For connection of the 24 V busbars (for booksize format)	**6SL3162-2AA01-0AA0**

If you require assistance, please contact your Siemens representative.

4

Overview

Line reactor

Smart Line Modules are not warranted to operate without the specified line reactors. The use of other makes of line reactor can lead to malfunctions or irreparable damage to equipment.

Selection and ordering data

Rated power of the Smart Line Module kW	Suitable for Smart Line Module in booksize format	**Line reactor** Article No.
5	6SL3130-6AE15-0AB1 6SL3131-6AE15-0AA1 6SL3136-6AE15-0AA1	**6SL3000-0CE15-0AA0**
10	6SL3130-6AE21-0AB1 6SL3131-6AE21-0AA1 6SL3136-6AE21-0AA1	**6SL3000-0CE21-0AA0**
16	6SL3130-6TE21-6AA4 6SL3131-6TE21-6AA3	**6SL3000-0CE21-6AA0**
36	6SL3130-6TE23-6AA3 6SL3131-6TE23-6AA3	**6SL3000-0CE23-6AA0**
55	6SL3130-6TE25-5AA3 6SL3131-6TE25-5AA3	**6SL3000-0CE25-5AA0**

Technical specifications

Product name	Line reactors					
	6SL3000-...	0CE15-0AA0	0CE21-0AA0	0CE21-6AA0	0CE23-6AA0	0CE25-5AA0
Line supply voltage 380 … 480 V 3 AC						
Rated current	A	14	28	35	69	103
Power loss	W	62	116	110	170	190
Line/load connection 1U1, 1V1, 1W1/ 1U2, 1V2, 1W2		Screw-type terminals	Screw-type terminals	Screw-type terminals	Screw-type terminals	Screw-type terminals
• Conductor cross-section	mm^2	4	10	10	16	70
PE connection		Screw-type terminals	Screw-type terminals	M5 screw studs according to DIN 46234	M6 screw studs according to DIN 46234	M8 screw studs according to DIN 46234
• Conductor cross-section	mm^2	4	10	–	–	–
Degree of protection		IP20	IP20	IP20	IP20	IP20
Dimensions						
• Width	mm	150	177	219	228	270
• Height	mm	175	196	180	235	275
• Depth	mm	70	110	144	224	290
Weight, approx.	kg	3.7	7.5	9.5	17	36
Approvals, according to		cURus	cURus	cURus	cURus	cURus
Suitable for Smart Line Module in booksize format	Type	6SL3130-6AE15-0AB1 6SL3131-6AE15-0AA1 6SL3136-6AE15-0AA1	6SL3130-6AE21-0AB1 6SL3131-6AE21-0AA1 6SL3136-6AE21-0AA1	6SL3130-6TE21-6AA4 6SL3131-6TE21-6AA3	6SL3130-6TE23-6AA3 6SL3131-6TE23-6AA3	6SL3130-6TE25-5AA3 6SL3131-6TE25-5AA3
• Rated power of the Smart Line Module	kW	5	10	16	36	55

Overview

Line filter

In plants with strict EMC requirements, line filters work together with line reactors to restrict the conducted interference emanating from the Power Modules to the limit values of Class A1 as defined in EN 55011 and Category C2 as defined in EN 61800-3. Line filters are suited only for direct connection to TN-systems.

Selection and ordering data

Rated power of the Smart Line Module kW	Suitable for Smart Line Module in booksize format	**Line filter** Article No.
5	6SL3130-6AE15-0AB1 6SL3131-6AE15-0AA1 6SL3136-6AE15-0AA1	**6SL3000-0HE15-0AA0**
10	6SL3130-6AE21-0AB1 6SL3131-6AE21-0AA1 6SL3136-6AE21-6AA1	**6SL3000-0HE21-0AA0**
16	6SL3130-6TE21-6AA4 6SL3131-6TE21-6AA3	**6SL3000-0BE21-6DA0**
36	6SL3130-6TE23-6AA3 6SL3131-6TE23-6AA3	**6SL3000-0BE23-6DA1**
55	6SL3130-6TE25-5AA3 6SL3131-6TE25-5AA3	**6SL3000-0BE25-5DA0**

Technical specifications

Product name	Line filter					
	6SL3000-...	0HE15-0AA0	0HE21-0AA0	0BE21-6DA0	0BE23-6DA1	0BE25-5DA0
Line supply voltage 380 … 480 V 3 AC						
Rated current	A	12	25	36	74	105
Power loss	W	20	20	16	26	43
Line/load connection L1, L2, L3 / U, V, W		Screw-type terminals	Screw-type terminals	Screw-type terminals	Screw-type terminals	Screw-type terminals
• Conductor cross-section	mm^2	10	10	10	35	50
PE connection		M6 screw studs according to DIN 46234	M6 screw studs according to DIN 46234	M6 screw studs according to DIN 46234	M6 screw studs according to DIN 46234	M6 screw studs according to DIN 46234
Degree of protection		IP20	IP20	IP20	IP20	IP20
Dimensions						
• Width	mm	60	60	50	75	100
• Height	mm	285	285	420	433	466
• Depth	mm	122	122	226	226	226
Weight, approx.	kg	2.1	2.3	5.0	7.5	11.5
Approvals, according to		cURus	cURus	cURus	cURus	cURus
Suitable for Smart Line Module in booksize format	Type	6SL3130-6AE15-0AB1 6SL3131-6AE15-0AA1 6SL3136-6AE15-0AA1	6SL3130-6AE21-0AB1 6SL3131-6AE21-0AA1 6SL3136-6AE21-6AA1	6SL3130-6TE21-6AA4 6SL3131-6TE21-6AA3	6SL3130-6TE23-6AA3 6SL3131-6TE23-6AA3	6SL3130-6TE25-5AA3 6SL3131-6TE25-5AA3
• Rated infeed power of the Smart Line Module	kW	5	10	16	36	55

Overview

Suitable line-side power components are assigned depending on the power rating of the Smart Line Module.

The tables below list recommended components.

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

Assignment of line-side power components to Smart Line Modules in booksize format

Rated power	Suitable for Smart Line Module in booksize format	Line contactor	Circuit breaker IEC 60947	Circuit breaker UL489/CSA C22.2 No. 5-02	Main switch
kW		Type	Article No./type	Type	Article No.
5	6SL3130-6AE15-0AB1 6SL3131-6AE15-0AA1 6SL3136-6AE15-0AA1	3RT1023-...	**3RV1031-4BA10**	3VL1102-2KM30-....	**3LD2003-0TK51**
10	6SL3130-6AE21-0AB1 6SL3131-6AE21-0AA1 6SL3136-6AE21-0AA1	3RT1026-...	**3RV1031-4FA10**	3VL1135-2KM30-....	**3LD2203-0TK51**
16	6SL3130-6TE21-6AA4 6SL3131-6TE21-6AA3	3RT1035-...	**3RV1031-4FA10**	3VL2105-2KN30-....	**3LD2504-0TK51**
36	6SL3130-6TE23-6AA3 6SL3131-6TE23-6AA3	3RT1045-...	**3RV1041-4LA10**	3VL2108-2KN30-....	**3LD2704-0TK51**
55	6SL3130-6TE25-5AA3 6SL3131-6TE25-5AA3	3RT1054-...	3VL2712-1DC33-....	3VL2112-2KW30-....	**3KA5330-1GE01**

Rated power	Suitable for Smart Line Module in booksize format	Fuse switch disconnector	Switch disconnector with fuse holders	LV HRC fuse (gL/gG)			UL/CSA fuse, Class J Available from: Mersen www.ep.mersen.com		
kW		Article No.	Article No.	Rated current	Size	Article No.	Rated current	Size mm	Reference No.
5	6SL3130-6AE15-0AB1 6SL3131-6AE15-0AA1 6SL3136-6AE15-0AA1	**3NP1123-1CA20**	**3KL5030-1GB01**	16 A	000	**3NA3805**	17.5 A	21 × 57	AJT17-1/2
10	6SL3130-6AE21-0AB1 6SL3131-6AE21-0AA1 6SL3136-6AE21-0AA1	**3NP1123-1CA20**	**3KL5030-1GB01**	35 A	000	**3NA3814**	35 A	27 × 60	AJT35
16	6SL3130-6TE21-6AA4 6SL3131-6TE21-6AA3	**3NP1123-1CA20**	**3KL5030-1GB01**	35 A	000	**3NA3814**	35 A	27 × 60	AJT35
36	6SL3130-6TE23-6AA3 6SL3131-6TE23-6AA3	**3NP1123-1CA20**	**3KL5230-1GB01**	80 A	000	**3NA3824**	80 A	27 × 117	AJT80
55	6SL3130-6TE25-5AA3 6SL3131-6TE25-5AA3	**3NP1143-1DA20**	**3KL5530-1GB01**	125 A	000	**3NA3132**	125 A	41 × 146	AJT125

Overview

Active Line Module

Active Line Modules are self-commutated feed/feedback units (with IGBTs in infeed and regenerative feedback directions) and generate a regulated DC link voltage. This means that the connected Motor Modules are decoupled from the line voltage. Line voltage fluctuations within the permissible supply tolerances have no effect on the motor voltage. Active Line Modules are designed for connection to grounded, star (TN, TT) and non-grounded, symmetrical IT systems.

The DC link is pre-charged via integrated pre-charging resistors.

In order to operate an Active Line Module, it is absolutely essential to use the appropriate Active Interface Module.

Design

The Active Line Modules in booksize format feature the following connections and interfaces as standard:

- 1 power connection via screw-type terminals
- 1 connection for the 24 V DC electronics power supply via the 24 V terminal adapter included in the scope of supply
- 1 DC link connection via integrated DC link busbars
- 3 DRIVE-CLiQ sockets
- 2 PE/protective conductor connections

The status of the Active Line Modules is indicated via two multi-color LEDs.

On the 100 mm wide Active Line Module, the shield for the power supply cable can be connected to the integrated shield connection plate via a terminal element or tube clip, e.g. Weidmüller type KLBÜ CO 4. The terminal element must not be used for strain relief. Shield connection plates are available for the 150 mm, 200 mm and 300 mm wide modules.

The signal cable shield can be connected to the Line Module by means of a shield terminal, e.g. Weidmüller type KLBÜ 3-8 SC.

The scope of supply of the Active Line Modules includes:

- DRIVE-CLiQ cable for connection to the adjacent Control Unit on the left for drive control, length 0.11 m
- DRIVE-CLiQ cable (length depends on module width) to connect Active Line Module to adjacent Motor Module, length = width of Active Line Module + 0.11 m
- 2 blanking plugs for sealing unused DRIVE-CLiQ sockets
- Jumper for connecting the 24 V DC busbar to the adjacent Motor Module
- 24 V terminal adapter (X24)
- Connector X21 for digital inputs
- Fan insert for Active Line Modules of 80 kW and 120 kW (the voltage is supplied by the Active Line Module)
- 1 set of warning labels in 30 languages
- 1 heat conducting foil (for Active Line Modules with cold plate cooling only)

Integration

The Active Line Module receives its control information via DRIVE-CLiQ from:

- SINUMERIK 828D BASIC
- SINUMERIK 828D
  - Numeric Control Extensions NX10.3

Technical specifications

Product name	Active Line Modules in booksize format
	6SL313 . -7TE...
Line supply voltage Up to 2000 m above sea level	380 ... 480 V 3 AC ± 10 % (-15 % < 1 min)
SCCR (**S**hort **C**ircuit **C**urrent **R**ating)	65 kA in conjunction with the recommended fuses class *J* or circuit breakers in accordance with UL489/ CSA 22.2 No. 5-02 see recommended line-side components
Line frequency	47 … 63 Hz
Line power factor	
• Active Mode	
- Fundamental (cos φ_1)	1.0 (factory setting), can be altered by input of a reactive current setpoint
- Total (λ)	1.0 (factory setting)
• Smart Mode	
- Fundamental (cos φ_1)	> 0.96
- Total	0.65 … 0.90
Efficiency	98 %
Overvoltage category In accordance with EN 60664-1	Class III
DC link voltage V_d	In Active Mode, the DC link voltage is regulated and can be adjusted as a voltage decoupled from the line voltage. In Smart Mode, the DC link voltage is regulated in proportion to the line voltage to the mean rectified line voltage value. Factory setting for DC link voltage: 380 … 400 V 3 AC: 600 V (Active Mode) 400 … 415 V 3 AC: 625 V (Active Mode) 416 … 480 V 3 AC: 1.35 × line voltage (Smart Mode)
Electronics power supply	24 V DC, -15 %/+20 %

Product name	Active Line Modules in booksize format
	6SL313 . -7TE...
Radio interference suppression	
• Standard combination, consisting of: Active Line Module + Active Interface Module	Category C3 to EN 61800-3 up to 350 m total cable length
• Extended combination, consisting of: Active Line Module + Active Interface Module + Basic Line Filter	Category C2 according to EN 61800-3 up to 350 m total cable length Category C3 according to EN 61800-3 from 350 m to 1000 m total cable length
• Alternative combination, consisting of: Active Line Module + HFD line reactor	No radio interference suppression
• Extended alternative combination, consisting of: Active Line Module + HFD line filter package (including Wideband Line Filter)	Category C2 to EN 61800-3
Cooling method	Internal air cooling (power units with increased air cooling by built-in fans) External air cooling (power units with increased air cooling by built-in fans) Cold plate cooling Liquid cooling
Ambient or coolant temperature (air) In operation for line-side components, Line Modules and Motor Modules	0 … 40 °C without derating, > 40 … 55 °C with derating
Installation altitude	Up to 1000 m above sea level without derating, > 1000 ... 4000 m above sea level with derating
Declarations of conformity	CE (Low Voltage and EMC Directives)
Approvals, according to	cULus

Technical specifications (continued)

Product name	Active Line Module in booksize format					
Internal air cooling	6SL3130-...	7TE21-6AA4	7TE23-6AA3	7TE25-5AA3	7TE28-0AA3	7TE31-2AA3
External air cooling	6SL3131-...	7TE21-6AA3	7TE23-6AA3	7TE25-5AA3	7TE28-0AA3	7TE31-2AA3
Cold plate cooling	6SL3136-...	7TE21-6AA3	7TE23-6AA3	7TE25-5AA3	7TE28-0AA3	7TE31-2AA3
Liquid cooling	6SL3135-...	–	–	–	–	7TE31-2AA3
Line supply voltage 380 … 480 V 3 AC						
Feed/feedback power						
• Rated power P_{rated} at 380 V 3 AC	kW	16	36	55	80 (64[1)])	120 (84[1)])
• For S6 duty P_{S6} (40 %)	kW	21	47	71	106	145
• P_{max}	kW	35	70	91 (110[2)])	131	175
DC link current						
• At 600 V DC	A	27	60	92	134	200
• For S6 duty (40 %)	A	35	79	121	176	244
• Maximum	A	59	117	152 (176[2)])	218	292
Input current						
• Rated current at 380/400/480 V 3 AC	A	26/25/21	58/55/46	88/84/70	128/122/102	192/182/152
• For S6 duty (40 %) at 400 V	A	32	71	108	161	220
• At 400 V max.	A	54	107	139 (168[2)])	200	267
Current requirement 24 V DC electronics power supply, max.	A	1.1	1.5	1.9	2.0	2.5 (2.1[3)])
Current carrying capacity						
• 24 V DC busbars	A	20	20	20	20	20
• DC link busbars	A	100	200	200	200	200
DC link capacitance						
• Active Line Module	µF	710	1410	1880	2820	3995
• Drive line-up, max.	µF	20000	20000	20000	20000	20000
Internal/external air cooling						
• Power loss[4)]						
- Total power loss for cooling methods: internal air cooling, external air cooling; cold plate cooling, liquid cooling	kW	0.29	0.67	0.95	1.39	2.26
- With external air cooling, int./ext.	kW	0.09/0.2	0.17/0.5	0.25/0.7	0.3/1.0	0.55/1.71
• Cooling air requirement	m^3/s	0.016	0.031	0.044	0.144	0.144
• Sound pressure level L_{pA} (1 m)	dB	< 60	< 65	< 60	< 75	< 75
Cold plate cooling						
• Power loss, int./ext.[4)]	kW	0.07/0.21	0.13/0.52	0.19/0.74	0.3/1.1	0.46/1.8
• Thermal resistance R_{th}	K/W	0.075	0.055	0.05	0.028	0.028

1) In the case of cold plate cooling, derating is necessary due to heat transfer to the external heatsink.

2) Higher peak power is possible in combination with the Active Interface Module 6SL3100-0BE25-5AB0 (for operating cycle constraints, see SINAMICS S120 Manual).

3) For 6SL3135-7TE31-2AA3

4) Power loss of Active Line Module at rated power including losses of 24 V DC electronics power supply.

Technical specifications (continued)

Product name	Active Line Module in booksize format					
Internal air cooling	6SL3130-...	7TE21-6AA4	7TE23-6AA3	7TE25-5AA3	7TE28-0AA3	7TE31-2AA3
External air cooling	6SL3131-...	7TE21-6AA3	7TE23-6AA3	7TE25-5AA3	7TE28-0AA3	7TE31-2AA3
Cold plate cooling	6SL3136-...	7TE21-6AA3	7TE23-6AA3	7TE25-5AA3	7TE28-0AA3	7TE31-2AA3
Liquid cooling	6SL3135-...	–	–	–	–	7TE31-2AA3
Line supply voltage 380 … 480 V 3 AC						
Feed/feedback power						
• Rated power P_{rated} at 380 V 3 AC	kW	16	36	55	80 (64[1)])	120 (84[1)])
Liquid cooling[2)]						
• Power loss, int./ext.[3)]	kW	–	–	–	–	0.46/1.8
- Rated volumetric flow for water at 70 kPa pressure drop[4)]	l/min	–	–	–	–	8
- Volume of liquid, internal	ml	–	–	–	–	100
- Coolant temperature, max.						
- Without derating	°C	–	–	–	–	45
- With derating	°C	–	–	–	–	50
- Sound pressure level L_{pA} (1 m)	dB	–	–	–	–	< 73
Line connection U1, V1, W1		Screw-type terminals (X1)	M6 screw studs (X1)	M8 screw studs (X1)	M8 screw studs (X1)	M8 screw studs (X1)
• Conductor cross-section, max.	mm^2	2.5 … 10	2.5 … 50	2.5 … 95, 2 × 35	2.5 … 120, 2 × 50	2.5 … 120, 2 × 50
Shield connection		Integrated in the connector	See Accessories	See Accessories	See Accessories	See Accessories
PE connection		M5 screw	M6 screw	M6 screw	M8 screw	M8 screw
Cable length, max. Total of all motor cables and DC link						
• Shielded	m	630[5)]	630[5)]	1000	1000	1000
Degree of protection		IP20	IP20	IP20	IP20	IP20
Dimensions						
• Width	mm	100	150	200	300	300
• Height	mm	380	380	380	380	380
- With fan[6)]	mm	–	–	–	629	629
- With screwed fitting	mm	–	–	–	629	553[2)]
• Depth						
- With internal air cooling	mm	270	270	270	270	270
- With external air cooling on/behind mounting surface	mm	226/66.5	226/71	226/92	226/82	226/82
- With cold plate cooling	mm	226	226	226	226	226
- With liquid cooling	mm	–	–	–	–	226
Weight, approx.						
• With internal air cooling	kg	7	10.3	17	23	23
• With external air cooling	kg	8.8	13.8	18.5	27.7	30.7
• With cold plate cooling	kg	6.1	10.2	13.8	20.3	20.4
• With liquid cooling	kg	–	–	–	–	23

1) In the case of cold plate cooling, derating is necessary due to heat transfer to the external heatsink.

2) The coolant connections are located on the lower side of the components. All connection elements can be accessed using an appropriate tool. Thread type of water connections: Pipe thread ISO 228 G ½ B.

3) Power loss of Active Line Module at rated power including losses of 24 V DC electronics power supply.

4) This value applies to water as coolant; for other coolants, refer to the SINAMICS S120 Manual.

5) Max. cable lengths in conjunction with Active Interface Module and Basic Line Filter (Category C3 in accordance with EN 61800-3).

6) The fan is supplied with the Active Line Module and must be installed before the Active Line Module is commissioned.

Selection and ordering data

Description	Article No.
Active Line Module in booksize format	
Internal air cooling Rated power:	
• 16 kW	**6SL3130-7TE21-6AA4**
• 36 kW	**6SL3130-7TE23-6AA3**
• 55 kW	**6SL3130-7TE25-5AA3**
• 80 kW	**6SL3130-7TE28-0AA3**
• 120 kW	**6SL3130-7TE31-2AA3**
External air cooling Rated power:	
• 16 kW	**6SL3131-7TE21-6AA3**
• 36 kW	**6SL3131-7TE23-6AA3**
• 55 kW	**6SL3131-7TE25-5AA3**
• 80 kW	**6SL3131-7TE28-0AA3**
• 120 kW	**6SL3131-7TE31-2AA3**
Cold plate cooling Rated power:	
• 16 kW	**6SL3136-7TE21-6AA3**
• 36 kW	**6SL3136-7TE23-6AA3**
• 55 kW	**6SL3136-7TE25-5AA3**
• 80 kW	**6SL3136-7TE28-0AA3**
• 120 kW	**6SL3136-7TE31-2AA3**
Liquid cooling Rated power:	
• 120 kW	**6SL3135-7TE31-2AA3**
Accessories for re-ordering	
Accessories pack (plug-in terminals, DRIVE-CLiQ jumper, dust-proof blanking plugs) For DRIVE-CLiQ port	
• For Active Line Modules with a width of 100 mm, int./ext. air cooling	**6SL3163-8FD00-0AA0**
• For Active Line Modules with a width of 150 mm, int./ext. air cooling	**6SL3163-8GF00-0AA0**
• For Active Line Modules with a width of 200 mm, int./ext. air cooling	**6SL3163-8HH00-0AA0**
• For Active Line Modules with a width of 300 mm, int./ext. air cooling	**6SL3163-8JM00-0AA0**
SINAMICS/SINUMERIK/SIMOTION dust-proof blanking plugs (50 units) For DRIVE-CLiQ port	**6SL3066-4CA00-0AA0**

Description	Article No.
Accessories	
Shield connection plate For Line Modules and Motor Modules in booksize format	
• 150 mm wide for internal air cooling	**6SL3162-1AF00-0AA1**
• 150 mm wide for external air cooling and cold plate cooling	**6SL3162-1AF00-0BA1**
• 200 mm wide for internal air cooling	**6SL3162-1AH01-0AA0**
• 200 mm wide for external air cooling and cold plate cooling	**6SL3162-1AH01-0BA0**
• 300 mm wide for all cooling types	**6SL3162-1AH00-0AA0**
DC link rectifier adapter For direct infeed of DC link voltage	
• Screw-type terminals 0.5 ... 10 mm^2 For Line Modules and Motor Modules in booksize format with a width of 50 mm or 100 mm	**6SL3162-2BD00-0AA0**
• Screw-type terminals 35 ... 95 mm^2 For Line Modules and Motor Modules in booksize format with a width of 150 mm, 200 mm and 300 mm	**6SL3162-2BM00-0AA0**
DC link adapter (2 units) For multi-tier configuration Screw-type terminals 35 … 95 mm^2 For all Line Modules and Motor Modules in booksize format	**6SL3162-2BM01-0AA0**
24 V terminal adapter For all Line Modules and Motor Modules in booksize format	**6SL3162-2AA00-0AA0**
24 V jumper For connection of the 24 V busbars (for booksize format)	**6SL3162-2AA01-0AA0**
Warning labels in 30 languages This set of foreign language warning labels can be placed on top of the standard German or English signs. A set of labels is supplied with the units. One sign in each of the following languages is provided in each set: BG, CN, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, JP, KR, LT, LV, MT, NL, NO, PL, PT, RO, RU, SE, SI, SK, TR	**6SL3166-3AB00-0AA0**

4

Overview

Active Interface Modules for 16 kW, 36 kW, 55 kW and 80 kW/120 kW

The Active Interface Modules combine with the Active Line Modules to form a functional unit and are essential for operation of the associated Active Line Module. The Active Interface Modules contain a Clean Power Filter and basic interference suppression to ensure compliance with Category C3 in accordance with EN 61800-3 regarding emitted interference.

The Clean Power Filter protects the line supply connection from switching-frequency harmonics. The drive system therefore draws a sinusoidal current from the supply and causes almost no harmonics.

The Active Line Modules in combination with the Active Interface Module can also be operated with supply systems with an isolated star point (IT systems).

Design

The scope of supply of the Active Interface Modules includes:

- Connector X21 for temperature evaluation and fan control
- Connector X24 for connecting the 24 V supply for the integrated fan
- DRIVE-CLiQ cable for connecting the Control Unit to the Active Line Module; length of the DRIVE-CLiQ cable = width of the Active Interface Module + 0.11 m
- Shield connection plate for Active Interface Module 16 kW
- 1 set of warning labels in 30 languages

Selection and ordering data

Rated power of the Active Line Module kW	Suitable for Active Line Module in booksize format	**Active Interface Module** Article No.
16	6SL3130-7TE21-6AA3 6SL3131-7TE21-6AA3 6SL3136-7TE21-6AA3	**6SL3100-0BE21-6AB0**
36	6SL3130-7TE23-6AA3 6SL3131-7TE23-6AA3 6SL3136-7TE23-6AA3	**6SL3100-0BE23-6AB0**
55	6SL3130-7TE25-5AA3 6SL3131-7TE25-5AA3 6SL3136-7TE25-5AA3	**6SL3100-0BE25-5AB0**
80	6SL3130-7TE28-0AA3 6SL3131-7TE28-0AA3 6SL3136-7TE28-0AA3	**6SL3100-0BE28-0AB0**
120	6SL3130-7TE31-2AA3 6SL3131-7TE31-2AA3 6SL3136-7TE31-2AA3 6SL3135-7TE31-2AA3	**6SL3100-0BE31-2AB0**

Description	Article No.
Accessories	
Shield connection plate[1)] For Active Interface Module	
• 36 kW	**6SL3163-1AF00-0AA0**
• 55 kW	**6SL3163-1AH00-0AA0**
• 80 kW and 120 kW	**6SL3163-1AM00-0AA0**
DRIVE-CLiQ cable, pre-assembled Degree of protection of connector IP20/IP20 For Active Interface Module	
• 16 kW, length 0.31 m	**6SL3060-4AK00-0AA0**
• 36 kW, length 0.41 m	**6SL3060-4AP00-0AA0**
• 55 kW, length 0.6 m	**6SL3060-4AU00-0AA0**
• 80 kW and 120 kW, length 0.95 m	**6SL3060-4AA10-0AA0**
Warning labels in 30 languages This set of foreign language warning labels can be placed on top of the standard German or English signs. A set of labels is supplied with the units. One sign in each of the following languages is provided in each set: BG, CN, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, JP, KR, LT, LV, MT, NL, NO, PL, PT, RO, RU, SE, SI, SK, TR	**6SL3166-3AB00-0AA0**
Accessories for re-ordering	
Accessories pack (plug-in terminals, DRIVE-CLiQ jumper) For Active Interface Module	
• 16 kW	**6SL3160-8CD10-0AA0**
• 36 kW	**6SL3160-8DF10-0AA0**
• 55 kW	**6SL3160-8EH10-0AA0**
• 80 kW and 120 kW	**6SL3160-8FM10-0AA0**

1) For Active Interface Module 16 kW, included in scope of supply.

Integration

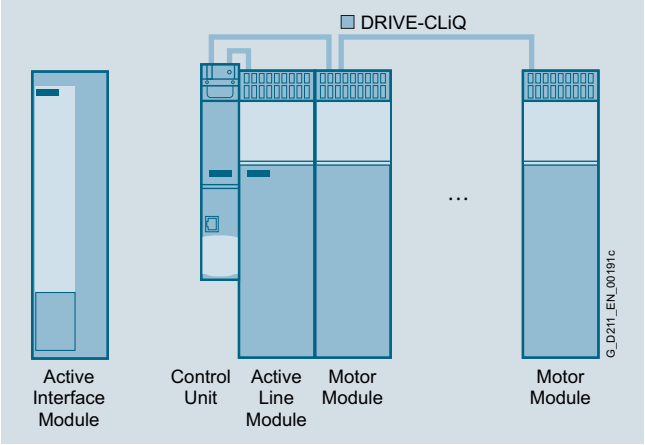
The Active Interface Module requires a 24 V DC supply for operation of the integral fan.

The fan rotates after the 24 V DC supply is applied and can, if necessary (service life, noise), be shut off from the Control Unit over the "Fan off" input. It is only permitted to switch off the fan when the infeed of the drive system is not operating, otherwise the Active Interface Module will overheat.

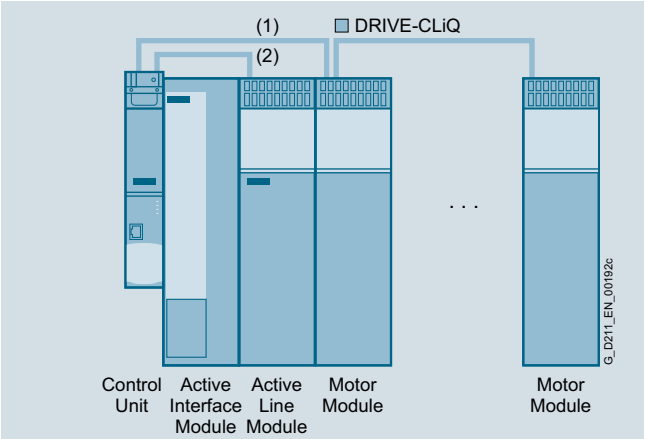
The thermostatic switch installed in the Active Interface Module is evaluated over the connected Active Line Module.

The power cables between the Active Interface Module and Active Line Module must be shielded if limit values for interference suppression are to be complied with. The cable shield can be routed over the shield connection set (option) to the Active Interface Module or Active Line Module.

Depending on the position of the Active Interface Module in the drive system, additional DRIVE-CLiQ cables may be required. If it is separately installed next to the left side of the Control Unit and Active Line Module, no additional DRIVE-CLiQ cables are required. If the Active Interface Module is placed between the Control Unit and Active Line Module, the DRIVE-CLiQ cables supplied with the Active Line Modules are suitable for setting up a line topology, i.e. Active Line Module and all Motor Modules in series on one DRIVE-CLiQ line. If the Active Line Module is connected over a separate DRIVE-CLiQ line, the DRIVE-CLiQ cable marked with (1) must be ordered. A DRIVE-CLiQ cable suitable for connection (2) is included in the scope of supply of the Active Line Module. For DRIVE-CLiQ cables for different configurations, see MOTION-CONNECT connection systems.



Separate Active Interface Module



(1) DRIVE-CLiQ cable between Control Unit and Motor Module
Active Interface Module 16 kW: 0.31 m (see Accessories)
Active Interface Module 36 kW: 0.41 m (see Accessories)
Active Interface Module 55 kW: 0.60 m (see Accessories)
Active Interface Module 80 kW and 120 kW: 0.95 m (see Accessories)
(2) Included in scope of supply of Active Line Modules

Active Interface Module integrated in the drive line-up

Technical specifications

Product name	Active Interface Module					
Internal air cooling	6SL3100-...	0BE21-6AB0	0BE23-6AB0	0BE25-5AB0	0BE28-0AB0	0BE31-2AB0
Line supply voltage 380 … 480 V 3 AC						
Rated current	A	27	60	88	132	200
Current requirement 24 V DC electronics power supply, max.	A	0.25	0.5	0.6	1.2	1.2
Internal resistance Digital input "Fan off" (X21/Pin 4)	Ω	1440 ±10 %	1440 ±10 %	1440 ±10 %	1440 ±10 %	1440 ±10 %
Power loss	kW	0.3	0.39	0.45	0.575	0.8
Cooling air requirement	m^3/s	0.03	0.04	0.075	0.15	0.15
Sound pressure level L_{pA} (1 m)	dB	57	60	66	68	68
Line/load connection L1, L2, L3/U2, V2, W2		Screw-type terminals	Screw-type terminals	M8 screw stud	M8 screw stud	M8 screw stud
• Conductor cross-section	mm^2	16	50	2.5 … 95 or 2 × 35	2.5 … 120 or 2 × 50	2.5 … 120 or 2 × 50
Thermostatic switch (NC contact)						
• Switching capacity		250 V AC/1.6 A 60 V DC/0.75 A	250 V AC/1.6 A 60 V DC/0.75 A	250 V AC/1.6 A 60 V DC/0.75 A	250 V AC/1.6 A 60 V DC/0.75 A	250 V AC/1.6 A 60 V DC/0.75 A
PE connection		M5 screw	M5 screw	M6 screw	M8 screw	M8 screw
Degree of protection		IP20	IP20	IP20	IP20	IP20
Dimensions						
• Width	mm	100	150	200	300	300
• Height	mm	380	380	380	380	380
• Depth	mm	270	270	270	270	270
Weight, approx.	kg	11	18.5	21	29	36
Approvals, according to		cURus	cURus	cURus	cURus	cURus
Suitable for Active Line Module in booksize format	Type	6SL3130-7TE21-6AA4 6SL3131-7TE21-6AA3 6SL3136-7TE21-6AA3	6SL3130-7TE23-6AA3 6SL3131-7TE23-6AA3 6SL3136-7TE23-6AA3	6SL3130-7TE25-5AA3 6SL3131-7TE25-5AA3 6SL3136-7TE25-5AA3	6SL3130-7TE28-0AA3 6SL3131-7TE28-0AA3 6SL3136-7TE28-0AA3	6SL3130-7TE31-2AA3 6SL3131-7TE31-2AA3 6SL3136-7TE31-2AA3 6SL3135-7TE31-2AA3
Rated power of the Active Line Module	kW	16	36	55	80	120

Overview

Basic Line Filter and line filter

In plants with strict EMC requirements, line filters work together with Active Interface Modules to restrict the conducted interference emanating from the power modules to the limit values of Category C2 as defined in EN 61800-3. Line filters are suited only for direct connection to TN systems.

Note:

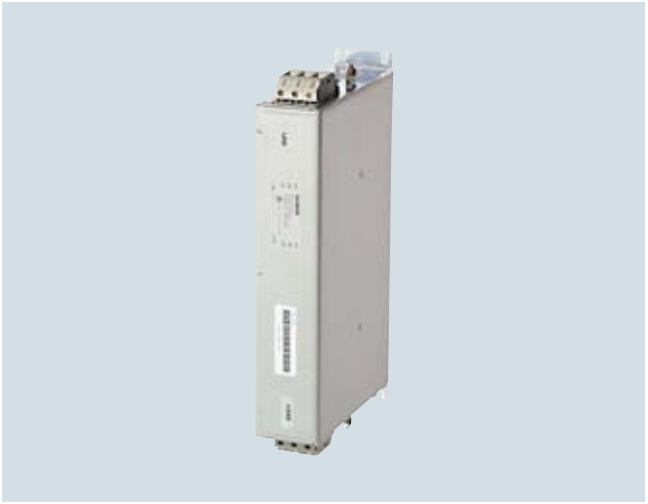
According to product standard IEC 61800-3, RFI suppression commensurate with the relevant rated conditions must be provided and is a legal requirement in the EU (EMC Directive). Line filters and line reactors are required for this purpose. The use of line filters of other makes can lead to limit value violations, resonance, overvoltages and irreparable damage to motors or other equipment. The machine manufacturer must provide verification that the machinery to be operated with the drive products and the installed suppression elements, e.g. line filters, are CE-EMC-compliant.

Optional Basic Line Filters that are coordinated with the power ranges in booksize format are available for the SINAMICS S120 drive system.

With the Basic Line Filters in combination with the Active Interface Modules, the limits for the interference voltages can be extended to Category C2 (IEC 61800-3) or, retaining Category C3, longer total cable lengths are possible for the configuration.

4

Overview



Basic Line Filter

Basic Line Filters are used on machines on which conducted interference emissions in the frequency range between 150 kHz and 30 MHz need to be damped in accordance with the requirements of CE-EMC legislation.

Selection and ordering data

Rated power of the Active Line Module kW	Suitable for Active Line Module in booksize format	**Basic Line Filter** Article No.
16	6SL3130-7TE21-6AA4 6SL3131-7TE21-6AA3 6SL3136-7TE21-6AA3	**6SL3000-0BE21-6DA0**
36	6SL3130-7TE23-6AA3 6SL3131-7TE23-6AA3 6SL3136-7TE23-6AA3	**6SL3000-0BE23-6DA1**
55	6SL3130-7TE25-5AA3 6SL3131-7TE25-5AA3 6SL3136-7TE25-5AA3	**6SL3000-0BE25-5DA0**
80	6SL3130-7TE28-0AA3 6SL3131-7TE28-0AA3 6SL3136-7TE28-0AA3	**6SL3000-0BE28-0DA0**
120	6SL3130-7TE31-2AA3 6SL3131-7TE31-2AA3 6SL3136-7TE31-2AA3 6SL3135-7TE31-2AA3	**6SL3000-0BE31-2DA0**

Technical specifications

Product name	Basic Line Filter					
	6SL3000-...	0BE21-6DA0	0BE23-6DA1	0BE25-5DA0	0BE28-0DA0	0BE31-2DA0
Line supply voltage 380 … 480 V 3 AC						
Rated current	A	36	74	105	132	192
Power loss	kW	0.016	0.028	0.041	0.048	0.086
Line/load connection L1, L2, L3 / U, V, W		Screw-type terminals	Screw-type terminals	Screw-type terminals	Screw-type terminals	Screw-type terminals
• Conductor cross-section	mm^2	10	35	50	95	95
PE connection		M6 screw studs according to DIN 46234	M6 screw studs according to DIN 46234	M8 screw studs according to DIN 46234	M10 screw studs according to DIN 46234	M10 screw studs according to DIN 46234
Degree of protection		IP20	IP20	IP20	IP20	IP20
Dimensions						
• Width	mm	50	75	100	150	150
• Height	mm	429	433	466	479	479
• Depth	mm	226	226	226	226	226
Weight, approx.	kg	5	7.5	11.5	18.2	18.8
Approvals, according to		cURus	cURus	cURus	cURus	cURus
Suitable for Active Line Module in booksize format	Type	6SL3130-7TE21-6AA4 6SL3131-7TE21-6AA3 6SL3136-7TE21-6AA3	6SL3130-7TE23-6AA3 6SL3131-7TE23-6AA3 6SL3136-7TE23-6AA3	6SL3130-7TE25-5AA3 6SL3131-7TE25-5AA3 6SL3136-7TE25-5AA3	6SL3130-7TE28-0AA3 6SL3131-7TE28-0AA3 6SL3136-7TE28-0AA3	6SL3130-7TE31-2AA3 6SL3131-7TE31-2AA3 6SL3136-7TE31-2AA3 6SL3135-7TE31-2AA3
• **Rated power of the Active Line Module**	kW	16	36	55	80	120

Overview

Suitable line-side power components are assigned depending on the power rating of the Active Line Modules.

The tables below list recommended components.

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

Assignment of line-side power components to Active Line Modules in booksize format

Rated power	Suitable for Active Line Module in booksize format	Line contactor	Output coupling device for line contactor	Main switch	Leading auxiliary switch for main switch
	Type 6SL3130- 6SL3131-	Type	Article No.	Article No.	Article No.
kW					
16	7TE21-6AA4	3RT1035-…	**3TX7004-1LB00**	**3LD2504-0TK51**	**3LD9200-5B**
36	7TE23-6AA3	3RT1045-…	**3TX7004-1LB00**	**3LD2704-0TK51**	**3LD9200-5B**
55	7TE25-5AA3	3RT1054-…	**3TX7004-1LB00**	**3KA5330-1GE01**	**3KX3552-3EA01**
80	7TE28-0AA3	3RT1056-…	**3TX7004-1LB00**	**3KA5330-1GE01**	**3KX3552-3EA01**
120	7TE31-2AA3	3RT1065-…	**3TX7004-1LB00**	**3KA5730-1GE01**	**3KX3552-3EA01**

Rated power	Suitable for Active Line Module in booksize format	Circuit breaker IEC 60947	Circuit breaker UL489/ CSA C22.2 No. 5-02	Fuse switch disconnector	Switch disconnector with fuse holders	Leading auxiliary switch for switch disconnector with fuse holders
	Type 6SL3130- 6SL3131- 6SL3136- 6SL3135-	Article No./type	Type	Article No.	Article No.	Article No.
kW						
16	7TE21-6AA4	**3RV1031-4FA10**	3VL2105-2KN30-....	**3NP1123-1CA20**	**3KL5030-1GB01**	**3KX3552-3EA01**
36	7TE23-6AA3	**3RV1041-4LA10**	3VL2108-2KN30-....	**3NP1123-1CA20**	**3KL5230-1GB01**	**3KX3552-3EA01**
55	7TE25-5AA3	3VL2712-1DC33-....	3VL2112-2KN30-....	**3NP1123-1DA20**	**3KL5530-1GB01**	**3KX3552-3EA01**
80	7TE28-0AA3	3VL3720-1DC33-....	3VL3117-2KN30-....	**3NP1123-1DA20**	**3KL5530-1GB01**	**3KX3552-3EA01**
120	7TE31-2AA3	3VL3725-1DC36-....	3VL3125-2KN30-....	**3NP1123-1DA20**	**3KL5730-1GB01**	**3KX3552-3EA01**

Rated power	Suitable for Active Line Module in booksize format	NEOZED fuse (gL/gG)			DIAZED fuse (gL/gG)			LV HRC fuse (gL/gG)			UL/CSA fuse, Class J[1] Available from: Mersen www.ep.mersen.com		
	Type 6SL3130- 6SL3131- 6SL3136- 6SL3135-	Rated current	Size	Article No.	Rated current	Size	Article No.	Rated current	Size	Article No.	Rated current	Size	Reference No.
kW												mm	
16	7TE21-6AA4	35 A	D02	**5SE2335**	35 A	DIII	**5SB411**	35 A	000	**3NA3814**	35 A	27 × 60	AJT35
36	7TE23-6AA3	–	–	–	80 A	DIV	**5SC211**	80 A	000	**3NA3824**	80 A	29 × 117	AJT80
55	7TE25-5AA3	–	–	–	–	–	–	125 A	1	**3NA3132**	125 A	41 × 146	AJT125
80	7TE28-0AA3	–	–	–	–	–	–	160 A	1	**3NA3136**	175 A	41 × 146	AJT175
120	7TE31-2AA3	–	–	–	–	–	–	250 A	1	**3NA3144**	250 A	54 × 181	AJT250

[1] Not suitable for 3NP and 3KL switch disconnectors.

4

Overview

20 kW, 40 kW and 100 kW Basic Line Modules in booksize format

Basic Line Modules are used for applications in which no energy is returned to the supply or where the energy exchange between motor and generator axes takes place in the DC link. Basic Line Modules can only feed energy from the supply system into the DC link, energy cannot be fed back into the supply system. The DC link voltage is directly derived from the 3-phase line voltage via a 6-pulse bridge circuit. Basic Line Modules are designed for connection to grounded, star TN, TT systems and non-grounded, symmetrical IT systems. The connected Motor Modules are pre-charged over the integrated pre-charging resistors (20 kW and 40 kW) or through activation of the thyristors (100 kW).

The 20 kW and 40 kW Basic Line Modules are equipped with an integrated brake chopper and can be directly used for applications in generating mode after connecting an external braking resistor.
A Braking Module is only required with a 100 kW Basic Line Module in generating mode.

Design

The Basic Line Modules in booksize format feature the following connections and interfaces as standard:

- 1 power connection
- 1 connection for the 24 V DC electronics power supply
- 1 DC link connection
- 3 DRIVE-CLiQ sockets
- 1 connection for braking resistor (20 kW and 40 kW Basic Line Modules only)
- 1 temperature sensor input

The status of the Basic Line Modules is indicated via two multi-color LEDs.

The scope of supply of the Basic Line Modules includes:

- DRIVE-CLiQ cable for connection to the adjacent Control Unit on the left for drive control, length 0.11 m
- DRIVE-CLiQ cable (length depends on module width) to connect Basic Line Module to adjacent Motor Module, length = width of Basic Line Module + 0.11 m
- Jumper for connecting the 24 V DC busbar to the adjacent Motor Module
- 24 V terminal adapter (X24)
- Connector X21
- 2 blanking plugs for sealing unused DRIVE-CLiQ sockets
- 1 set of warning labels in 30 languages
- 1 heat conducting foil (for Basic Line Modules with cold plate cooling only)

Note: The thermostatic switch built into the braking resistor must be looped into the shutdown chain of the drive to prevent thermal overloading of the system in the event of a fault. If a braking resistor is not connected, a jumper must be connected between X21.1 and X21.2.

Integration

The Basic Line Module receives its control information via DRIVE-CLiQ from:

- SINUMERIK 828D BASIC
- SINUMERIK 828D
  - Numeric Control Extensions NX10.3

Technical specifications

Product name	Basic Line Modules in booksize format 6SL313 . -1TE...
Line supply voltage Up to 2000 m above sea level	380 ... 480 V 3 AC ±10 % (-15 % < 1 min)[1]
SCCR (**S**hort **C**ircuit **C**urrent **R**ating)	65 kA in conjunction with the recommended fuses class *J* or circuit breakers in accordance with UL489/CSA 22.2 No. 5-02 see recommended line-side components
Line frequency	47 … 63 Hz
Line power factor At rated power	
• Fundamental (cos φ_1)	> 0.96
• Total (λ)	0.75 … 0.93
Overvoltage category In accordance with EN 60664-1	Class III
DC link voltage, approx.	1.35 × line voltage[2]
Electronics power supply	24 V DC, -15 %/+20 %
Radio interference suppression	
• Standard	
- 20 kW and 40 kW Basic Line Modules	No radio interference suppression
- 100 kW Basic Line Module	Category C3 according to EN 61800-3 up to 350 m total cable length (shielded)
• With line filter	Category C2 according to EN 61800-3 up to 350 m total cable length (shielded)

Product name	Basic Line Modules in booksize format 6SL313 . -1TE...
Cooling method	Internal air cooling, power units with increased air cooling by built-in fans Cold plate cooling
Ambient or coolant temperature (air) In operation for line-side components, Line Modules and Motor Modules	0 … 40 °C without derating, > 40 … 55 °C with derating
Installation altitude	Up to 1000 m above sea level without derating, > 1000 ... 4000 m above sea level with derating
Declarations of conformity	CE (Low Voltage and EMC Directives)
Approvals, according to	cULus

Product name	Basic Line Module in booksize format			
Internal air cooling with varnished modules	6SL3130-...	1TE22-0AA0	1TE24-0AA0	1TE31-0AA0
Cold plate cooling	6SL3136-...	1TE22-0AA0	1TE24-0AA0	1TE31-0AA0
Line supply voltage 380 … 480 V 3 AC				
Power				
• Rated power P_{rated} at 380 V 3 AC	kW	20	40	100
• For S6 duty P_{S6} (40 %)	kW	26	52	130
• P_{max}	kW	60	120	175
Braking power With external braking resistor				
• $P_{Bmax.}$ (= 2 × P_{rated})	kW	40	80	–
• Continuous braking power P_d (= 0.25 × P_{rated})	kW	5	10	–
DC link current				
• At 600 V DC	A	34	67	167
• For S6 duty (40 %)	A	43	87	217
• Maximum	A	100	200	292
Input current				
• Rated current at 380 V 3 AC	A	35	69	172
• Maximum	A	113	208	301
Activation threshold Braking chopper	V	774	774	–

1) Can also be operated on supply systems with 200 ... 240 V 3 AC ±10 % with appropriate parameter assignment and reduced output.

2) The DC link voltage is unregulated and load-dependent.

Technical specifications (continued)

Product name	Basic Line Module in booksize format			
Internal air cooling with varnished modules	6SL3130-...	1TE22-0AA0	1TE24-0AA0	1TE31-0AA0
Cold plate cooling	6SL3136-...	1TE22-0AA0	1TE24-0AA0	1TE31-0AA0
Line supply voltage 380 … 480 V 3 AC				
Resistance value External braking resistor	Ω	≥ 14.8	≥ 7.4	–
Cable length To braking resistor, max.	m	15	15	–
Connection for braking resistor (X2)		Screw-type terminals	Screw-type terminals	–
• Conductor cross-section, max.	mm^2	0.5 … 4	0.5 … 10	
Current requirement 24 V DC electronics power supply, max.	A	1	1.4	2
Current carrying capacity				
• 24 V DC busbars	A	20	20	20
• DC link busbars	A	100	200	200
DC link capacitance				
• Basic Line Module	µF	940	1880	4100
• Drive line-up, max.	µF	20000	20000	50000
Internal air cooling				
• Power loss[1)]	kW	0.144	0.284	0.628
• Cooling air requirement	m^3/s	0.016	0.031	0.05
• Sound pressure level L_{pA} (1 m)	dB	< 60	< 65	< 65
Cold plate cooling				
• Power loss, int./ext.[1)]	kW	0.047/0.095	0.071/0.205	0.168/0.450
• Thermal resistance R_{th}	K/W	0.075	0.05	0.045
Line connection U1, V1, W1		Screw-type terminals	Screw-type terminals	M8 screw stud
• Conductor cross-section, max.	mm^2	0.5 … 16	10 … 50	1 × 35 … 120 or 2 × 50
Shield connection		Integrated into the power plug	See Accessories	See Accessories
PE connection		M5 screw	M6 screw	M6 screw
Cable length, max. (Total of all motor power cables and DC link)				
• Shielded/unshielded	m	630/850	630/850	1000/1500
Degree of protection		IP20	IP20	IP20
Dimensions				
• Width	mm	100	150	200
• Height	mm	380	380	380
• Depth				
- With internal air cooling	mm	270	270	270
- With cold plate cooling	mm	226	226	226
Weight, approx.				
• With internal air cooling	kg	6.8	11.3	15.8
• With cold plate cooling	kg	6.4	10.9	16.4

1) Power loss of Basic Line Module at rated power including losses of 24 V DC electronics power supply.

Selection and ordering data

Description	Article No.
Basic Line Module in booksize format	
Internal air cooling Rated power:	
• 20 kW	**6SL3130-1TE22-0AA0**
• 40 kW	**6SL3130-1TE24-0AA0**
• 100 kW	**6SL3130-1TE31-0AA0**
Cold plate cooling Rated power:	
• 20 kW	**6SL3136-1TE22-0AA0**
• 40 kW	**6SL3136-1TE24-0AA0**
• 100 kW	**6SL3136-1TE31-0AA0**
Accessories	
Shield connection plate For Line Modules and Motor Modules in booksize format	
• 150 mm wide for internal air cooling	**6SL3162-1AF00-0AA1**
• 150 mm wide for cold plate cooling	**6SL3162-1AF00-0BA1**
• 200 mm wide for internal air cooling	**6SL3162-1AH01-0AA0**
• 200 mm wide for cold plate cooling	**6SL3162-1AH01-0BA0**
DC link rectifier adapter For direct infeed of DC link voltage	
• Screw-type terminals 0.5 ... 10 mm^2 For Line Modules and Motor Modules in booksize format with a width of 50 mm or 100 mm	**6SL3162-2BD00-0AA0**
• Screw-type terminals 35 ... 95 mm^2 For Line Modules and Motor Modules in booksize format with a width of 150 mm, 200 mm and 300 mm	**6SL3162-2BM00-0AA0**
DC link adapter (2 units) For multi-tier configuration Screw-type terminals 35 … 95 mm^2 For all Line Modules and Motor Modules in booksize format	**6SL3162-2BM01-0AA0**
24 V terminal adapter For all Line Modules and Motor Modules in booksize format	**6SL3162-2AA00-0AA0**
24 V jumper For connection of the 24 V busbars (for booksize format)	**6SL3162-2AA01-0AA0**
Warning labels in 30 languages This set of foreign language warning labels can be placed on top of the standard German or English signs. A set of labels is supplied with the units. One sign in each of the following languages is provided in each set: BG, CN, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, JP, KR, LT, LV, MT, NL, NO, PL, PT, RO, RU, SE, SI, SK, TR	**6SL3166-3AB00-0AA0**

Description	Article No.
Accessories for re-ordering	
Accessories pack (plug-in terminals, DRIVE-CLiQ jumper, dust-proof blanking plugs) For DRIVE-CLiQ port	
• For Basic Line Modules with a width of 100 mm	**6SL3163-8LD00-0AA0**
SINAMICS/SINUMERIK/SIMOTION dust-proof blanking plugs (50 units) For DRIVE-CLiQ port	**6SL3066-4CA00-0AA0**

Overview

20 kW and 100 kW line reactors

Line reactors limit low-frequency line harmonic effects and reduce the load on the semiconductors of the Basic Line Module.

Selection and ordering data

Rated power of the Basic Line Module kW	Suitable for Basic Line Module in booksize format	**Line reactor** Article No.
20	6SL3130-1TE22-0AA0 6SL3136-1TE22-0AA0	**6SL3000-0CE22-0AA0**
40	6SL3130-1TE24-0AA0 6SL3136-1TE24-0AA0	**6SL3000-0CE24-0AA0**
100	6SL3130-1TE31-0AA0 6SL3136-1TE31-0AA0	**6SL3000-0CE31-0AA0**

Technical specifications

Product name	Line reactors			
	6SL3000-...	0CE22-0AA0	0CE24-0AA0	0CE31-0AA0
Line supply voltage 380 … 480 V 3 AC				
Rated current	A	37	74	185
Power loss At 50/60 Hz	kW	0.130/0.154	0.270/0.320	0.480/0.565
Line/load connection		Screw-type terminals	Screw-type terminals	Flat connector for M8 screw
• Conductor cross-section	mm^2	0.5 … 16	2.5 … 35	–
Degree of protection		IP20	IP20	IP00
Dimensions				
• Width	mm	178	210	261
• Height	mm	165	245	228
• Depth	mm	100	93	137
Weight, approx.	kg	5.2	11.2	21.7
Approvals, according to		cURus	cURus	cURus
Suitable for Basic Line Module in booksize format	Type	6SL3130-1TE22-0AA0 6SL3136-1TE22-0AA0	6SL3130-1TE24-0AA0 6SL3136-1TE24-0AA0	6SL3130-1TE31-0AA0 6SL3136-1TE31-0AA0
• Rated power of the Basic Line Module	kW	20	40	100

Overview

Line filter

In plants with strict EMC requirements, line filters work together with line reactors to restrict the conducted interference emanating from the Power Modules to the limit values of Class A1 as defined in EN 55011 and Category C2 as defined in EN 61800-3. Line filters are suited only for direct connection to TN systems.

Selection and ordering data

Rated power of the Basic Line Module kW	Suitable for Basic Line Module in booksize format	**Line filter** Article No.
20	6SL3130-1TE22-0AA0 6SL3136-1TE22-0AA0	**6SL3000-0BE21-6DA0**
40	6SL3130-1TE24-0AA0 6SL3136-1TE24-0AA0	**6SL3000-0BE23-6DA1**
100	6SL3130-1TE31-0AA0 6SL3136-1TE31-0AA0	**6SL3000-0BE31-2DA0**

Technical specifications

Product name	Line filter			
	6SL3000-...	0BE21-6DA0	0BE23-6DA1	0BE31-2DA0
Line supply voltage 380 … 480 V 3 AC				
Rated current	A	36	74	192
Power loss	kW	0.016	0.02	0.09
Line/load connection L1, L2, L3 / U, V, W		Screw-type terminals	Screw-type terminals	Screw-type terminals
• Conductor cross-section	mm^2	10	35	95
PE connection		M6 screw stud	M6 screw stud	M10 screw stud
Degree of protection		IP20	IP20	IP20
Dimensions				
• Width	mm	50	75	150
• Height	mm	429	433	479
• Depth	mm	226	226	226
Weight, approx.	kg	5	7.5	18.8
Approvals, according to		cURus	cURus	cURus
Suitable for Basic Line Module in booksize format	Type	6SL3130-1TE22-0AA0 6SL3136-1TE22-0AA0	6SL3130-1TE24-0AA0 6SL3136-1TE24-0AA0	6SL3130-1TE31-0AA0 6SL3136-1TE31-0AA0
• Rated power of the Basic Line Module	kW	20	40	100

Overview

Suitable line-side power components are assigned depending on the power rating of the Basic Line Modules.

The tables below list recommended components.

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

Assignment of line-side power components to Basic Line Modules in booksize format

Rated power	Suitable for Basic Line Module in booksize format	Line contactor	Output coupling device for line contactor	Main switch
	Type 6SL3130-6SL3136-	Type	Article No.	Article No.
kW				
20	1TE22-0AA0	3RT1035-…	**3TX7004-1LB00**	**3LD2504-0TK51**
40	1TE24-0AA0	3RT1045-…	**3TX7004-1LB00**	**3LD2704-0TK51**
100	1TE31-0AA0	3RT1056-…	**3TX7004-1LB00**	**3KA5530-1GE01**

Rated power	Suitable for Basic Line Module in booksize format	Circuit breaker IEC 60947	Circuit breaker UL489/CSA C22.2 No. 5-02	Fuse switch disconnector
	Type 6SL3130-6SL3136-	Article No./type	Type	Article No.
kW				
20	1TE22-0AA0	**3RV1041-4JA10**	3VL2106-2KN30-....	**3NP1123-1CA20**
40	1TE24-0AA0	3VL2710-1DC33-....	3VL2110-2KN30-....	**3NP1123-1CA20**
100	1TE31-0AA0	3VL3725-1DC36-....	3VL3125-2KN30-....	**3NP1123-1DA20**

Rated power	Suitable for Basic Line Module in booksize format	Switch disconnector with fuse holders	LV HRC fuse (gL/gG)			UL/CSA fuse, Class J[1] Available from: Mersen www.ep.mersen.com		
	Type 6SL3130-6SL3136-	Article No.	Rated current	Size	Article No.	Rated current	Size	Reference No.
kW							mm	
20	1TE22-0AA0	**3KL5230-1GB01**	63 A	000	**3NA3822**	60 A	29 × 117	AJT60
40	1TE24-0AA0	**3KL5230-1GB01**	100 A	000	**3NA3830**	100 A	29 × 117	AJT100
100	1TE31-0AA0	**3KL5730-1GB01**	250 A	1	**3NA3144**	250 A	54 × 181	AJT250

[1] Not suitable for 3NP and 3KL switch disconnectors.

Design

Single Motor Module in booksize format

The Single Motor Modules in booksize format feature the following connections and interfaces as standard:

- 2 DC link connections via integrated DC link busbars
- 1 electronics power supply connection via integrated 24 V DC bars
- 3 DRIVE-CLiQ sockets
- 1 motor connection, plug-in (not included in scope of supply) or screw-stud depending on rated output current
- 1 safe standstill input (Enable Pulses)
- 1 safe motor brake control
- 1 temperature sensor input (KTY84-130 or PTC)
- 2 PE/protective conductor connections

The status of the Motor Modules is indicated via two multi-color LEDs.

The motor cable shield is inside the connector on 50 mm and 100 mm wide Motor Modules. A shield connection plate can be supplied for 150 mm, 200 mm and 300 mm wide Motor Modules. On these modules, the motor cable shield can be connected using a hose clip.

The signal cable shield can be connected to the Motor Module by means of a shield terminal, e.g. Weidmüller type KLBÜ 3-8 SC.

Design (continued)

The scope of supply of the Motor Modules includes:

- DRIVE-CLiQ cable appropriate to the width of the Motor Module for connection to the adjacent Motor Module, length = width of Motor Module + 0.06 m
- Jumper for connecting the 24 V DC busbar to the adjacent Motor Module
- Connector X21
- Connector X11 for the motor brake connection (for Motor Modules with a rated output current of 45 A to 200 A)
- 2 blanking plugs for sealing unused DRIVE-CLiQ sockets
- Fan insert for the 132 A and 200 A Motor Modules (the voltage for the fan insert is supplied by the Motor Module)
- 1 set of warning labels in 30 languages
- 1 heat conducting foil (for Motor Modules with cold plate cooling only)

Integration

The Single Motor Module receives its control information via DRIVE-CLiQ from:

- SINUMERIK 828D BASIC
- SINUMERIK 828D
  - Numeric Control Extensions NX10.3

Technical specifications

Product name	Single Motor Module in booksize format 6SL312. -1TE...
DC link voltage Up to 2000 m above sea level	510 ... 720 V DC (line voltage 380 ... 480 V 3 AC)
Output frequency	0 … 650 Hz[1]
Electronics power supply	24 V DC -15 %/+20 %
Cooling method	Internal air cooling, external air cooling Power units with increased air cooling by built-in fans Cold plate cooling Liquid cooling
Ambient or coolant temperature (air) In operation for line-side components, Line Modules and Motor Modules	0 … 40 °C without derating, > 40 … 55 °C with derating

Product name	Single Motor Module in booksize format 6SL312. -1TE...
Installation altitude	Up to 1000 m above sea level without derating, > 1000 ... 4000 m above sea level with derating
Declarations of conformity	CE (Low Voltage and EMC Directives)
Approvals, according to	cULus
Safety Integrated	Safety Integrity Level 2 (SIL 2) acc. to IEC 61508, Performance Level d (PLd) acc. to ISO 13849-1 Control category 3 acc. to ISO 13849-1

Product name		Single Motor Module in booksize format				
Internal air cooling	6SL3120-...	1TE13-0AA4	1TE15-0AA4	1TE21-0AA4	1TE21-8AA4	1TE23-0AA3
External air cooling	6SL3121-...	1TE13-0AA4	1TE15-0AA4	1TE21-0AA4	1TE21-8AA4	1TE23-0AA3
Cold plate cooling	6SL3126-...	1TE13-0AA4	1TE15-0AA4	1TE21-0AA4	1TE21-8AA4	1TE23-0AA3
Liquid cooling	6SL3125-...	–	–	–	–	–
DC link voltage 510 … 720 V DC						
Output current						
• Rated current I_{rated}	A	**3**	**5**	**9**	**18**	**30**
• Base-load current I_H	A	2.6	4.3	7.7	15.3	25.5
• For S6 duty I_{S6} (40 %)	A	3.5	6	10	24	40
• I_{max}	A	9	15	27	54	56
Type rating[2]						
• Based on I_{rated}	kW	1.6	2.7	4.8	9.7	16.0
• Based on I_H	kW	1.4	2.3	4.1	8.2	13.7
Rated pulse frequency	kHz	4	4	4	4	4
DC link current I_d[3]	A	3.6	6	11	22	36
Current carrying capacity						
• DC link busbars	A	100[4]	100[4]	100[4]	100[4]	100[4]
• 24 V DC busbars	A	20	20	20	20	20
DC link capacitance	µF	110	110	110	220	710
Current requirement At 24 V DC, max.	A	0.85	0.85	0.85	0.85	0.9

1) At rated output current (max. output frequency 1300 Hz for 62.5 µs current control cycle, 8 kHz pulse frequency, 60 % permissible output current). Note the correlation between max. output frequency, pulse frequency and current derating

2) Rated power of a typical standard asynchronous motor at 400 V 3 AC.

3) Rated DC link current for dimensioning an external DC connection.

4) With reinforced DC link busbar set, 150 A is possible (accessories).

Technical specifications (continued)

Product name	Single Motor Module in booksize format					
Internal air cooling	6SL3120-...	1TE13-0AA4	1TE15-0AA4	1TE21-0AA4	1TE21-8AA4	1TE23-0AA3
External air cooling	6SL3121-...	1TE13-0AA4	1TE15-0AA4	1TE21-0AA4	1TE21-8AA4	1TE23-0AA3
Cold plate cooling	6SL3126-...	1TE13-0AA4	1TE15-0AA4	1TE21-0AA4	1TE21-8AA4	1TE23-0AA3
Liquid cooling	6SL3125-...	–	–	–	–	–
DC link voltage 510 … 720 V DC						
Internal/external air cooling						
• Power loss[1]						
- Maximum losses with internal air cooling in control cabinet	kW	0.05	0.07	0.1	0.19 (0.18 with cold plate cooling)	0.31
- Typical losses with internal air cooling in control cabinet[2]	kW	0.03	0.04	0.06	0.14	0.26
- With external air cooling, int./ext.[1]	kW	0.035/0.015	0.04/0.03	0.055/0.045	0.1/0.09	0.1/0.21
• Cooling air requirement	m^3/s	0.008	0.008	0.008	0.008	0.016
• Sound pressure level L_{pA} (1 m)	dB	< 60	< 60	< 60	< 60	< 60
Cold plate cooling						
• Power loss, int./ext.[1]	kW	0.025/0.02	0.035/0.035	0.045/0.05	0.08/0.1	0.085/0.22
• Thermal resistance R_{th}	K/W	0.175	0.175	0.175	0.175	0.075
Motor connection U2, V2, W2		Connector (X1)[3], max. 30 A	Connector (X1)[3], max. 30 A	Connector (X1)[3], max. 30 A	Connector (X1)[3], max. 30 A	Connector (X1)[3], max. 30 A
Shield connection		Integrated in connector (X1)	Integrated in connector (X1)	Integrated in connector (X1)	Integrated in connector (X1)	Integrated in connector (X1)
PE connection		M5 screw	M5 screw	M5 screw	M5 screw	M5 screw
Motor brake connection		Integrated into the plug-in motor connector (X1), 24 V DC, 2 A	Integrated into the plug-in motor connector (X1), 24 V DC, 2 A	Integrated into the plug-in motor connector (X1), 24 V DC, 2 A	Integrated into the plug-in motor connector (X1), 24 V DC, 2 A	Integrated into the plug-in motor connector (X1), 24 V DC, 2 A
Motor cable length, max.						
• Shielded	m	50	50	50	70	100
• Unshielded	m	75	75	75	100	150
Degree of protection		IP20	IP20	IP20	IP20	IP20
Dimensions						
• Width	mm	50	50	50	50	100
• Height	mm	380	380	380	380	380
• Depth						
- With internal air cooling	mm	270	270	270	270	270
- With external air cooling, on/behind mounting surface	mm	226/66.5	226/66.5	226/66.5	226/66.5	226/66.5
- With cold plate cooling	mm	226	226	226	226	226
Weight, approx.						
• With internal air cooling	kg	5.0	5.0	5.0	5.0	6.9
• With external air cooling	kg	5.7	5.7	5.7	5.7	8.5
• With cold plate cooling	kg	4.2	4.2	4.5	4.5	6.1

1) Power loss of Motor Module at rated power including losses of 24 V DC electronics power supply.
2) At max. motor cable length 30 m, pulse frequency 4 kHz and DC link voltage 540 … 600 V.
3) Connector not included in scope of supply, see Accessories.

Technical specifications (continued)

Product name	Single Motor Module in booksize format					
Internal air cooling	6SL3120-...	1TE24-5AA3	1TE26-0AA3	1TE28-5AA3	1TE31-3AA3	1TE32-0AA4
External air cooling	6SL3121-...	1TE24-5AA3	1TE26-0AA3	1TE28-5AA3	1TE31-3AA3	1TE32-0AA4
Cold plate cooling	6SL3126-...	1TE24-5AA3	1TE26-0AA3	1TE28-5AA3	1TE31-3AA3	1TE32-0AA4
Liquid cooling	6SL3125-...	–	–	–	–	1TE32-0AA4
DC link voltage 510 … 720 V DC						
Output current						
• Rated current I_{rated}	A	**45**	**60**	**85**	**132 (105[1])**	**200 (140[1])**
• Base-load current I_H	A	38	52	68	105 (84)	141 (99)
• For S6 duty I_{S6} (40 %)	A	60	80	110	150 (120)	230 (161)
• I_{max}	A	85	113	141	210	282
Rated pulse frequency	kHz	4	4	4	4	4
• **Power**[2] At 600 V DC link voltage						
• Rated power	kW	24	32	46	71 (57)	107 (75)
• Based on I_H	kW	21	28	37	57	76
DC link current I_d[3]	A	54	72	102	158	200
Current carrying capacity						
• DC link busbars	A	200	200	200	200	200
• 24 V DC busbars	A	20	20	20	20	20
DC link capacitance	µF	1175	1410	1880	2820	3995
Current requirement At 24 V DC, max.	A	1.2	1.2	1.5	1.5	1.5
Internal/external air cooling						
• Power loss[4]						
- Maximum power loss with internal air cooling in control cabinet	kW	0.46	0.62	0.79	1.29	2.09
- Typical losses with internal air cooling in control cabinet[5]	kW	0.38	0.55	0.77	1.26	2.03
- With external air cooling, int./ext.[4]	kW	0.14/0.32	0.16/0.46	0.2/0.59	0.29/1.0	0.47/1.62
• Cooling air requirement	m^3/s	0.031	0.031	0.044	0.144	0.144
• Sound pressure level L_{pA} (1 m)	dB	< 65	< 65	< 60	< 73	< 73
Cold plate cooling						
• Power loss, int./ext.[4]	kW	0.11/0.34	0.13/0.48	0.15/0.62	0.24/1.05	0.39/1.7
• Thermal resistance R_{th}	K/W	0.055	0.055	0.05	0.028	0.028

1) In the case of cold plate cooling, derating is necessary due to heat transfer to the external heatsink.
2) Rated power of a typical standard asynchronous motor at 400 V 3 AC
3) Rated DC link current for dimensioning an external DC connection.
4) Power loss of Motor Module at rated power including losses of 24 V DC electronics power supply.
5) At max. motor cable length 30 m, pulse frequency 4 kHz and DC link voltage 540 … 600 V.

Technical specifications (continued)

Product name	Single Motor Module in booksize format					
Internal air cooling	6SL3120-...	1TE24-5AA3	1TE26-0AA3	1TE28-5AA3	1TE31-3AA3	1TE32-0AA4
External air cooling	6SL3121-...	1TE24-5AA3	1TE26-0AA3	1TE28-5AA3	1TE31-3AA3	1TE32-0AA4
Cold plate cooling	6SL3126-...	1TE24-5AA3	1TE26-0AA3	1TE28-5AA3	1TE31-3AA3	1TE32-0AA4
Liquid cooling	6SL3125-...	–	–	–	–	1TE32-0AA4
DC link voltage 510 … 720 V DC						
Liquid cooling[1]						
• Power loss, int./ext.	kW	–	–	–	–	0.39/1.7
- Rated volumetric flow for water at 70 kPa pressure drop[2]	l/min	–	–	–	–	8
- Volume of liquid, internal	ml	–	–	–	–	100
- Coolant temperature, max.						
- Without derating	°C	–	–	–	–	45
- With derating	°C	–	–	–	–	50
- Sound pressure level L_{pA} (1 m)	dB	–	–	–	–	< 73
Motor connection U2, V2, W2		M6 screw studs (X1)	M6 screw studs (X1)	M8 screw studs (X1)	M8 screw studs (X1)	M8 screw studs (X1)
• Conductor cross-section, max.	mm^2	2.5 … 50	2.5 … 50	2.5 … 95, 2 × 35	2.5 … 120, 2 × 50	2.5 … 120, 2 × 50
Shield connection		See Accessories	See Accessories	See Accessories	See Accessories	See Accessories
PE connection		M6 screw	M6 screw	M6 screw	M8 screw	M8 screw
Motor brake connection		Plug-in connector (X11), 24 V DC, 2 A	Plug-in connector (X11), 24 V DC, 2 A	Plug-in connector (X11), 24 V DC, 2 A	Plug-in connector (X11), 24 V DC, 2 A	Plug-in connector (X11), 24 V DC, 2 A
Motor cable length, max.						
• Shielded	m	100	100	100	100	100
• Unshielded	m	150	150	150	150	150
Degree of protection		IP20	IP20	IP20	IP20	IP20
Dimensions						
• Width	mm	150	150	200	300	300
• Height	mm	380	380	380	380	380
- With fan[3]	mm	–	–	–	629	629
- With screwed fitting	mm	–	–	–	–	553[1]
• Depth						
- With internal air cooling	mm	270	270	270	270	270
- With external air cooling, on/behind mounting surface	mm	226/71	226/71	226/92	226/82	226/82
- With cold plate cooling	mm	226	226	226	226	226
- With liquid cooling	mm	–	–	–	–	226
Weight, approx.						
• With internal air cooling	kg	9	9	15	21	21
• With external air cooling	kg	13.2	13.4	17.2	27.2	30
• With cold plate cooling	kg	9.1	9.1	12.5	18	18
• With liquid cooling	kg	–	–	–	–	21

1) The coolant connections are located on the lower side of the components. All connection elements can be accessed using an appropriate tool. Thread type of water connections: Pipe thread ISO 228 G ½ B.

2) This value applies to water as coolant; for other coolants, refer to the 01/2012 Manual.

3) The fan is supplied with the Motor Module and must be installed before the Motor Module is commissioned.

Selection and ordering data

Rated output current	Type rating	Single Motor Module in booksize format			
		Internal air cooling	External air cooling	Cold plate cooling	Liquid cooling
A	kW	Article No.	Article No.	Article No.	Article No.
DC link voltage 510 … 720 V DC					
3	1.6	**6SL3120-1TE13-0AA4**	**6SL3121-1TE13-0AA4**	**6SL3126-1TE13-0AA4**	**–**
5	2.7	**6SL3120-1TE15-0AA4**	**6SL3121-1TE15-0AA4**	**6SL3126-1TE15-0AA4**	**–**
9	4.8	**6SL3120-1TE21-0AA4**	**6SL3121-1TE21-0AA4**	**6SL3126-1TE21-0AA4**	**–**
18	9.7	**6SL3120-1TE21-8AA4**	**6SL3121-1TE21-8AA4**	**6SL3126-1TE21-8AA4**	**–**
30	16	**6SL3120-1TE23-0AA3**	**6SL3121-1TE23-0AA3**	**6SL3126-1TE23-0AA3**	**–**
45	24	**6SL3120-1TE24-5AA3**	**6SL3121-1TE24-5AA3**	**6SL3126-1TE24-5AA3**	**–**
60	32	**6SL3120-1TE26-0AA3**	**6SL3121-1TE26-0AA3**	**6SL3126-1TE26-0AA3**	**–**
85	46	**6SL3120-1TE28-5AA3**	**6SL3121-1TE28-5AA3**	**6SL3126-1TE28-5AA3**	**–**
132	71	**6SL3120-1TE31-3AA3**	**6SL3121-1TE31-3AA3**	**6SL3126-1TE31-3AA3**	**–**
200	107	**6SL3120-1TE32-0AA4**	**6SL3121-1TE32-0AA4**	**6SL3126-1TE32-0AA4**	**6SL3125-1TE32-0AA4**

Description	Article No.
Accessories	
Power connector (X1) At Motor Module end, with screw-type terminals 1.5 ... 10 mm^2, For Motor Modules with rated output current of 3 … 30 A	**6SL3162-2MA00-0AA0**
Shield connection plate For Line Modules and Motor Modules in booksize format	
• 150 mm wide for internal air cooling	**6SL3162-1AF00-0AA1**
• 150 mm wide for external air cooling and cold plate cooling	**6SL3162-1AF00-0BA1**
• 200 mm wide for internal air cooling	**6SL3162-1AH01-0AA0**
• 200 mm wide for external air cooling and cold plate cooling	**6SL3162-1AH01-0BA0**
• 300 mm wide for all cooling types	**6SL3162-1AH00-0AA0**
DC link rectifier adapter For direct infeed of DC link voltage	
• Screw-type terminals 0.5 ... 10 mm^2 For Line Modules and Motor Modules in booksize format with a width of 50 mm or 100 mm	**6SL3162-2BD00-0AA0**
• Screw-type terminals 35 ... 95 mm^2 for Line Modules and Motor Modules in booksize format with a width of 150 mm, 200 mm and 300 mm	**6SL3162-2BM00-0AA0**
DC link adapter (2 units) For multi-tier configuration Screw-type terminals 35 … 95 mm^2 For all Line Modules and Motor Modules in booksize format	**6SL3162-2BM01-0AA0**
24 V terminal adapter For all Line Modules/Motor Modules in booksize format	**6SL3162-2AA00-0AA0**

Description	Article No.
Accessories *(continued)*	
Reinforced DC link busbar set For replacement of DC link busbars for 5 modules in booksize format	
• 50 mm wide	**6SL3162-2DB00-0AA0**
• 100 mm wide	**6SL3162-2DD00-0AA0**
Warning labels in 30 languages This set of foreign language warning labels can be placed on top of the standard German or English signs. A set of labels is supplied with the units. One sign in each of the following languages is provided in each set: BG, CN, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, JP, KR, LT, LV, MT, NL, NO, PL, PT, RO, RU, SE, SI, SK, TR	**6SL3166-3AB00-0AA0**
Accessories for re-ordering	
Accessories pack (plug-in terminals, DRIVE-CLiQ jumper, dust-proof blanking plugs) For DRIVE-CLiQ port	
• For Motor Modules 50 mm wide, int./ext. air cooling	**6SL3162-8AB00-0AA0**
• For Motor Modules 100 mm wide, int./ext. air cooling	**6SL3162-8BD00-0AA0**
• For Motor Modules 150 mm wide, int./ext. air cooling	**6SL3162-8CF00-0AA0**
• For Motor Modules 200 mm wide, int./ext. air cooling	**6SL3162-8DH00-0AA0**
• For Motor Modules 300 mm wide, int./ext. air cooling	**6SL3162-8EM00-0AA0**
SINAMICS/SINUMERIK/SIMOTION dust-proof blanking plugs (50 units) For DRIVE-CLiQ port	**6SL3066-4CA00-0AA0**

Design

Double Motor Module

Double Motor Modules feature the following connections and interfaces as standard:

- 2 DC link connections via integrated DC link busbars
- 2 electronics power supply connections via integrated 24 V DC bars
- 4 DRIVE-CLiQ sockets
- 2 plug-in motor connections (not included in scope of supply)
- 2 safe standstill inputs (1 input per axis)
- 2 safe motor brake control
- 2 temperature sensor inputs (KTY84-130 or PTC)
- 3 PE/protective conductor connections

The status of the Motor Modules is indicated via two multi-color LEDs.

On Double Motor Modules, the motor cable shield can be connected in the connector.

The signal cable shield can be connected to the Motor Module by means of a shield terminal, e.g. Weidmüller type KLBÜ 3-8 SC.

The scope of supply of the Motor Modules includes:

- DRIVE-CLiQ cable appropriate to the width of the Motor Module for connection to the adjacent Motor Module
- 2 blanking plugs for sealing unused DRIVE-CLiQ sockets
- Jumper for connecting the 24 V DC busbar to the adjacent Motor Module
- Connectors X21 and X22
- Device fans for cooling power units on modules with internal and external air cooling supplied from the internal voltage levels
- 1 set of warning labels in 30 languages
- 1 heat conducting foil (for Double Motor Modules with cold plate cooling only)

Integration

The Double Motor Module receives its control information via DRIVE-CLiQ from:

- SINUMERIK 828D BASIC
- SINUMERIK 828D
  - Numeric Control Extensions NX10.3

Technical specifications

Product name	Double Motor Modules in booksize format 6SL312. -2TE...
DC link voltage Up to 2000 m above sea level	510 ... 720 V DC (line supply voltage 380 ... 480 V 3 AC)
Output frequency	0 … 650 Hz[1)]
Electronics power supply	24 V DC -15 %/+20 %
Cooling method	Internal air cooling, external air cooling power units with increased air cooling by built-in fans Cold plate cooling
Ambient or coolant temperature (air) In operation for line-side components, Line Modules, and Motor Modules	0 … 40 °C without derating, > 40 … 55 °C with derating
Installation altitude	Up to 1000 m above sea level without derating, > 1000 ... 4000 m above sea level with derating
Declarations of conformity	CE (Low Voltage and EMC Directives)
Approvals, according to	cULus
Safety Integrated	Safety Integrity Level 2 (SIL 2) acc. to IEC 61508, Performance Level d (PLd) acc. to ISO 13849-1, Control Category 3 acc. to ISO 13849-1

1) At rated output current (max. output frequency 1300 Hz for 62.5 µs current control cycle, 8 kHz pulse frequency, 60 % permissible output current). Note the correlation between max. output frequency, pulse frequency and current derating.

Technical specifications (continued)

Product name		Double Motor Module in booksize format			
Internal air cooling	6SL3120-...	2TE13-0AA4	2TE15-0AA4	2TE21-0AA4	2TE21-8AA3
External air cooling	6SL3121-...	2TE13-0AA4	2TE15-0AA4	2TE21-0AA4	2TE21-8AA3
Cold plate cooling	6SL3126-...	2TE13-0AA4	2TE15-0AA4	2TE21-0AA4	2TE21-8AA3
DC link voltage 510 … 720 V DC					
Output current					
• Rated current I_{rated}	A	**2 × 3**	**2 × 5**	**2 × 9**	**2 × 18**
• For S6 duty I_{S6} (40 %)	A	2 × 3.5	2 × 6	2 × 10	2 × 24
• Base-load current I_H	A	2 × 2.6	2 × 4.3	2 × 7.7	2 × 15.3
• I_{max}	A	2 × 6	2 × 10	2 × 18	2 × 36
Type rating[1]					
• Based on I_{rated}	kW	2 × 1.6	2 × 2.7	2 × 4.8	2 × 9.7
• Based on I_H	kW	2 × 1.4	2 × 2.3	2 × 4.1	2 × 8.2
DC link current I_d[2]	A	7.2	12	22	43
Current carrying capacity					
• DC link busbars	A	100	100	100	100
• 24 V DC busbars	A	20	20	20	20
DC link capacitance	µF	220 With internal cooling	220	220	705
Current requirement At 24 V DC, max.	A	1.15 0.9 with cold plate cooling	1.15 0.9 with cold plate cooling	1.15 0.9 with cold plate cooling	1.0
Internal/external air cooling					
• Power loss[3]					
- Maximum losses with internal air cooling in control cabinet	kW	0.10 0.9 with cold plate cooling	0.13	0.19 0.9 with cold plate cooling	0.35
- Typical losses with internal air cooling in control cabinet[4]		0.05	0.08	0.15	0.28
- With external air cooling, int./ext.[3]	kW	0.06/0.035	0.07/0.06	0.09/0.095	0.105/0.24
• Cooling air requirement	m^3/s	0.008	0.008	0.008	0.016
• Sound pressure level L_{pA} (1 m)	dB	< 60	< 60	< 60	< 60
Cold plate cooling					
• Power loss, int./ext.[3]	kW	0.055/0.035	0.06/0.065	0.08/0.1	0.095/0.25
• Thermal resistance R_{th}	K/W	0.185	0.185	0.185	0.075
Motor connection U2, V2, W2		2 x connectors (X1, X2)[5], max. 30 A (not included in scope of supply, see Accessories)			
Shield connection		Integrated in connector (X1, X2)	Integrated in connector (X1, X2)	Integrated in connector (X1, X2)	Integrated in connector (X1, X2)
PE connection		M5 screw	M5 screw	M5 screw	M5 screw
Motor brake connection		Integrated into the plug-in motor connector (X1, X2), 24 V DC, 2 A			
Motor cable length, max.					
• Shielded	m	50	50	50	70
• Unshielded	m	75	75	75	100
Degree of protection		IP20	IP20	IP20	IP20
Dimensions					
• Width	mm	50	50	50	100
• Height	mm	380	380	380	380
• Depth					
- With internal air cooling	mm	270	270	270	270
- With external air cooling, on/behind mounting surface	mm	226/66.5	226/66.5	226/66.5	226/66.5
- With cold plate cooling	mm	226	226	226	226
Weight, approx.					
• With internal air cooling	kg	5.3	5.3	5.3	6.8
• With external air cooling	kg	5.8	5.8	5.8	8.6
• With cold plate cooling	kg	4.5	4.5	4.5	5.9

1) Rated power of a typical standard asynchronous motor at 400 V 3 AC
2) Rated DC link current for dimensioning an external DC connection.
3) Power loss of Motor Module at rated power including losses of 24 V DC electronics power supply.
4) At max. motor cable length 30 m, pulse frequency 4 kHz and DC link voltage 540 … 600 V.
5) Connector not included in scope of supply, see Accessories.

Selection and ordering data

Rated output current	Type rating	Double Motor Module in booksize format		
		Internal air cooling Article No.	External air cooling Article No.	Cold plate cooling Article No.
2 × 3 A	2 × 1.6 kW	**6SL3120-2TE13-0AA4**	**6SL3121-2TE13-0AA4**	**6SL3126-2TE13-0AA4**
2 × 5 A	2 × 2.7 kW	**6SL3120-2TE15-0AA4**	**6SL3121-2TE15-0AA4**	**6SL3126-2TE15-0AA4**
2 × 9 A	2 × 4.8 kW	**6SL3120-2TE21-0AA4**	**6SL3121-2TE21-0AA4**	**6SL3126-2TE21-0AA4**
2 × 18 A	2 × 9.7 kW	**6SL3120-2TE21-8AA3**	**6SL3121-2TE21-8AA3**	**6SL3126-2TE21-8AA3**

Description	Article No.
Accessories	
Power connector (X1/X2) At Motor Module end, with screw-type terminals 1.5 ... 10 mm^2, For Motor Modules with rated output current of 3 … 30 A	**6SL3162-2MA00-0AA0**
DC link rectifier adapter For direct supply of the DC link voltage Screw-type terminals 0.5 … 10 mm^2 For Line Modules and Motor Modules in booksize format with a width of 50 mm and 100 mm	**6SL3162-2BD00-0AA0**
DC link adapter (2 units) For multi-tier configuration Screw-type terminals 35 … 95 mm^2 For all Line Modules and Motor Modules in booksize format	**6SL3162-2BM01-0AA0**
24 V terminal adapter For all Line Modules and Motor Modules in booksize format	**6SL3162-2AA00-0AA0**
24 V jumper For connection of the 24 V busbars (for booksize format)	**6SL3162-2AA01-0AA0**
Reinforced DC link busbar set For replacement of DC link busbars for 5 modules in booksize format	
• 50 mm wide	**6SL3162-2DB00-0AA0**
• 100 mm wide	**6SL3162-2DD00-0AA0**
Warning labels in 30 languages This set of foreign language warning labels can be placed on top of the standard German or English signs. A set of labels is supplied with the units. One sign in each of the following languages is provided in each set: BG, CN, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, JP, KR, LT, LV, MT, NL, NO, PL, PT, RO, RU, SE, SI, SK, TR	**6SL3166-3AB00-0AA0**

Description	Article No.
Accessories for re-ordering	
Accessories pack (plug-in terminals, DRIVE-CLiQ jumper, dust-proof blanking plugs) For DRIVE-CLiQ port	
• For Motor Modules 50 mm wide, int./ext. air cooling	**6SL3162-8AB00-0AA0**
• For Motor Modules 100 mm wide, int./ext. air cooling	**6SL3162-8BD00-0AA0**
SINAMICS/SINUMERIK/SIMOTION dust-proof blanking plugs (50 units) For DRIVE-CLiQ port	**6SL3066-4CA00-0AA0**

4

Overview

Series motor reactor

A series reactor in the form of a three-limb iron-cored reactor may be required in the case of special motors with minimal leakage inductance (for which the controller settings are insufficient). Motors with a low leakage inductance are, from experience, motors that can achieve high stator frequencies > 300 Hz or motors with a high rated current > 85 A.

The series motor reactors are designed for a pulse frequency of 4 kHz or 8 kHz output from the Motor Module. Higher pulse frequencies are not permissible.

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

The voltage drop across a series reactor depends on the motor current and the motor frequency. If an unregulated infeed is used, the maximum rated motor voltage depends on the line supply voltage available. If these guide values are observed, lower reductions in power in the upper speed range of the motor can be achieved.

The surface temperature of the series motor reactor can reach up to 100 °C. This additional heat source must be taken into account in the system.

The notes in the Configuration Manual for the motors used must be observed.

Selection and ordering data

Rated current	Rated inductance	**Series motor reactor**
A	mH	Article No.
22.5	0.3	**4EU2552-0EF00-4BA0**
108	0.1	**4EU3951-0AR00-4B**

Technical specifications

Product name		Series motor reactor	
		4EU2552-0EF00-4BA0	4EU3951-0AR00-4B
Input voltage 380 ... 480 V 3 AC (DC link voltage 510 ... 720 V DC)			
Rated current	A	22.5	108
Rated inductance	mH	0.3	0.1
Power loss	kW	0.146	0.454
Continuous current I_{thmax}, therm. perm.	A	25	120
Continuous frequency, therm. perm.	Hz	1400	1400
Pulse frequency, max.	kHz	8	8
Relative voltage drop at the series motor reactor At I_{thmax} and V_{rated}	%	23	38
Ambient temperature	°C	40	40
Connection to Motor Module/motor		Flat-type terminal	Flat-type terminal
PE connection		M6 screw	M8 screw
Degree of protection		IP00	IP00
Dimensions			
• Width	mm	225	410
• Height	mm	210	385
• Depth	mm	115	174
Weight, approx.	kg	16	68
Approvals, according to		cURus	cURus
Suitable for Motor Module in booksize format	Type	6SL3120-... 6SL3121-... 6SL3126-... 6SL3125-...	6SL3120-... 6SL3121-... 6SL3126-... 6SL3125-...

Overview

Braking Module

A Braking Module and the matching external braking resistor are required to bring drives to a controlled standstill in the event of a power failure (e.g. emergency retraction or EMERGENCY STOP category 1) or limit the DC link voltage for brief periods of generator operation, e.g. when the regenerative feedback capability of the Line Module is deactivated. The Braking Module includes the power electronics and the associated control circuit. During operation, the DC link power is converted into heat loss in an external braking resistor. Braking Modules function autonomously.

Braking Modules in booksize format can also be used for rapid discharge of the DC link.

Design

The Braking Module in booksize format features the following connections and interfaces as standard:

- 2 DC link connections via integrated DC link busbars
- 2 electronics power supply connections via integrated 24 V DC bars
- Terminals for connecting the braking resistor
- 2 digital inputs (disable Braking Module/acknowledge faults and rapid discharge of DC link)
- 2 digital outputs (Braking Module disabled and prewarning – $I \times t$ monitoring)
- 2 PE/protective conductor connections

The status of the Braking Module is indicated via two 2-color LEDs.

Technical specifications

Product name	Braking Module in booksize format
Internal air cooling	6SL3100-1AE31-0AB1
DC link voltage 510 … 720 V DC	
Rated power P_{DB}	1.5 kW[1)]
Peak power P_{max}	100 kW[1)]
Activation threshold	770 V
Cable length To braking resistor, max.	10 m
DC link capacitance	110 µF
Current requirement at 24 V DC, max.	0.5 A
Digital inputs in accordance with IEC 61131-2 Type 1	
• Voltage	-3 V … +30 V
• Low level (an open digital input is interpreted as "low")	-3 V … +5 V
• High level	15 … 30 V
• Current consumption at 24 V DC, typ.	10 mA
• Conductor cross-section, max.	1.5 mm²
Digital outputs (sustained short-circuit proof)	
• Voltage	24 V DC
• Load current per digital output, max.	100 mA
• Conductor cross-section, max.	1.5 mm²
Current carrying capacity	
• 24 V DC busbars	20 A
• DC link busbars	100 A
PE connection	M5 screw
Dimensions	
• Width	50 mm
• Height	380 mm
• Depth, with spacer (included in scope of supply)	270 mm
Weight, approx.	4.1 kg
Approvals, according to	cURus

Selection and ordering data

Description	Article No.
Braking Module in booksize format	**6SL3100-1AE31-0AB1**
Accessories for re-ordering	
Warning labels in 30 languages This set of foreign language warning labels can be placed on top of the standard German or English signs. A set of labels is supplied with the units. One sign in each of the following languages is provided in each set: BG, CN, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, JP, KR, LT, LV, MT, NL, NO, PL, PT, RO, RU, SE, SI, SK, TR	**6SL3166-3AB00-0AA0**

1) Several Braking Modules can be operated in parallel, typically up to 4 Modules

Overview

Braking resistor

The excess energy of the DC link is dissipated in the braking resistor.

The corresponding braking resistor is connected to a Braking Module or Basic Line Module. The braking resistor is positioned outside the cabinet or switchgear room. This arrangement enables the resulting heat losses to be dissipated, thereby allowing a reduction in the level of air conditioning required.

Selection and ordering data

Rated/peak power		**Braking resistor**
kW	Suitable for	Article No.
DC link voltage 510 … 720 V DC		
0.3 kW/25 kW	Braking Module 6SL3100-1AE31-0AB1	**6SN1113-1AA00-0DA0**
1.5 kW/100 kW	Braking Module 6SL3100-1AE31-0AB1	**6SL3100-1BE31-0AA0**
5 kW/30 kW	Basic Line Module 20 kW 6SL3130-1TE22-0AA0	**6SE7023-2ES87-2DC0**
12.5 kW/75 kW	Basic Line Module 40 kW 6SL3130-1TE24-0AA0	**6SE7028-0ES87-2DC0**

Technical specifications

Product name		Braking resistor for Braking Module in booksize and booksize compact formats			
		6SN1113-1AA00-0DA0		6SL3100-1BE31-0AA0	
DC link voltage 510 V … 720 V DC					
Resistance	Ω	17		5.7	
Rated power P_{DB}	kW	0.3		1.5	
Peak power P_{max}	kW	25		100	
Load duration for peak power t_a	s	0.1	0.4	1	2
Cycle duration of braking duty cycle t	s	11.5	210	68	460
Degree of protection		IP54 Braking resistor with connected 1.5 mm^2 cable (shielded), 3 m long		IP20	
Dimensions					
• Width	mm	80		193	
• Height	mm	210		410	
• Depth	mm	53		240	
Weight, approx.	kg	3.4		5.6	
Approvals, according to		cULus		–	

Product name		Braking resistor	
		6SE7023-2ES87-2DC0	6SE7028-0ES87-2DC0
DC link voltage 510 V … 720 V DC			
Resistance	Ω	20	8
Rated power P_{DB}	kW	5	12.5
Peak power P_{max}	kW	30	75
Load duration for peak power t_a	s	15	15
Cycle duration of braking duty cycle t	s	90	90
Degree of protection		IP20	IP20
Power connections		M6 screw stud	M6 screw stud
PE connection		M6 screw stud	M8 screw stud
Thermostatic switch (NC contact)		Screw-type terminals	Screw-type terminals
• Switching capacity		250 V AC/max. 10 A 42 V DC/0.2 A	250 V AC/max. 10 A 42 V DC/0.2 A
• Conductor cross-section	mm^2	2.5	2.5
Dimensions			
• Width	mm	430	740
• Height	mm	485	485
• Depth	mm	305	305
Weight, approx.	kg	14	22
Approvals, according to		UL, CSA	UL, CSA
Suitable for			
Basic Line Module in booksize format	Type	6SL3130-1TE22-0AA0	6SL3130-1TE24-0AA0
Braking Module in booksize compact format	Type	6SL3400-1AE31-0AA0	–

4

Overview

Capacitor Module

The Capacitor Module is used to increase the DC link capacitance to bridge momentary power losses.

The Capacitor Module is connected to the DC link voltage via the integrated DC link busbars. The Capacitor Module functions autonomously.

Several Capacitor Modules can be operated in parallel.

Design

Capacitor Modules feature the following connections and interfaces as standard:

- 2 DC link connections via integrated DC link busbars
- 2 PE/protective conductor connections

Technical specifications

Product name	Capacitor Module
Internal air cooling	6SL3100-1CE14-0AA0
DC link voltage 510 … 720 V DC	
Capacitance	4000 µF
Current carrying capacity	
• 24 V DC busbars	20 A
• DC link busbars	100 A
PE connection	M5 screw
Dimensions	
• Width	100 mm
• Height	380 mm
• Depth, with spacer (included in scope of supply)	270 mm
Weight, approx.	7.2 kg
Approvals, according to	cULus

Selection and ordering data

Description	Article No.
Capacitor Module	**6SL3100-1CE14-0AA0**
Accessories for re-ordering	
Warning labels in 30 languages This set of foreign language warning labels can be placed on top of the standard German or English signs. A set of labels is supplied with the units. One sign in each of the following languages is provided in each set: BG, CN, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, JP, KR, LT, LV, MT, NL, NO, PL, PT, RO, RU, SE, SI, SK, TR	**6SL3166-3AB00-0AA0**

Overview

Control Supply Module

The Control Supply Module in booksize format provides a 24 V to 28.8 V DC power supply that can be set using an integrated potentiometer via the line or DC link. The Control Supply Module can either be operated individually or in a parallel connection with a maximum of 10 devices.
A DIP switch on the top of the module is used to change over in the deenergized state (details of connection for parallel operation are given in the Manual for booksize modules).

Using the Control Supply Module, it possible, for example, to make emergency retraction movements in the event of a supply failure, provided that the DC link voltage is available.

Design

Control Supply Modules feature the following connections and interfaces as standard:

- 1 power connection
- 2 DC link connections via integrated DC link busbars
- 2 electronics power supply connections via integrated 24 V DC bars
- 1 connection for the electronics power supply for Control Units, Terminal Modules, Sensor Modules, etc., via the 24 V terminal adapter provided in the scope of supply (max. cross-section 6 mm^2, max. fuse protection 20 A)
- 1 integrated potentiometer for setting the output voltage
- 1 digital output to signal the error-free state
- 1 DIP switch to change over between single and parallel mode
- 2 PE/protective conductor connections

The status of the Control Supply Modules is indicated via two multi-color LEDs.

Technical specifications

Product name	Control Supply Module in booksize format
Internal air cooling	6SL3100-1DE22-0AA1
DC link voltage 510 … 720 V DC	
Line voltage 380 … 480 V 3 AC	
Rated input current	
• At 400 V 3 AC	≤ 2 A
• At 600 V DC	1.1 A
DC link voltage range	300 … 882 V DC (operation in 300 … 430 V DC range is permitted temporarily for < 1 min)
Radio interference suppression (standard)	Category C2 to EN 61800-3
Rated output voltage	24 V ... 28.8 V DC (adjustable via potentiometer)
Rated output current	20 A
Current carrying capacity	
• 24 V DC busbars	20 A
• DC link busbars	100 A
Line connection L1, L2, L3 (X1)	Screw-type terminals
• Conductor cross-section	0.2 … 4.0 mm^2
PE connection	M5 screw
Dimensions	
• Width	50 mm
• Height	380 mm
• Depth, with spacer (included in scope of supply)	270 mm
Weight, approx.	4.8 kg
Approvals, according to	cULus

Selection and ordering data

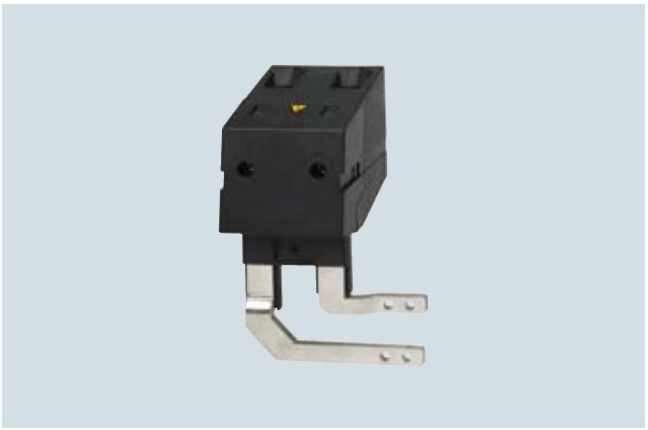
Description	Article No.
Control Supply Module in booksize format	**6SL3100-1DE22-0AA1**
Accessories for re-ordering	
Warning labels in 30 languages This set of foreign language warning labels can be placed on top of the standard German or English signs. A set of labels is supplied with the units. One sign in each of the following languages is provided in each set: BG, CN, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, JP, KR, LT, LV, MT, NL, NO, PL, PT, RO, RU, SE, SI, SK, TR	**6SL3166-3AB00-0AA0**

4

Overview

DC link rectifier adapter

DC link rectifier adapter for unit widths of 50 mm ... 100 mm



DC link rectifier adapter for unit widths of 150 mm ... 300 mm

If the internal DC link busbars of the Motor Modules are not used, the DC link voltage must be supplied externally through a DC link rectifier adapter, e.g. when devices of booksize format are coupled with devices of chassis format over an external DC busbar. The DC link rectifier adapter is mounted on the DC link busbars of the Motor Module. The DC link cables are routed from above.

DC link adapter

DC link adapter (multi-tier) for all unit widths

If a multi-tier Motor Module configuration is used, a DC link adapter can be provided for linking the DC links of two drive line-ups. The DC link adapter is mounted sideways on the DC link busbars of the Motor Module. It can be mounted on the right or left side of the Motor Module. The identification of the poles (DCN and DCP) on the DC link adapter changes in accordance with the mounting position. The DC link cables are routed from behind. The DC link adapter (multi-tier) cannot be used in combination with the reinforced DC link rails for the Motor Modules ≤ 100 mm in width. DC link adapters are supplied in sets of 2 units.

Selection and ordering data

Description	Article No.
DC link rectifier adapter For direct infeed of DC link voltage For Line Modules and Motor Modules in booksize and booksize compact format	
• 50 mm, 75 mm and 100 mm wide	**6SL3162-2BD00-0AA0**
• 150 mm, 200 mm and 300 mm wide	**6SL3162-2BM00-0AA0**
DC link adapter set (2 units) For multi-tier configuration For all Line Modules and Motor Modules in booksize and booksize compact format	**6SL3162-2BM01-0AA0**

Technical specifications

Product name		DC link rectifier adapter		DC link adapter
		6SL3162-2BD00-0AA0	6SL3162-2BM00-0AA0	6SL3162-2BM01-0AA0
Connection		Screw-type terminals	Screw-type terminals	Screw-type terminals
• Conductor cross-section	mm^2	0.5 … 10	35 … 95	35 … 95
Current carrying capacity	A	43	240	240
Weight, approx.	kg	0.06	0.48	0.76
Approvals, according to		cURus	cURus	cURus
Suitable for Line Modules and Motor Modules	Formats	Booksize and booksize compact	Booksize and booksize compact	Booksize and booksize compact

Overview

DMC20 DRIVE-CLiQ Hub Module

The DMC20 DRIVE-CLiQ Hub Module is used to connect direct encoders.

Design

The following are located on the DMC20 DRIVE-CLiQ Hub Module:

- 6 DRIVE-CLiQ sockets for connecting 5 DRIVE-CLiQ nodes
- 1 connection for the electronics power supply via the 24 V DC power supply connector

The status of the DMC20 DRIVE-CLiQ Hub Module is indicated via a multi-color LED.

Technical specifications

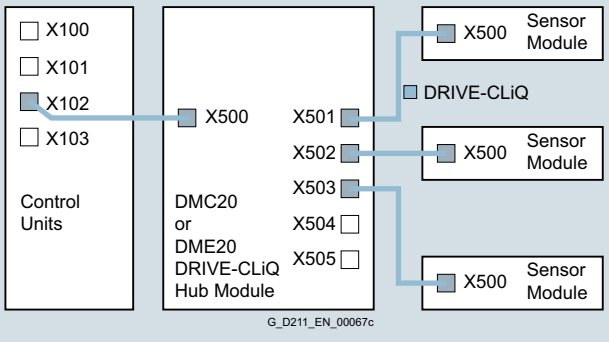
Product name	DMC20 DRIVE-CLiQ Hub Module 6SL3055-0AA00-6AA0
Current requirement, max. At 24 V DC without DRIVE-CLiQ supply	0.15 A
• Conductor cross-section, max.	2.5 mm^2
Degree of protection	IP20
Dimensions	
• Width	50 mm
• Height	150 mm
• Depth	111 mm
Weight, approx.	0.8 kg
Approvals, according to	cULus

Selection and ordering data

Description	Article No.
DMC20 DRIVE-CLiQ Hub Module Without DRIVE-CLiQ cable	**6SL3055-0AA00-6AA0**
Accessories for re-ordering	
SINAMICS/SINUMERIK/SIMOTION dust-proof blanking plugs (50 units) For DRIVE-CLiQ port	**6SL3066-4CA00-0AA0**

Integration

Signals from more than one encoder can be collected with the DRIVE-CLiQ Hub Module and forwarded to the Control Unit through a single DRIVE-CLiQ cable.



Overview

DME20 DRIVE-CLiQ Hub Module

The DME20 DRIVE-CLiQ Hub Module is used to implement a star-shaped distribution of a DRIVE-CLiQ line. Two DME20 DRIVE-CLiQ Hub Modules can be connected in series (cascaded).

Design

The following are located on the DME20 DRIVE-CLiQ Hub Module:

- 6 DRIVE-CLiQ sockets for connecting 5 DRIVE-CLiQ nodes
- 1 connection for the electronics power supply via the 24 V DC circular power supply connector with conductor cross-section 4 × 0.75 mm^2 (pins 1+2 internally bridged; pins 3+4 internally bridged)

Technical specifications

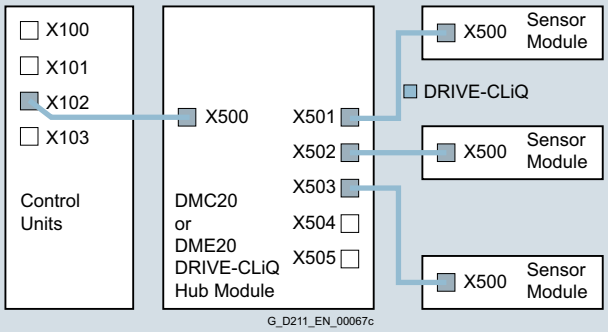
Product name	DME20 DRIVE-CLiQ Hub Module 6SL3055-0AA00-6AB0
Current requirement, max. At 24 V DC without DRIVE-CLiQ supply	0.15 A
• Conductor cross-section, max.	4 × 0.75 mm^2
Degree of protection	IP67
Dimensions	
• Width	99 mm
• Height	149 mm
• Depth	55.7 mm (without connector)
Weight, approx.	0.8 kg
Approvals, according to	cULus

Selection and ordering data

Description	Article No.
DME20 DRIVE-CLiQ Hub Module Without DRIVE CLiQ cable; without electronics power supply cable and circular connector for 24 V DC	**6SL3055-0AA00-6AB0**
Accessories	
24 V DC power supply cable	Order and delivery Phoenix Contact www.phoenixcontact.com
• Shielded connector, 5-pole, user-assembled	Part No. 1508365
• 4-pole non-shielded connector, user-assembled, Speedcon quick-lock	Part No. 1521601
Accessories for re-ordering	
SINAMICS dust-proof blanking plugs IP67 (6 units) For DRIVE-CLiQ port	**6SL3066-4CA01-0AA0**

Integration

Signals from more than one encoder can be collected with the DRIVE-CLiQ Hub Module and forwarded to the Control Unit through a single DRIVE-CLiQ cable.



Overview

TM54F Terminal Module

The TM54F Terminal Module is a dual-processor I/O interface with 4 fail-safe digital outputs and 10 fail-safe digital inputs for utilization of the Safety Integrated functions of the SINAMICS S120 drive system over external actuators and sensors.

Every available safety function integrated in the drive can be controlled via the fail-safe digital inputs of the TM54F Terminal Module. In cases where the parameterized safety functions of several drives operated together on a SINUMERIK 828D BASIC, SINUMERIK 828D, CU320-2 or SIMOTION D4x5-2 are to be executed together, the relevant drives can be combined into groups in the TM54F Terminal Module. This has the advantage that only one fail-safe digital input needs to be connected for these drives.

The fail-safe digital inputs and outputs have two channels with internal cross-over data comparison using the two processors. A fail-safe digital output consists of one P-switching and one M-switching output as well as one digital input to read back the switching state. A fail-safe digital input comprises two digital inputs.

Safety sensors can be connected over two switchable 24 V sensor supplies and can be evaluated over the fail-safe digital inputs. The switchable 24 V sensor supply ensures that the fail-safe digital inputs can be dynamized to detect dormant errors (this dynamization is used to check the shutdown paths). An un-switchable 24 V sensor supply is additionally provided by the TM54F Terminal Module for connecting undynamizable safety sensors.

Design

The following are located on the TM54F Terminal Module:

- 4 fail-safe digital outputs
- 10 fail-safe digital inputs
- 4 LEDs, single-color for indicating the status of the read back channel of the fail-safe digital outputs
- 4 LEDs, dual-color for indicating the status of the fail-safe digital outputs
- 20 LEDs, dual-color for indicating the status of the fail-safe digital inputs
- 3 LEDs, single-color for indicating the status of the 24 V sensor supplies
- 2 DRIVE-CLiQ sockets
- 2 connections for 24 V sensor supply, switchable
- 1 connection for 24 V sensor supply, not switchable
- 1 connection for the electronics power supply via the 24 V DC power supply connector
- 1 connection for the 24 V power supply to digital outputs and sensors
- 1 PE/protective conductor connection

The TM54F Terminal Module can be snapped onto a TH 35 top-hat rail in accordance with EN 60715 (IEC 60715).

The signal cable shield can be connected to the TM54F Terminal Module via a shield terminal, e.g. Phoenix Contact type SK8 or Weidmüller type KLBÜ CO 1.
The shield terminal must not be used for strain relief.

The status of the TM54F Terminal Module is indicated via a multi-color LED.

Pins for connector coding are supplied with the TM54F Terminal Module.

Note:

Only one TM54F Terminal Module can be assigned to each Control Unit. It is not permissible to make the TM54F connection via another DRIVE-CLiQ device, e.g. a Motor Module or Line Module.

Integration

The TM54F Terminal Module receives its control information via DRIVE-CLiQ from:

- SINUMERIK 828D BASIC
- SINUMERIK 828D
  - Numeric Control Extensions NX10.3

Selection and ordering data

Description	Article No.
TM54F Terminal Module Without DRIVE-CLiQ cable	**6SL3055-0AA00-3BA0**
Accessories for re-ordering	
SINAMICS/SINUMERIK/SIMOTION dust-proof blanking plugs (50 units) For DRIVE-CLiQ port	**6SL3066-4CA00-0AA0**

Technical specifications

Product name	TM54F Terminal Module 6SL3055-0AA00-3BA0
Current requirement (X524 at 24 V DC) without DRIVE-CLiQ supply	0.2 A
• Conductor cross-section, max.	2.5 mm^2
• Fuse protection, max.	20 A
Current requirement ext. 24 V DC, max. For supplying the digital outputs and 24 V sensor supply (X514 at 24 V DC)	4 A
• Conductor cross-section, max.	2.5 mm^2
• Fuse protection, max.	20 A
I/Os	
• Number of fail-safe digital inputs	10
• Number of fail-safe digital outputs	4
• 24 V sensor supply	3, of which 2 can be internally shut down temporarily for dynamizing fail-safe digital inputs, current carrying capacity of each is 0.5 A
• Connection method	Plug-in screw-type terminals
• Conductor cross-section, max.	1.5 mm^2
Digital inputs According to IEC 61131-2 Type 1, with isolation	
• Voltage	-3 … +30 V
• Low level (an open digital input is interpreted as low)	-3 … +5 V
• High level	15 … 30 V
• Current consumption at 24 V DC, typ.	> 2 mA
• Delay time of digital inputs, approx.[1]	
- L → H, typ.	30 µs
- H → L, typ.	60 µs
• Safe state	Low level (for inputs that can be inverted: without inversion)

Product name	TM54F Terminal Module 6SL3055-0AA00-3BA0
Digital outputs	Sustained short-circuit proof
• Voltage	24 V DC
• Load current per fail-safe digital output, max.[2]	0.5 A
• Delay times (resistive load)[1]	
- L → H, typ.	300 µs
- H → L, typ.	350 µs
• Safe state	Output switched off
Scanning cycle t_{SI} For fail-safe digital inputs or fail-safe digital outputs	4 ... 25 ms (adjustable)
PE connection	M4 screw
Dimensions	
• Width	50 mm
• Height	150 mm
• Depth	111 mm
Weight, approx.	0.9 kg
Approvals, according to	cULus
Safety Integrated	Safety Integrity Level 2 (SIL2) acc. to IEC 61508, Performance Level d (PLd) acc. to ISO 13849-1, Control Category 3 acc. to ISO 13849-1 or EN 954-1.

[1] The specified delay times refer to the hardware. The actual reaction time depends on the time slice in which the digital input/output is processed.

[2] The total current of all fail-safe digital outputs must not exceed 5.33 A.

Overview

SMC20 Sensor Module Cabinet-Mounted

The SMC20 Sensor Module Cabinet-Mounted is required to evaluate the encoder signals of motors without a DRIVE-CLiQ interface. External encoders can also be connected via the SMC20.

The following encoder signals can be evaluated:

- Incremental encoder sin/cos 1 V_{pp}
- Absolute encoder EnDat 2.1
- SSI encoder with incremental signals sin/cos 1 V_{pp} (firmware V2.4 and later)

The motor temperature can also be detected with KTY84-130 or PTC thermistors.

Design

The SMC20 Sensor Module Cabinet-Mounted features the following connections and interfaces as standard:

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

The status of the SMC20 Sensor Module Cabinet-Mounted is indicated via a multi-color LED.

The SMC20 Sensor Module Cabinet-Mounted can be snapped onto a TH 35 top-hat rail according to EN 60715 (IEC 60715).

The signal cable shield is connected via the encoder system connector and can also be connected to the SMC20 Sensor Module Cabinet-Mounted via a shield terminal, e.g. Phoenix Contact type SK8 or Weidmüller type KLBÜ CO 1.

Integration

SMC20 Sensor Modules Cabinet-Mounted communicate with a Control Unit via DRIVE-CLiQ.

Technical specifications

Product name	SMC20 Sensor Module Cabinet-Mounted 6SL3055-0AA00-5BA3
Current requirement, max. At 24 V DC, without taking encoder into account	0.2 A
• Conductor cross-section, max.	2.5 mm^2
• Fuse protection, max.	20 A
Power loss, max.	10 W
Encoders which can be evaluated	• Incremental encoder sin/cos 1 V_{pp} • Absolute encoder EnDat • SSI encoder with incremental signals sin/cos 1 V_{pp} (firmware V2.4 and later)
• Encoder supply	5 V DC/0.35 A
• Encoder frequency incremental signals, max.	500 kHz
• Signal subdivision (interpolation), max.	16384 times (14 bit)
• SSI baud rate	100 kBaud
• Cable length to encoder, max.	100 m
PE connection	M4 screw
Dimensions	
• Width	30 mm
• Height	150 mm
• Depth	111 mm
Weight, approx.	0.45 kg
Approvals, according to	cULus

Selection and ordering data

Description	Article No.
SMC20 Sensor Module Cabinet-Mounted Without DRIVE-CLiQ cable	**6SL3055-0AA00-5BA3**

4

Overview

SMC30 Sensor Module Cabinet-Mounted

The SMC30 Sensor Module Cabinet-Mounted is required to evaluate the encoder signals of motors without a DRIVE-CLiQ interface. External encoders can also be connected via the SMC30.

The following encoder signals can be evaluated:

- Incremental encoder TTL/HTL with/without open-circuit detection (open-circuit detection is only available with bipolar signals)
- SSI encoder with TTL/HTL incremental signals
- SSI encoder without incremental signals

The motor temperature can also be detected with KTY84-130 or PTC thermistors.

Design

The SMC30 Sensor Module Cabinet-Mounted features the following connections and interfaces as standard:

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

The status of the SMC30 Sensor Module Cabinet-Mounted is indicated via a multi-color LED.

The SMC30 Sensor Module Cabinet-Mounted can be snapped onto a TH 35 top-hat rail according to EN 60715 (IEC 60715).

The maximum signal cable length between SMC30 modules and encoders is 100 m. For HTL encoders, this length can be increased to 300 m if the A+/A- and B+/B- signals are evaluated and the power supply cable has a minimum cross-section of 0.5 mm^2.

The signal cable shield can be connected to the SMC30 Sensor Module Cabinet-Mounted via a shield terminal, e.g. Phoenix Contact type SK8 or Weidmüller type KLBÜ CO 1.

Integration

SMC30 Sensor Modules Cabinet-Mounted communicate with a Control Unit via DRIVE-CLiQ.

Technical specifications

Product name	SMC30 Sensor Module Cabinet-Mounted
	6SL3055-0AA00-5CA2
Current requirement, max.	0.2 A
At 24 V DC, without taking encoder into account	
• Conductor cross-section, max.	2.5 mm^2
• Fuse protection, max.	20 A
Power loss, max.	10 W
Encoders which can be evaluated	• Incremental encoder TTL/HTL • SSI encoder with TTL/HTL incremental signals • SSI encoder without incremental signals
• Input impedance	
- TTL	570 Ω
- HTL, max.	16 mA
• Encoder supply	24 V DC/0.35 A or 5 V DC/0.35 A
• Encoder frequency, max.	300 kHz
• SSI baud rate	100 … 250 kBaud
• Limiting frequency	300 kHz
• Resolution absolute position SSI	30 bit
• Cable length, max.	
- TTL encoder	100 m (only bipolar signals permitted)[1]
- HTL encoder	100 m for unipolar signals 300 m for bipolar signals[1]
- SSI encoder	100 m
PE connection	M4 screw
Dimensions	
• Width	30 mm
• Height	150 mm
• Depth	111 mm
Weight, approx.	0.45 kg
Approvals, according to	cULus

Selection and ordering data

Description	Article No.
SMC30 Sensor Module Cabinet-Mounted Without DRIVE-CLiQ cable	**6SL3055-0AA00-5CA2**

[1] Signal cables twisted in pairs and shielded.

Overview

SMC40 Sensor Module Cabinet-Mounted

The SMC40 Sensor Module Cabinet-Mounted is required to evaluate the encoder signals of motors without a DRIVE-CLiQ interface. External encoders can also be connected via the SMC40.

The following encoder signals can be evaluated:

- Absolute encoder EnDat 2.2

Design

The SMC40 Sensor Module Cabinet-Mounted features the following connections and interfaces as standard:

- 2 DRIVE-CLiQ interfaces
- 2 encoder system interfaces
- 1 connection for the electronics power supply via the 24 V DC power supply connector
- 1 PE/protective conductor connection

The status of the SMC40 Sensor Module Cabinet-Mounted is indicated via a multi-color LED.

The SMC40 Sensor Module Cabinet-Mounted can be snapped onto a TH 35 top-hat rail according to EN 60715 (IEC 60715).

The maximum signal cable length between the SMC40 and encoder system is 100 m. The specified supply voltage of the encoder must be observed. The maximum DRIVE-CLiQ cable length is 30 m.

The signal cable shield can be connected to the SMC40 Sensor Module Cabinet-Mounted via a shield connection terminal, e.g. Phoenix Contact type SK8 or Weidmüller type KLBÜ CO 1.

Integration

SMC40 Sensor Modules Cabinet-Mounted communicate with a Control Unit via DRIVE-CLiQ.

Technical specifications

Product name	SMC40 Sensor Module Cabinet-Mounted 6SL3055-0AA00-5DA0
Current requirement, max. At 24 V DC, without taking encoder into account	0.1 A
• Conductor cross-section, max.	2.5 mm^2
• Fuse protection, max.	20 A
Power loss, max.	4 W
Encoders which can be evaluated	EnDat 2.2
PE connection	M4 screw
Dimensions	
• Width	30 mm
• Height	150 mm
• Depth	111 mm
Weight, approx.	0.45 kg
Approvals, according to	cULus

Selection and ordering data

Description	Article No.
SMC40 Sensor Module Cabinet-Mounted Without DRIVE-CLiQ cable	**6SL3055-0AA00-5DA0**

Overview

SME125 Sensor Module External

The SME125 Sensor Modules External are encoder evaluation units with degree of protection IP67, especially suitable for use in linear and torque motor applications. They can be installed close to the motor systems and encoders in the machine.

Sensor Modules External evaluate the encoder signals and motor temperature sensors specifically and convert the information obtained for DRIVE-CLiQ.
The motor temperature signals are safely electrically separated.

Neither motor nor encoder data are saved in the SME 125.
It can be operated on Control Units with firmware release V2.4 and later.

The following encoder signals can be evaluated:

- Absolute encoder EnDat 2.1
- SSI absolute encoder[1] with sin/cos 1 V_{pp} incremental signals, but without reference signal

The motor temperature can also be detected with KTY84-130 or PTC thermistors.

Design

SME125 Sensor Modules External feature the following connections and interfaces as standard:

- 1 DRIVE-CLiQ interface with integrated 24 V DC electronics power supply from the Control Unit or Motor Module
- 1 encoder connection (circular connector)
- 1 temperature sensor connection (circular connector)
- 1 PE/protective conductor connection

Technical specifications

Product name	SME125 Sensor Module External 6SL3055-0AA00-5KA3
Encoders	• Absolute encoder EnDat with 5 V power supply • SSI with incremental encoder sin/cos 1 V_{pp} with 5 V power supply
Signal subdivision (Interpolation)	≤ 16384 times (14 bit)
Max. encoder frequency that can be evaluated	≤ 500 kHz
SSI/EnDat 2.1 baud rate	100 kHz
Measuring system interface	17-pin M23 circular connector
Temperature sensor input	6-pin M17 circular connector
Output	IP67 DRIVE-CLiQ connector
Current requirement, max. At 24 V DC, without taking encoder into account	0.16 A
• Current carrying capacity of encoder supply for measuring system (at 5 V DC)	0.35 A
• Conductor cross-section	Acc. to connector contacts
• Protection	Via DRIVE-CLiQ power supply source
Power loss	≤ 4.5 W
PE connection	M4 screw/1.8 Nm
Cable length, max.	
• To measuring system[2]/ temperature sensor	3 m
• To automatic speed control	100 m
Degree of protection	IP67
Dimensions	
• Width	117.6 mm
• Height	44 mm
• Depth	127 mm
Weight, approx.	0.7 kg
Approvals, according to	cULus

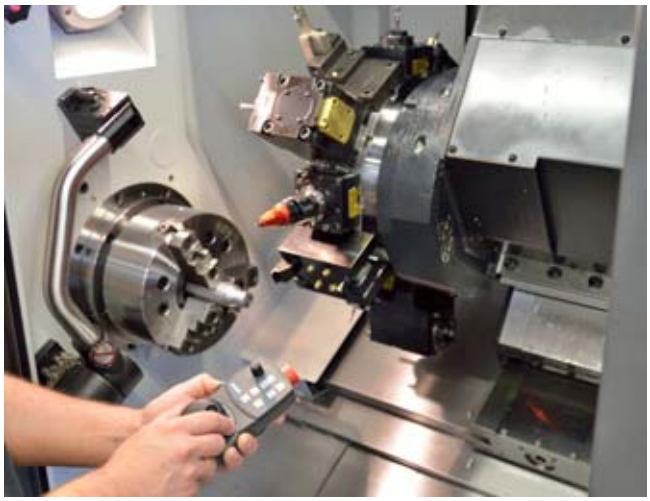
Selection and ordering data

Description	Article No.
SME125 Sensor Module External For absolute measuring systems Without DRIVE-CLiQ cable	**6SL3055-0AA00-5KA3**
Accessories	
Connector for temperature sensor input (connector kits, 6+1-pole)	**6FX2003-0SU07**
Connector for SME125 encoder system interface (connector kits, 17-pole)	**6FX2003-0SA17**

1) Only SSI encoders with 5 V supply voltage.

2) The maximum cable length for the encoder system interface depends on the current consumption of the encoder system and the cross-section of the wires in the cable. However, the maximum length is 10 m.
For further details see Manual SINAMICS S120 Control Units and Supplementary System Components.

Overview



Drive Based Safety Integrated provides integrated safety functions that support the implementation of highly effective personnel and machine protection. The safety functions comply with the requirements of Category 3 as well as Performance Level PL d according to DIN EN ISO 13849-1 and safety integrity level SIL 2 according to DIN EN 61508. Consequently, important functional safety requirements can be implemented easily and economically. The function scope includes, e.g.:

- Functions for safe monitoring of standstill
- Functions for safe monitoring of speed

Benefits

- High level of safety:
  Full implementation of the safety functions in Category 3/SIL 2/PL d
- High level of flexibility:
  Practical safety and operating concepts can be implemented
- Faster commissioning due to integrated safety functions

Function

The safety functions are available in all modes and can communicate with the process using safety-related input/output signals. These can be implemented individually for each axis and spindle. The following Safety Integrated functions are available (terms in accordance with IEC 61800-5-2):

Safety Integrated basic functions

- Safe Torque Off (STO)
  Prevention of unexpected startup by internal cancellation of the drive pulses.
- Safe Brake Control (SBC)
  Safe brake control of holding brakes which are active in the de-energized state, e.g. motor holding brakes.
- Safe Stop 1 (SS1)
  Safe stopping of the drive with subsequent prevention of unexpected startup (STO).

Function (continued)

Extended Safety Integrated functions

- Safe Operating Stop (SOS)
  Monitors drives for standstill. The drives remain fully functional for position control.
- Safe Stop 2 (SS2)
  Safe stopping of the drive with subsequent monitoring for standstill (SOS).
- Safely Limited Speed (SLS)
  Monitoring of configurable velocity limit values, e.g. during setup.
- Safe Speed Monitor (SSM)
  Safe checkback signal when a value falls below a settable speed limit, e.g. for enabling a protective door.
- Safe Acceleration Monitor (SAM)
  Safe monitoring of drive acceleration.
- Safe Direction (SDI)
  Safe monitoring of the direction of motion.

The Safety Integrated basic functions are license-free. The extended Safety Integrated functions require a software license in the form of a CNC option per axis with Safety functions.

The Safety Integrated basic functions are controlled via existing terminals on the SINAMICS S120 Combi Power Modules or the SINAMICS S120 Motor Modules in booksize compact format and the SINUMERIK 828.

A SINAMICS S120 TM54F Terminal Module is required for controlling the extended Safety Integrated functions.

We recommend the following safety relays for the configuration of the safe control logic for individual safety functions:

- SIRIUS 3SK1 safety relay for configuring a hardware link
- SIRIUS 3RK3 Modular Safety System for a graphically parameterizable solution

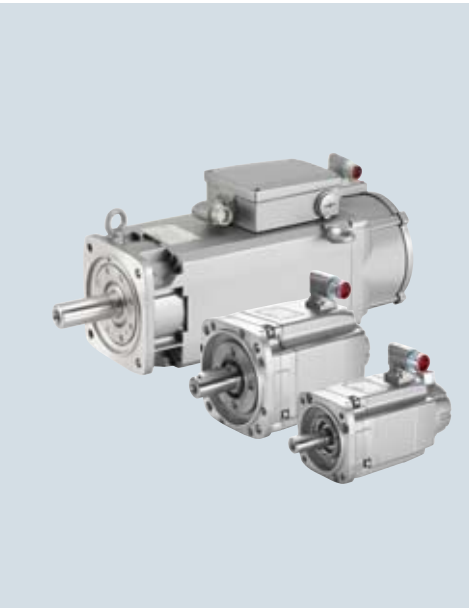
See Catalog SI 10 or Siemens Industry Mall:

www.siemens.com/industrymall

Integration

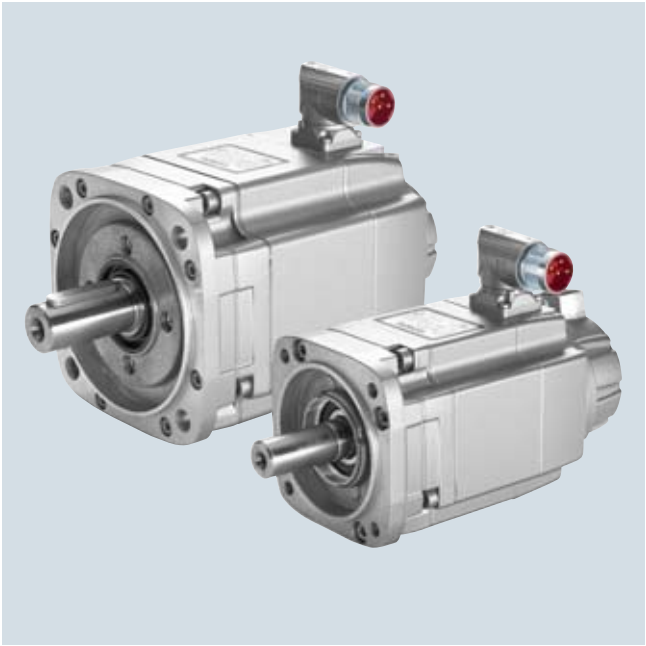
- SINUMERIK 828D BASIC
- SINUMERIK 828D
- SINAMICS S120 Combi Power Module or SINAMICS S120 Motor Module in booksize compact format
- Motors with encoders that comply with the Safety Integrated specification: SIMOTICS M-1PH8 or SIMOTICS S-1FK7 motors
- Encoder system: If you require information about the use of suitable encoder systems with SINUMERIK Safety Integrated, please contact your local Siemens office.
- Signal cables that comply with the SINAMICS S120 specification: MOTION-CONNECT connection systems
- Controlling the extended Safety Integrated functions: SINAMICS S120 TM54F Terminal Module
- CNC software license is required per axis with the extended Safety Integrated functions, see SINUMERIK 828
- 3TK28, 3SK1 or 3RK3 safety relays

Notes



SIMOTICS S-1FK7 Compact/1FK7 High Inertia synchronous motors – Natural cooling

Overview



SIMOTICS S-1FK7 feed motors in SH 63/SH 48 with DQI encoder

SIMOTICS S-1FK7 motors are compact permanent-magnet synchronous motors. 1FK7 motors can be combined with the SINAMICS S120 drive system to create a powerful system with high functionality. The motors are designed for operation without external cooling and the heat is dissipated through the motor surface. 1FK7 motors have a high overload capability.

The SIMOTICS S-1FK7 feed motors are perfectly adapted to the SINAMICS S120 Combi drive system.

Benefits

- Maximum machine dynamics thanks to optimum relation between torque and motor moment of inertia.
- Very high torque even at high speeds as a result of the special field weakening concept
- Excellent machine precision thanks to high resolution of motor encoder and high-precision shaft and flange mounting
- Very fast acceleration thanks to triple electrical overload capability
- High degree of ruggedness because encoder is mechanically decoupled from the motor shaft
- Maintenance-free absolute encoders without battery
- High energy efficiency

SIMOTICS S-1FK7 Compact motors

- Space-saving installation due to extremely high power density
- For universal applications
- Wide range of motors

SIMOTICS S-1FK7 High Inertia motors

- Robust closed-loop control properties for high or variable load moment of inertia
- Minimal optimization and commissioning overhead for the compensation of disturbances

Function

- Compact synchronous servomotors
- Torque M_0: 3 to 48 Nm
- Shaft heights: 48 to 100
- Rated speeds: 2000 to 6000 rpm
- Easily replaceable encoders with 20 bit resolution
- Electronic rating plate in motor encoder
- Naturally-cooled type of construction without fan
- Plug connection for power cable
- DRIVE-CLiQ interface for signal cable
- IP65 degree of protection

Technical specifications

Product name	SIMOTICS S-1FK7 Compact/1FK7 High Inertia synchronous motor
Type of motor	Permanent-magnet synchronous motor
Magnet material	Rare-earth magnet material
Cooling	Natural cooling
Temperature monitoring	KTY84 temperature sensor in the stator winding
Insulation of the stator winding in accordance with EN 60034-1 (IEC 60034-1)	Temperature class 155 (F) for a winding temperature rise of ΔT = 100 K at an ambient temperature of 40 °C
Type of construction in accordance with EN 60034-7 (IEC 60034-7)	IM B5 (IM V1, IM V3)
Degree of protection in accordance with EN 60034-5 (IEC 60034-5)	IP65
Shaft extension on the drive end in accordance with DIN 748-3 (IEC 60072-1)	Plain shaft/ feather key and keyway (half-key balancing)
Shaft and flange accuracy in accordance with DIN 42955 (IEC 60072-1)[1]	Tolerance N
Vibration severity in accordance with EN 60034-14 (IEC 60034-14)	Grade A is maintained up to rated speed
Sound pressure level L_{pA} (1 m) in accordance with DIN EN ISO 1680, max.	
• 1FK704	55 dB
• 1FK706	65 dB
• 1FK708/1FK710	70 dB
Connection	Connectors for signals and power, can be rotated
Paint finish	Anthracite RAL 7016
2nd rating plate	Enclosed separately
Holding brake	Without/with
Approvals, according to	cURus

Options

Order code	Description
K23	Special paint finish for "Worldwide" climate group: Primer and paint finish: Anthracite RAL 7016

When ordering a motor with options, **-Z** should be added to the Article No.

[1] Shaft extension run-out, concentricity of centering ring and shaft, and perpendicularity of flange to shaft.

SIMOTICS S-1FK7 Compact/1FK7 High Inertia synchronous motors – Natural cooling

Selection and ordering data

Static torque	Rated speed	Shaft height	Rated power	**SIMOTICS S-1FK7 synchronous motors Natural cooling**	Moment of inertia of rotor		Weight, approx.	
					Without brake	With brake	Without brake	With brake
M_0 at ΔT=100 K	n_{rated}	SH	P_{rated} at ΔT=100 K		J	J	m	m
Nm	rpm		kW	Article No.	10^{-4} kgm^2	10^{-4} kgm^2	kg	kg
1FK7 Compact								
6	3000	63	1.5	**1FK7060-2AF71-1 ■■1**	7.7	8.7	7.1	8.5
8	3000	80	2.1	**1FK7080-2AF71-1 ■■1**	14.2	17.5	10.3	13.3
8.5	3000	63	1.9	**1FK7062-2AF71-1 ■■1**	11.2	12.2	9.1	10.5
11	2000	63	1.9	**1FK7063-2AC71-1 ■■1**	14.7	15.7	11.1	12.5
	3000	63	2.3	**1FK7063-2AF71-1 ■■1**	14.7	15.7	11.1	12.5
12	2000	80	2.1	**1FK7081-2AC71-1 ■■1**	20	23.5	12.9	15.9
	3000	80	2.7	**1FK7081-2AF71-1 ■■1**	20	23.5	12.9	15.9
16	2000	80	2.6	**1FK7083-2AC71-1 ■■1**	26	29.5	15.6	18.6
	3000	80	3.3	**1FK7083-2AF71-1 ■■1**	26	29.5	15.6	18.6
18	2000	100	3.0	**1FK7100-2AC71-1 ■■1**	54	62	17.6	21
	3000	100	3.8	**1FK7100-2AF71-1 ■■1**	54	62	17.6	21
20	2000	80	3.1	**1FK7084-2AC71-1 ■■1**	32.5	35.5	18.3	21.3
	3000	80	3.1	**1FK7084-2AF71-1 ■■1**	32.5	35.5	18.3	21.3
27	2000	100	4.3	**1FK7101-2AC71-1 ■■1**	79	87	23.0	27.5
36	2000	100	5.2	**1FK7103-2AC71-1 ■■1**	104	112	28.5	33.0
48	2000	100	7.7	**1FK7105-2AC71-1 ■■1**	154	162	39.0	43.5
1FK7 High Inertia								
3	6000	48	0.9	**1FK7042-3BK71-1 ■■1**	5.1	5.4	5.1	5.8
6	3000	63	1.5	**1FK7060-3BF71-1 ■■1**	12.5	13.5	7.9	9.3
8.5	3000	63	1.9	**1FK7062-3BF71-1 ■■1**	23.5	24.5	10.7	12.1
12	3000	80	2.7	**1FK7081-3BF71-1 ■■1**	49	52	15.2	18.2
18	2000	100	3.0	**1FK7100-3BC71-1 ■■1**	87	95	19.4	22.8
20	2000	80	3.1	**1FK7084-3BC71-1 ■■1**	99	102	23.0	26.0
	3000	80	3.1	**1FK7084-3BF71-1 ■■1**	99	102	23.0	26.0
27	2000	100	4.3	**1FK7101-3BC71-1 ■■1**	127	136	25.7	30.2
	3000	100	4.9	**1FK7101-3BF71-1 ■■1**	127	136	25.7	30.2
36	2000	100	5.2	**1FK7103-3BC71-1 ■■1**	168	176	32.1	36.6
	3000	100	4.4	**1FK7103-3BF71-1 ■■1**	168	176	32.1	36.6
48	2000	100	7.7	**1FK7105-3BC71-1 ■■1**	249	258	44.4	48.9

Encoder system for motors with DRIVE-CLiQ interface

20 bit absolute encoder single-turn (AS20DQI encoder)	**Q**
20 bit absolute encoder single-turn +12 bit multi-turn (AM20DQI encoder)	**R**

Shaft extension	**Shaft and flange accuracy**	**Holding brake**	
Feather key and keyway	Tolerance N	Without	**A**
Feather key and keyway	Tolerance N	With	**B**
Plain shaft	Tolerance N	Without	**G**
Plain shaft	Tolerance N	With	**H**

Motor type (repeated)	Efficiency[1]	Stall current	**SINAMICS S120 Combi Power Module**	**SINAMICS S120 Motor Module Booksize compact format**	**Power cable with complete shield** Motor connection and brake connection via power connector	
			Rated output current	Rated output current	Power connector	Cable cross-section[2]
	η	I_0 at M_0 at ΔT=100 K	I_{rated}	I_{rated}		
	%	A	A	A	Size	mm^2
1FK7060-2AF71-...	90	4.45	5	5	1	4 × 1.5
1FK7080-2AF71-...	92	4.9	5	5	1	4 × 1.5
1FK7062-2AF71-...	91	5.3	5	5	1	4 × 1.5
1FK7063-2AC71-...	91	5.3	5	5	1	4 × 1.5
1FK7063-2AF71-...	91	8.0	9	9	1	4 × 1.5
1FK7081-2AC71-...	93	5.0	5	5	1	4 × 1.5
1FK7081-2AF71-...	93	8.7	9	9	1	4 × 1.5
1FK7083-2AC71-...	93	7.5	9	9	1	4 × 1.5
1FK7083-2AF71-...	93	10.1	12	18	1	4 × 1.5
1FK7100-2AC71-...	92	8.4	9	9	1	4 × 1.5
1FK7100-2AF71-...	92	11.1	12	18	1	4 × 1.5
1FK7084-2AC71-...	93	8.5	9	9	1	4 × 1.5
1FK7084-2AF71-...	93	12.1	12	18	1	4 × 1.5
1FK7101-2AC71-...	93	12.3	12	18	1.5	4 × 1.5
1FK7103-2AC71-...	93	14.4	–	18	1.5	4 × 1.5
1FK7105-2AC71-...	93	20.0	–	18	1.5	4 × 2.5
1FK7042-3BK71-...	89	4.4	5	5	1	4 × 1.5
1FK7060-3BF71-...	90	4.45	5	5	1	4 × 1.5
1FK7062-3BF71-...	91	5.3	5	5	1	4 × 1.5
1FK7081-3BF71-...	93	8.7	9	9	1	4 × 1.5
1FK7100-3BC71-...	92	8.4	9	9	1	4 × 1.5
1FK7084-3BC71-...	93	8.5	9	9	1	4 × 1.5
1FK7084-3BF71-...	93	12.1	12	18	1	4 × 1.5
1FK7101-3BC71-...	93	12.3	12	18	1.5	4 × 1.5
1FK7101-3BF71-...	93	18.8	–	18	1.5	4 × 2.5
1FK7103-3BC71-...	93	14.4	–	18	1.5	4 × 1.5
1FK7103-3BF71-...	93	26.0	–	30	1.5	4 × 4
1FK7105-3BC71-...	93	20.0	–	30	1.5	4 × 2.5

Information about the cables can be found under MOTION-CONNECT connection systems.

[1] Optimum efficiency in continuous duty.

[2] The current carrying capacity of the power cables complies with EN 60204-1 for installation type C, for continuous duty at an ambient air temperature of 40 °C.

SIMOTICS M-1PH8 asynchronous motors – SH 80 to SH 132 – Forced ventilation

Overview

SIMOTICS M-1PH808 spindle motor with forced ventilation

SIMOTICS M-1PH8 motors are compact squirrel-cage asynchronous motors with degree of protection IP55. SIMOTICS M-1PH8 motors have been designed specifically for use in conjunction with the SINAMICS S120 drive system. Depending on the control requirements, appropriate encoder systems are available for the motors for sensing the motor speed and indirect position.

The SIMOTICS M-1PH8 spindle motors are perfectly adapted to the SINAMICS S120 Combi drive system.

Application

- Main spindles for standard milling and turning machines
- Driven tools for standard turning machines

Benefits

- Maximum power over an extremely wide speed range as a result of intelligent winding design and optimized field-weakening and heat dissipation concept
- Very fast spindle acceleration rates and maximum cutting forces thanks to special lamination structure and high overload factor
- Long-lasting motor bearings for high radial forces with belt drives
- High degree of protection, including motor fan

Function

- Compact asynchronous spindle motors
- Spindle power: 2.8 to 12 kW
- Shaft heights: 80 to 132
- Maximum speed: 24000 rpm
- Electronic rating plate in motor encoder
- Integrated, easily replaceable fan
- Integrated terminal box for power cable
- DRIVE-CLiQ interface for signal cable
- IP55 degree of protection (including fan)
- Vibration severity grade S/A and Special/B
- High rotational accuracy
- Optimized bearing design for high cantilever forces

Technical specifications

Product name	SIMOTICS M-1PH8 motor
Cooling	Forced ventilation
Ambient temperature, permissible	-15 ... +40 °C
Temperature monitoring	KTY84 temperature sensor in the stator winding
Insulation of the stator winding in accordance with EN 60034-1 (IEC 60034-1)	For an ambient temperature of up to 40 °C
• 1PH808/1PH810/1PH813	Temperature class 180 (H)
Motor fan ratings	
• 1PH808	230 V 1 AC ± 10 %, 50 Hz 265 V 1 AC ± 10 %, 60 Hz
• 1PH810/1PH813	400 V 3 AC ± 10 %, 50 Hz 480 V 3 AC ± 10 %, 60 Hz
Encoder system, built-in	DRIVE-CLiQ interface
• 1PH8...-1D... for speeds up to 12000 rpm	22 bit incremental encoder (resolution 4194304, internal 2048 S/R) + commutation position 11 bit (IC22DQ encoder)
• 1PH8...-1U... for speeds up to 15000 rpm	20 bit incremental encoder (resolution 1048576, internal 512 S/R) without commutation position (IN20DQ encoder)
• 1PH8...-1S... for speeds up to 24000 rpm	19 bit incremental encoder (resolution 524288, internal 256 S/R) without commutation position (IN19DQ encoder)
Sound pressure level L_{pA} (1 m) in accordance with EN ISO 1680 Tolerance + 3 dB	Rated pulse frequency of 4 kHz and speed range up to 5000 rpm
• 1PH808/1PH810/1PH813	70 dB
Connection	
• 1PH808/1PH810/1PH813	Terminal box top/cable entry from right/signal connection DE
• Fan	
- 1PH808	Power connector
- 1PH810/1PH813	Terminals in terminal box
• Encoder system	Connector for signals (without mating connector) or DRIVE-CLiQ
Vibration severity	In accordance with Siemens/EN 60034-14 (IEC 60034-14)
Shaft and flange accuracy[1]	In accordance with Siemens/DIN 42955 (IEC 60072-1)
Degree of protection in accordance with EN 60034-5 (IEC 60034-5)	
• 1PH808/1PH810/1PH813	IP55
• Fan	IP55
Rating plate	1 unit attached to motor 1 unit supplied loose in terminal box
Paint finish	Anthracite RAL 7016
Approvals, according to	cURus

Terminal box assignment, max. connectable conductor cross-sections

1PH8 motor Forced ventilation		Terminal box	Cable entry		Outer cable diameter, max.[2]	Number of main terminals	Cross-section per terminal, max.	Rated current, max.[3]
Type		Type	Power	External signals	mm		mm^2	A
1PH808		gk803	1 × M25 × 1.5	1 × Ø 22 mm[4]	20	Phases: 3 × M5 Grounding: 2 × M5	1 × 10	50
1PH810		gk813	1 × M32 × 1.5	1 × Ø 22 mm[4]	24.2	Phases: 3 × M5 Grounding: 2 × M5	1 × 16	66
1PH810	Star/ delta	gk826	1 × M32 × 1.5	1 × Ø 22 mm[4]	24.2	Phases: 6 × M5 Grounding: 2 × M5	1 × 10	50
1PH813		gk833	1 × M40 × 1.5	1 × Ø 22 mm[4]	32	Phases: 3 × M6 Grounding: 2 x M6	1 × 35	104

[1] Shaft extension run-out, concentricity of centering ring and shaft, and perpendicularity of flange to shaft.
[2] Dependent on the design of the metric cable gland.
[3] Current-carrying capacity based on EN 60204-1 and IEC 60364-5-52 according to installation type C.
[4] Hole with Ø 22 mm, 90° to signal connection.

SIMOTICS M-1PH8 asynchronous motors – SH 80 to SH 132 – Forced ventilation

Selection and ordering data

Rated speed	Continuous speed, max.	Rated power S1 duty	Rated torque	Static torque	**SIMOTICS M-1PH8 asynchronous motor** **Forced ventilation DE → NDE** **Terminal box top**	Efficiency	Moment of inertia	Weight, approx.
n_{rated} rpm	n_{max1} rpm	P_{rated} kW	M_{rated} Nm	M_0 Nm	Article No.	η %	J kgm^2	m kg
Shaft height SH 80 – Line voltage 400 V 3 AC								
1500	10000	**2.8**	18	21	**1PH8083-1DF0 ■ - ■ HA1**	80.9	0.0064	32
1500	12000	**2.8**	18	21	**1PH8083-1DF0 ■ - ■ LA1**	80.9	0.0064	32
2000	10000	**3.7**	18	21	**1PH8083-1DG0 ■ - ■ HA1**	83.2	0.0064	32
2000	15000	**3.7**	18	21	**1PH8083-1UG0 ■ - ■ LA1**	83.2	0.0064	32
2000	17000	**3.7**	18	21	**1PH8083-1SG0 ■ - ■ MA1**	83.2	0.0064	32
3000	10000	**4.1**	13	21	**1PH8083-1DM0 ■ - ■ HA1**	86.9	0.0064	32
3000	15000	**4.1**	13	21	**1PH8083-1UM0 ■ - ■ LA1**	86.9	0.0064	32
3000	20000	**4.1**	13	21	**1PH8083-1SM0 ■ - ■ MA1**	86.9	0.0064	32
4500	10000	**4.8**	10	19	**1PH8083-1DN0 ■ - ■ HA1**	86.4	0.0064	32
4500	15000	**4.8**	10	19	**1PH8083-1UN0 ■ - ■ LA1**	86.4	0.0064	32
4500	20000	**4.8**	10	19	**1PH8083-1SN0 ■ - ■ MA1**	86.4	0.0064	32
1500	10000	**3.7**	24	27	**1PH8087-1DF0 ■ - ■ HA1**	81.7	0.0089	39
1500	14000	**3.7**	24	27	**1PH8087-1UF0 ■ - ■ LA1**	81.7	0.0089	39
2000	10000	**4.9**	23	27	**1PH8087-1DG0 ■ - ■ HA1**	85.3	0.0089	39
2000	15000	**4.9**	23	27	**1PH8087-1UG0 ■ - ■ LA1**	85.3	0.0089	39
2000	18000	**4.9**	23	27	**1PH8087-1SG0 ■ - ■ MA1**	85.3	0.0089	39
3000	10000	**4.8**	15	27	**1PH8087-1DM0 ■ - ■ HA1**	87.1	0.0089	39
3000	15000	**4.8**	15	27	**1PH8087-1UM0 ■ - ■ LA1**	87.1	0.0089	39
3000	20000	**4.8**	15	27	**1PH8087-1SM0 ■ - ■ MA1**	87.1	0.0089	39
4500	10000	**5.8**	12	25	**1PH8087-1DN0 ■ - ■ HA1**	86.8	0.0089	39
4500	15000	**5.8**	12	25	**1PH8087-1UN0 ■ - ■ LA1**	86.8	0.0089	39
4500	20000	**5.8**	12	25	**1PH8087-1SN0 ■ - ■ MA1**	86.8	0.0089	39

Type of construction	
IM B3 (IM V5, IM V6)	**0**
IM B5 (IM V1, IM V3)	**2**

Shaft extension DE	**Balancing**
Plain shaft	–
Feather key	Full-key
Feather key	Half-key

		Bearing version	**Vibration severity acc. to Siemens [1]/ EN 60034-14**	**Shaft and flange accuracy**
0	**H**	Standard	S/A	R
1	**L**	Performance	SPECIAL/B	SPECIAL
2	**M**	High Performance	SPECIAL/B	SPECIAL

Motor is part of Quick Packages.

[1] For definition of the vibration severity according to Siemens, see the 1PH8 Configuration Manual.

Motor type (repeated)	Rated current for S1 duty	Stall current	**SINAMICS S120 Combi**					
			Rated output current for S1 duty	**3-axis Power Modules**			**4-axis Power Modules**	
				Article No.			Article No.	
	I_{rated} A	I_0 A	I_{rated} A	**6SL3111-3VE21-6FA0**	**6SL3111-3VE21-6EA0**	**6SL3111-3VE22-0HA0**	**6SL3111-4VE21-6FA0**	**6SL3111-4VE21-6EA0**	**6SL3111-4VE22-0HA0**
1PH8083-1.F...	**7.5**	8	9	O	O/●	O/●	O/●	O/●	O/●
1PH8083-1.F...	**7.5**	8	9	O	O/●	O/●	O/●	O/●	O/●
1PH8083-1.G...	**11.6**	12	12	O	O	O	O	O	O/●
1PH8083-1.G...	**11.6**	12	12	O	O	O	O	O	O/●
1PH8083-1.G...	**11.6**	12	12	O	O	O	O	O	O/●
1PH8083-1.M...	**13.6**	17	18	O	O	O	O	O	O/●[2]
1PH8083-1.M...	**13.6**	17	18	O	O	O	O	O	O/●[2]
1PH8083-1.M...	**13.6**	17	18	O	O	O	O	O	O/●[2]
1PH8083-1.N...	**17**	23	18	✓	O	O	✓	O	O
1PH8083-1.N...	**17**	23	18	✓	O	O	✓	O	O
1PH8083-1.N...	**17**	23	18	✓	O	O	✓	O	O
1PH8087-1.F...	**10**	11	12	O	O/●[2]	O/●[2]	O/●[2]	O/●[2]	O/●
1PH8087-1.F...	**10**	11	12	O	O/●[2]	O/●[2]	O/●[2]	O/●[2]	O/●
1PH8087-1.G...	**14.1**	15	18	O	O	O	O	O	O
1PH8087-1.G...	**14.1**	15	18	O	O	O	O	O	O
1PH8087-1.G...	**14.1**	15	18	O	O	O	O	O	O
1PH8087-1.M...	**17.3**	23	18	✓	O	O	✓	O	O
1PH8087-1.M...	**17.3**	23	18	✓	O	O	✓	O	O
1PH8087-1.M...	**17.3**	23	18	✓	O	O	✓	O	O
1PH8087-1.N...	**19.5**	28	30	✓[2]	O	O	✓[2]	O	O
1PH8087-1.N...	**19.5**	28	30	✓[2]	O	O	✓[2]	O	O
1PH8087-1.N...	**19.5**	28	30	✓[2]	O	O	✓[2]	O	O

✓ Perfectly suited as main spindle
O Suitable as main spindle
● Perfectly suited as driven tool
– Not suitable

Options

Order code	Description
K23	Special paint finish for "Worldwide" climate group: Primer and paint finish: Anthracite RAL 7016

When ordering a motor with options, **-Z** should be added to the Article No.

[2] With derating.

SIMOTICS M-1PH8 asynchronous motors – SH 80 to SH 132 – Forced ventilation

Selection and ordering data

Rated speed	Continuous speed, max.	Rated power S1 duty	Rated torque	Static torque	**SIMOTICS M-1PH8 asynchronous motor** **Forced ventilation DE → NDE** **IP55 degree of protection** **Terminal box top**	Efficiency	Moment of inertia	Weight, approx.
n_{rated} rpm	n_{max1} rpm	P_{rated} kW	M_{rated} Nm	M_0 Nm	Article No.	η %	J kgm^2	m kg
Shaft height SH 100 – Line voltage 400 V 3 AC								
1500	9000	**3.7**	24	29	**1PH8101-1DF0 ■ - ■ HA1**	83.5	0.0138	42
1500	12000	**3.7**	24	29	**1PH8101-1DF0 ■ - ■ LA1**	83.5	0.0138	42
1000	9000	**3.7**	35	38	**1PH8103-1DD0 ■ - ■ HA1**	81.4	0.0172	51
1000	12000	**3.7**	35	38	**1PH8103-1DD0 ■ - ■ LA1**	81.4	0.0172	51
1500	9000	**5.5**	35	38	**1PH8103-1DF0 ■ - ■ HA1**	85.2	0.0172	51
1500	12000	**5.5**	35	38	**1PH8103-1DF0 ■ - ■ LA1**	85.2	0.0172	51
2000	9000	**7**	33	38	**1PH8103-1DG0 ■ - ■ HA1**	87.7	0.0172	51
2000	12000	**7**	33	38	**1PH8103-1DG0 ■ - ■ LA1**	87.7	0.0172	51
3000	9000	**8.4**	27	38	**1PH8103-1DM0 ■ - ■ HA1**	90.0	0.0172	51
3000	12000	**8.4**	27	38	**1PH8103-1DM0 ■ - ■ LA1**	90.0	0.0172	51
1500	9000	**7**	45	52	**1PH8105-1DF0 ■ - ■ HA1**	86.7	0.0252	65
1500	12000	**7**	45	52	**1PH8105-1DF0 ■ - ■ LA1**	86.7	0.0252	65
1000	9000	**6.3**	60	63	**1PH8107-1DD0 ■ - ■ HA1**	83.4	0.0289	73
1000	12000	**6.3**	60	63	**1PH8107-1DD0 ■ - ■ LA1**	83.4	0.0289	73
1500	9000	**9**	57	63	**1PH8107-1DF0 ■ - ■ HA1**	86.9	0.0289	73
1500	12000	**9**	57	63	**1PH8107-1DF0 ■ - ■ LA1**	86.9	0.0289	73
2000	9000	**10.5**	50	63	**1PH8107-1DG0 ■ - ■ HA1**	89.7	0.0289	73
2000	12000	**10.5**	50	63	**1PH8107-1DG0 ■ - ■ LA1**	89.7	0.0289	73
Shaft height SH 100 – Line voltage 400 V 3 AC – Star-delta circuit								
1500/4000	9000	**3.7/3.7**	24/9	29/19	**1PH8101-1DS0 ■ - ■ HA1**	83.0/89.0	0.0138	42
1500/4000	12000	**3.7/3.7**	24/9	29/19	**1PH8101-1DS0 ■ - ■ LA1**	83.0/89.0	0.0138	42
1500/4000	18000	**3.7/3.7**	24/9	29/19	**1PH8101-1SS0 ■ - ■ MA1**	83.0/89.0	0.0138	42
1500/4000	9000	**7.5/7.5**	48/18	55/36	**1PH8105-1DS0 ■ - ■ HA1**	86.4/90.7	0.0252	65
1500/4000	12000	**7.5/7.5**	48/18	55/36	**1PH8105-1DS0 ■ - ■ LA1**	86.4/90.7	0.0252	65
1500/4000	18000	**7.5/7.5**	48/18	55/36	**1PH8105-1SS0 ■ - ■ MA1**	86.4/90.7	0.0252	65
1500/4000	9000	**8.5/8.5**	54/20	63/42	**1PH8107-1DS0 ■ - ■ HA1**	86.1/89.8	0.0289	73
1500/4000	12000	**8.5/8.5**	54/20	63/42	**1PH8107-1DS0 ■ - ■ LA1**	86.1/89.8	0.0289	73
1500/4000	18000	**8.5/8.5**	54/20	63/42	**1PH8107-1SS0 ■ - ■ MA1**	86.1/89.8	0.0289	73
Shaft height SH 132 – Line voltage 400 V 3 AC								
1500	8000	**11**	70	96	**1PH8131-1DF0 ■ - ■ HA1**	89.9	0.059	89
1500	10000	**11**	70	96	**1PH8131-1DF0 ■ - ■ LA1**	89.9	0.059	89
1000	8000	**12**	115	128	**1PH8133-1DD0 ■ - ■ HA1**	87.1	0.076	106
1000	10000	**12**	115	128	**1PH8133-1DD0 ■ - ■ LA1**	87.1	0.076	106

Type of construction	
IM B3 (IM V5, IM V6) IM B5 (IM V1, IM V3)	**0** **2**

Shaft extension DE	**Balancing**
Plain shaft	–
Feather key	Full-key
Feather key	Half-key

		Bearing version	**Vibration severity acc. to Siemens [1]/ EN 60034-14**	**Shaft and flange accuracy**
0	**H**	Standard	S/A	R
1	**L**	Performance	SPECIAL/B	SPECIAL
2	**M**	High Performance	SPECIAL/B	SPECIAL

Motor is part of Quick Packages.

[1] For definition of the vibration severity according to Siemens, see the 1PH8 Configuration Manual.

Motor type (repeated)	Rated current for S1 duty	Stall current	SINAMICS S120 Combi						
			Rated output current for S1 duty	3-axis Power Modules			4-axis Power Modules		
				Article No.			Article No.		
	I_{rated} A	I_0 A	I_{rated} A	6SL3111-3VE21-6FA0	6SL3111-3VE21-6EA0	6SL3111-3VE22-0HA0	6SL3111-4VE21-6FA0	6SL3111-4VE21-6EA0	6SL3111-4VE22-0HA0
1PH8101-1.F...	**12.5**	14	12	O	O	O	O	O	O/●
1PH8101-1.F...	**12.5**	14	12	O	O	O	O	O	O/●
1PH8103-1.D...	**10**	11	12	O	O/●[2]	O/●[2]	O/●[2]	O/●[2]	O/●
1PH8103-1.D...	**10**	11	12	O	O/●[2]	O/●[2]	O/●[2]	O/●[2]	O/●
1PH8103-1.F...	**13.5**	14	18	O	O	O	O	O	O/●[2]
1PH8103-1.F...	**13.5**	14	18	O	O	O	O	O	O/●[2]
1PH8103-1.G...	**17.5**	19	18	✓	O	O	✓	O	O
1PH8103-1.G...	**17.5**	19	18	✓	O	O	✓	O	O
1PH8103-1.M...	**25.7**	31	30	–	✓[2]	O	–	✓[2]	O
1PH8103-1.M...	**25.7**	31	30	–	✓[2]	O	–	✓[2]	O
1PH8105-1.F...	**17.5**	20	18	✓	O	O	✓	O	O
1PH8105-1.F...	**17.5**	20	18	✓	O	O	✓	O	O
1PH8107-1.D...	**17.5**	25	18	✓	O	O	✓	O	O
1PH8107-1.D...	**17.5**	25	18	✓	O	O	✓	O	O
1PH8107-1.F...	**23.5**	25	24	–	✓	O	–	✓	O
1PH8107-1.F...	**23.5**	25	24	–	✓	O	–	✓	O
1PH8107-1.G...	**26**	29	30	–	✓[2]	✓	–	✓[2]	✓
1PH8107-1.G...	**26**	29	30	–	✓[2]	✓	–	✓[2]	✓
1PH8101-1.S...	**13.2/13.5**	15/20	18	O	O	O	O	O	O
1PH8101-1.S...	**13.2/13.5**	15/20	18	O	O	O	O	O	O
1PH8101-1.S...	**13.2/13.5**	15/20	18	O	O	O	O	O	O
1PH8105-1.S...	**23/24**	25/35	24	–	O	O	–	O	O
1PH8105-1.S...	**23/24**	25/35	24	–	O	O	–	O	O
1PH8105-1.S...	**23/24**	25/35	24	–	O	O	–	O	O
1PH8107-1.S...	**27/28**	30/40	30	–	–	O	–	–	O
1PH8107-1.S...	**27/28**	30/40	30	–	–	O	–	–	O
1PH8107-1.S...	**27/28**	30/40	30	–	–	O	–	–	O
1PH8131-1.F...	**24**	30	24	–	✓	O	–	✓	O
1PH8131-1.F...	**24**	30	24	–	✓	O	–	✓	O
1PH8133-1.D...	**30**	32	30	–	–	✓	–	–	✓
1PH8133-1.D...	**30**	32	30	–	–	✓	–	–	✓

✓ Perfectly suited as main spindle
O Suitable as main spindle
● Perfectly suited as driven tool
– Not suitable

Options

Order code	Description
K23	Special paint finish for "Worldwide" climate group: Primer and paint finish: Anthracite RAL 7016

When ordering a motor with options, **-Z** should be added to the Article No.

[2] With derating.

SIMOTICS M-1PH8 Premium Performance asynchronous motors – SH 80 – Forced ventilation

Selection and ordering data

Rated speed	Maximum speed	Rated power S1 duty	Rated torque	**SIMOTICS M-1PH8 Premium Performance asynchronous motor Forced ventilation DE → NDE IP55 degree of protection Terminal box top**	Efficiency	Moment of inertia	Weight, approx. Motor with solid shaft
n_{rated} rpm	n_{max} rpm	P_{rated} kW	M_{rated} Nm	Article No.	η %	J kgm^2	m kg
Shaft height SH 80 – Line voltage 400 V 3 AC							
9000	24000	**2.8**	3.0	**1PH8081-1SU0 2-■NA1-Z Q12+Q52**	88.5	0.0045	24
9000	24000	**2.8**	3.0	**1PH8081-1SW02-■NA1-Z Q12+Q52**	84.3	0.0045	24
9000	24000	**3.5**	3.7	**1PH8081-1SV0 2-■NA1-Z Q12+Q52**	95.0	0.0045	24
5200	24000	**4.5**	8.3	**1PH8083-1SW02-■NA1-Z Q12+Q52**	86.6	0.0064	29.5
12000	24000	**4.5**	3.6	**1PH8083-1SV0 2-■NA1-Z Q12+Q52**	93.9	0.0064	29.5
12000	24000	**6.5**	5.2	**1PH8087-1SV0 2-■NA1-Z Q12+Q52**	94.7	0.0089	37

Type of construction		
IM B5 (IM V1, IM V3)		**2**
Shaft extension DE		
Solid shaft		**0**
Hollow shaft	Order code **Y64** required. Prepared for rotary union without bearing[1)]	**3**

Bearing version	**Vibration severity acc. to Siemens EN 60034-14**[2)]	**Shaft and flange accuracy**	
Premium Performance	SPECIAL/B	SPECIAL	**N**

Q52	DE flange with additional 4 × M8 thread for one adapter plate for alignment of motor shaft with spindle shaft
Q12	M5 sealing air connection on terminal box[1)]

[1)] For further details on interfaces and sealing air conditioning, see the 1PH8 Configuration Manual.
[2)] For definition of the vibration severity according to Siemens, see the 1PH8 Configuration Manual.

Motor type (repeated)	Rated current for S1 duty	SINAMICS S120 Combi						
		Pulse frequency	3-axis Power Modules			4-axis Power Modules		
			Article No.			Article No.		
	I_{rated} A	kHz	6SL3111-3VE21-6FA0	6SL3111-3VE21-6EA0	6SL3111-3VE22-0HA0	6SL3111-4VE21-6EA0	6SL3111-4VE22-0HA0	6SL3111-4VE21-0EA0
1PH8081-1SU02-....	**12.5**	4	–	–	–	✓	✓	O
1PH8081-1SW02-....	**12.5**	8	–	–	–	–	–	✓
1PH8081-1SV02-....	**15.5**	8	–	–	–	–	–	✓
1PH8083-1SW02-....	**15.5**	8	–	–	–	–	–	✓
1PH8083-1SV02-....	**15.5**	8	–	–	–	–	–	✓
1PH8087-1SV02-....	**19.0**	8	–	–	–	–	–	✓

✓ Perfectly suited as main spindle
O Suitable as main spindle
● Perfectly suited as driven tool
– Not suitable

5

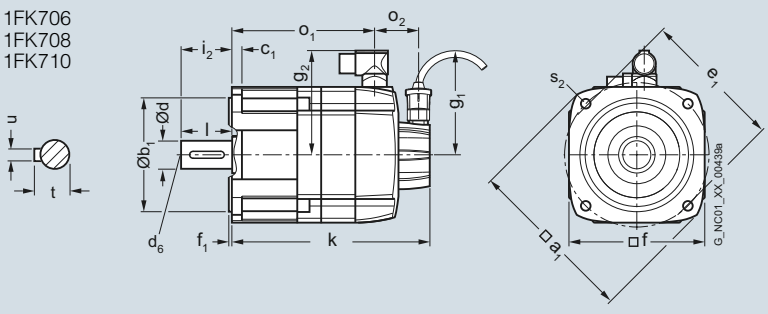
SIMOTICS S-1FK7 Compact synchronous motors with DRIVE-CLiQ – Natural cooling

Dimensional drawings

For motor		Dimensions in mm (inches)									Shaft extension DE				
Shaft height	Type	DIN IEC	a_1 P	b_1 N	c_1 LA	e_1 M	f AB	f_1 T	i_2 –	s_2 S	**d** **D**	d_6 –	l E	t GA	u F
1FK7 Compact, natural cooling, DQI encoder with DRIVE-CLiQ, with/without brake															
63	1FK706.-2A		155 (6.10)	110 (4.33)	10 (0.39)	130 (5.12)	126 (4.96)	3.5 (0.14)	50 (1.97)	9 (0.35)	**24** **(0.94)**	M8	50 (1.97)	27 (1.06)	8 (0.31)
80	1FK708.-2A		194 (7.64)	130 (5.12)	11.5 (0.45)	165 (6.50)	155 (6.10)	3.5 (0.14)	58 (2.28)	11 (0.43)	**32** **(1.26)**	M12	58 (2.28)	35 (1.38)	10 (0.39)
100	1FK710.-2A		245 (9.65)	180 (7.09)	13 (0.51)	215 (8.46)	192 (7.56)	4 (0.16)	80 (3.15)	14 (0.55)	**38** **(1.50)**	M12	80 (3.15)	41 (1.61)	10 (0.39)

			DQI encoder with DRIVE-CLiQ						
				Without brake		With brake			
Shaft height	Type	DIN IEC	o_2 –	k LB	o_1 –	k LB	o_1 –	g_1 –	g_2 –
63	1FK7060-2A		50 (1.97)	168 (6.61)	106 (4.17)	203 (7.99)	141 (5.55)	104.5 (4.11)	104 (4.09)
	1FK7062-2A		50 (1.97)	190 (7.48)	128 (5.04)	226 (8.90)	163 (6.42)	104.5 (4.11)	104 (4.09)
	1FK7063-2A		50 (1.97)	213 (8.39)	151 (5.94)	248 (9.76)	186 (7.32)	104.5 (4.11)	104 (4.09)
80	1FK7080-2A		48 (1.89)	171 (6.73)	111 (4.37)	223 (8.78)	163 (6.42)	104.5 (4.11)	119 (4.69)
	1FK7081-2A		48 (1.89)	190 (7.48)	130 (5.12)	242 (9.53)	182 (7.17)	104.5 (4.11)	119 (4.69)
	1FK7083-2A		48 (1.89)	209 (8.23)	149 (5.87)	261 (10.28)	201 (7.91)	104.5 (4.11)	119 (4.69)
	1FK7084-2A		48 (1.89)	229 (9.02)	168 (6.61)	281 (11.06)	221 (8.70)	104.5 (4.11)	119 (4.69)
100	1FK7100-2A		53 (2.09)	183 (7.20)	118 (4.65)	220 (8.66)	170 (6.69)	104.5 (4.11)	137 (5.39)
	1FK7101-2A		53 (2.09)	209 (8.23)	144 (5.67)	261 (10.28)	196 (7.72)	104.5 (4.11)	158 (6.22)
	1FK7103-2A		53 (2.09)	235 (9.25)	170 (6.69)	287 (11.30)	222 (8.74)	104.5 (4.11)	158 (6.22)
	1FK7105-2A		53 (2.09)	287 (11.30)	222 (8.74)	339 (13.35)	274 (10.79)	104.5 (4.11)	158 (6.22)

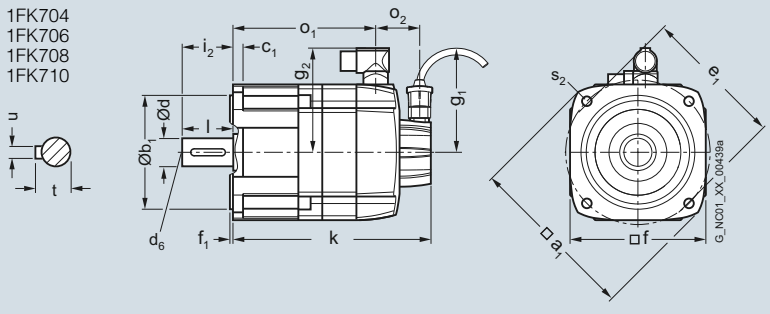
1FK706
1FK708
1FK710



Dimensional drawings

For motor		Dimensions in mm (inches)													
											Shaft extension DE				
Shaft height	Type	DIN IEC	a_1 P	b_1 N	c_1 LA	e_1 M	f AB	f_1 T	i_2 –	s_2 S	**d** **D**	d_6 –	l E	t GA	u F
1FK7 High Inertia, natural cooling, DQI encoder with DRIVE-CLiQ, with/without brake															
48	1FK704.-3B		120	80	10	100	96	3	40	6.5	**19**	M6	40	21.5	6
	8G		(4.72)	(3.15)	(0.39)	(3.94)	(3.78)	(0.12)	(1.57)	(0.26)	**(0.75)**		(1.57)	(0.85)	(0.24)
63	1FK706.-3B		155	110	10	130	126	3.5	50	9	**24**	M8	50	27	8
	8G		(6.10)	(4.33)	(0.39)	(5.12)	(4.96)	(0.14)	(1.97)	(0.35)	**(0.94)**		(1.97)	(1.06)	(0.31)
80	1FK708.-3B		194	130	11.5	165	155	3.5	58	11	**32**	M12	58	35	10
			(7.64)	(5.12)	(0.45)	(6.50)	(6.10)	(0.14)	(2.28)	(0.43)	**(1.26)**		(2.28)	(1.38)	(0.38)
100	1FK710.-3B		245	180	13	215	192	4	80	14	**38**	M12	80	41	10
			(9.65)	(7.09)	(0.51)	(8.46)	(7.56)	(0.16)	(3.15)	(0.55)	**(1.50)**		(3.15)	(1.61)	(0.39)

			DQI encoder with DRIVE-CLiQ						
				Without brake		With brake			
Shaft height	Type	DIN IEC	o_2 –	k LB	o_1 –	k LB	o_1 –	g_1 –	g_2 –
48	1FK7042-3B		50 (1.97)	187 (7.36)	125 (4.92)	219 (8.62)	157 (6.18)	104.5 (4.11)	90 (3.54)
63	1FK7060-3B		50 (1.97)	182 (7.17)	120 (4.72)	217 (8.54)	155 (6.10)	104.5 (4.11)	104 (4.09)
	1FK7062-3B		50 (1.97)	216 (8.50)	153 (6.02)	251 (9.88)	189 (7.44)	104.5 (4.11)	104 (4.09)
80	1FK7081-3B		48 (1.89)	211 (8.31)	151 (5.94)	264 (10.39)	203 (7.99)	104.5 (4.11)	119 (4.69)
	1FK7084-3B		48 (1.89)	270 (10.63)	209 (8.23)	322 (12.68)	262 (10.31)	104.5 (4.11)	119 (4.69)
100	1FK7100-3B		104.5 (4.11)	137 (5.39)	53 (2.09)	183 (7.20)	118 (4.65)	220 (8.66)	170 (6.69)
	1FK7101-3B		104.5 (4.11)	158 (6.22)	53 (2.09)	209 (8.23)	144 (5.67)	261 (10.28)	196 (7.72)
	1FK7103-3B		104.5 (4.11)	158 (6.22)	53 (2.09)	235 (9.25)	170 (6.69)	287 (11.30)	222 (8.74)
	1FK7105-3B		104.5 (4.11)	158 (6.22)	53 (2.09)	287 (11.30)	222 (8.74)	339 (13.35)	274 (10.79)

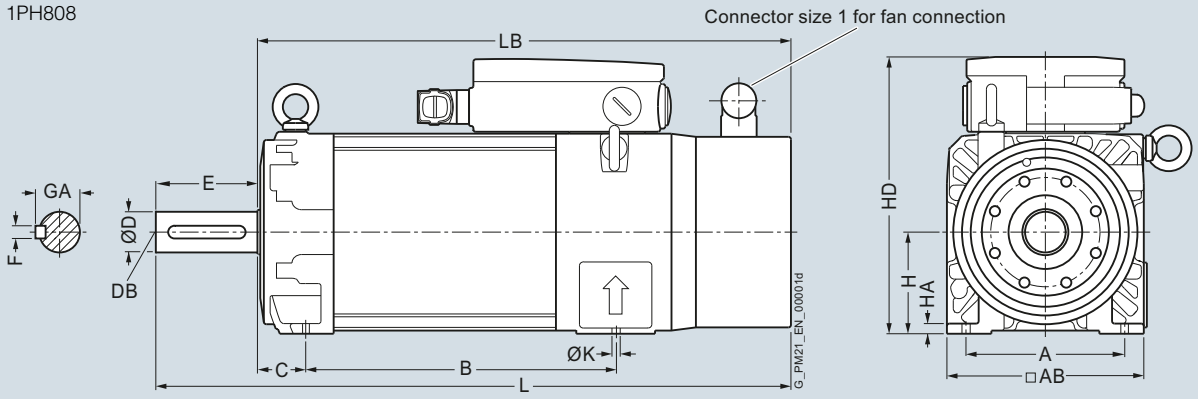


SIMOTICS M-1PH8 asynchronous motors – SH 80 – Forced ventilation

Dimensional drawings

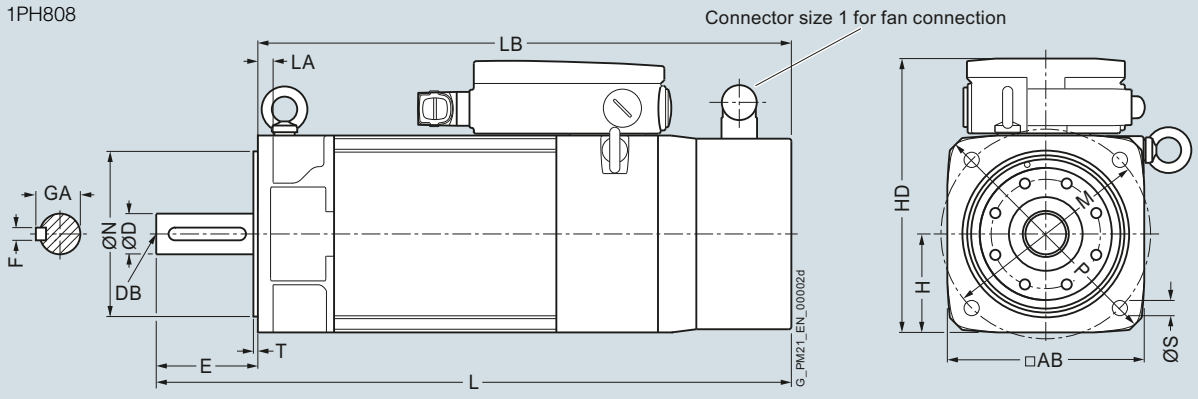
For motor		Dimensions in mm (inches)											Shaft extension DE				
Shaft height	Type	IEC	A	AB	B	C	H	HA	HD	L	LB	K	**D**	DB	E	F	GA
1PH8, type of construction IM B3, forced ventilation																	
80	1PH8083		125 (4.92)	155 (6.10)	194 (7.64)	38 (1.50)	80 (3.15)	8 (0.31)	216 (8.50)	455 (17.91)	375 (14.76)	10 (0.39)	**32 (1.26)**	M12	80 (3.15)	10 (0.39)	35 (1.38)
	1PH8087				244 (9.61)					505 (19.88)	425 (16.73)						

1PH808



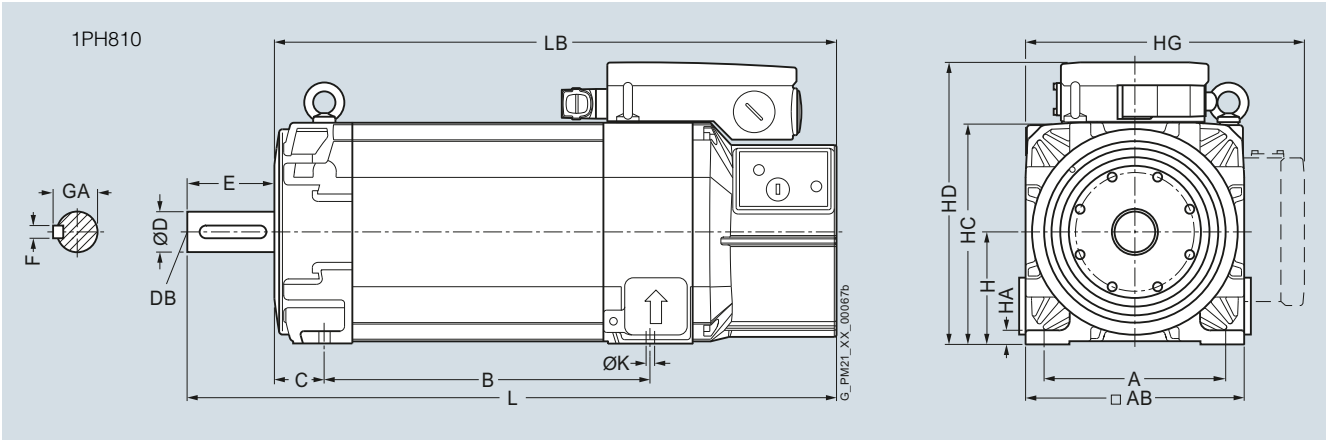
For motor		Dimensions in mm (inches)												Shaft extension DE				
Shaft height	Type	IEC	AB	H	HD	L	LA	LB	M	N	P	S	T	**D**	DB	E	F	GA
1PH8, type of construction IM B5, forced ventilation																		
80	1PH8083		155 (6.10)	77.5 (3.05)	213.5 (8.41)	455 (17.91)	12 (0.47)	375 (14.76)	165 (6.50)	130 (5.12)	200 (7.87)	12 (0.47)	3.5 (0.14)	**32 (1.26)**	M12	80 (3.15)	10 (0.39)	35 (1.38)
	1PH8087					505 (19.88)		425 (16.73)										

1PH808

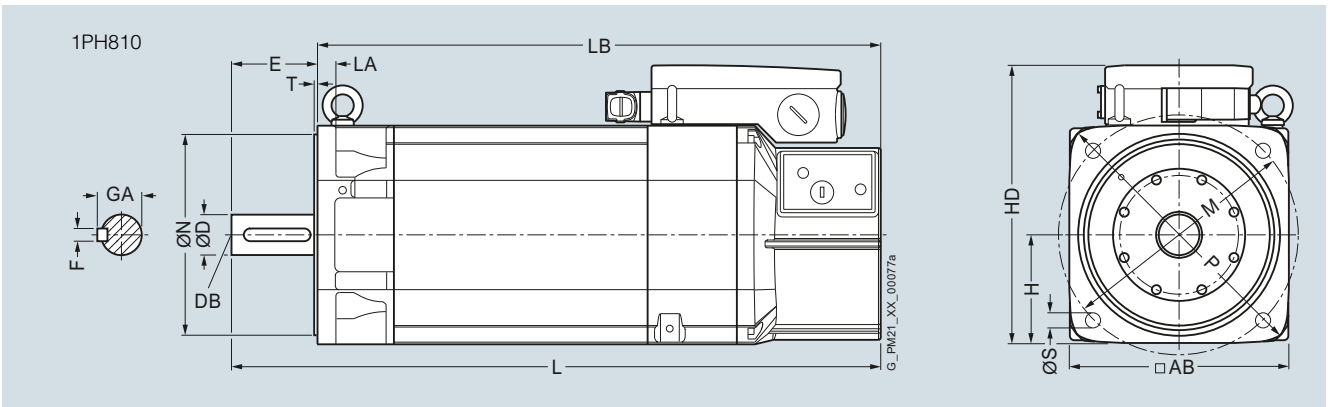


Dimensional drawings

For motor		Dimensions in mm (inches)													Shaft extension DE				
Shaft height	Type	IEC	A	AB	C	B	H	HA	HC	HD	HG	K	L	LB	**D**	DB	E	F	GA
1PH8, type of construction IM B3, forced ventilation																			
100	1PH8101		160 (6.30)	196 (7.72)	43 (1.69)	167 (6.57)	100 (3.94)	11 (0.43)	198 (7.80)	252 (9.92)	276.5 (10.89)	12 (0.47)	449.5 (17.70)	369.5 (14.55)	**38 (1.50)**	M12	80 (3.15)	10 (0.39)	41 (1.61)
	1PH8103					202.5 (7.97)							485 (19.09)	405 (15.94)					
	1PH8105					262 (10.31)							544.5 (21.44)	464.5 (18.29)					
	1PH8107					297.5 (11.71)							580 (22.83)	500 (19.69)					



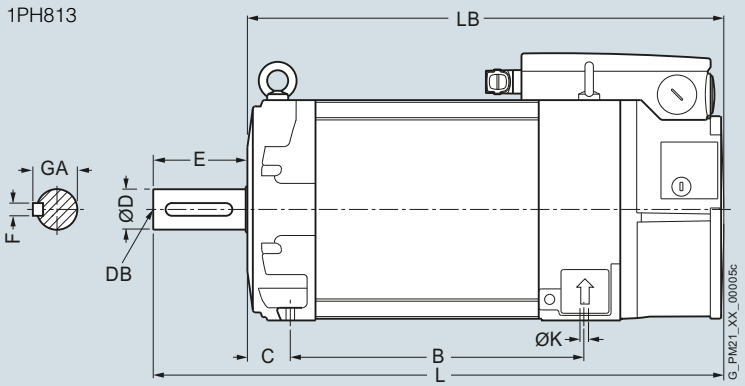
For motor		Dimensions in mm (inches)												Shaft extension DE				
Shaft height	Type	IEC	AB	H	HD	L	LA	LB	M	N	P	S	T	**D**	DB	E	F	GA
1PH8, type of construction IM B5, forced ventilation																		
100	1PH8101		196 (7.72)	98 (3.86)	250 (9.84)	449.5 (17.70)	16 (0.63)	369.5 (14.55)	215 (8.46)	180 (7.09)	250 (9.84)	14 (0.55)	4 (0.16)	**38 (1.50)**	M12	80 (3.15)	10 (0.39)	41 (1.61)
	1PH8103					485 (19.09)		405 (15.94)										
	1PH8105					544.5 (21.44)		464.5 (18.29)										
	1PH8107					580 (22.83)		500 (19.69)										



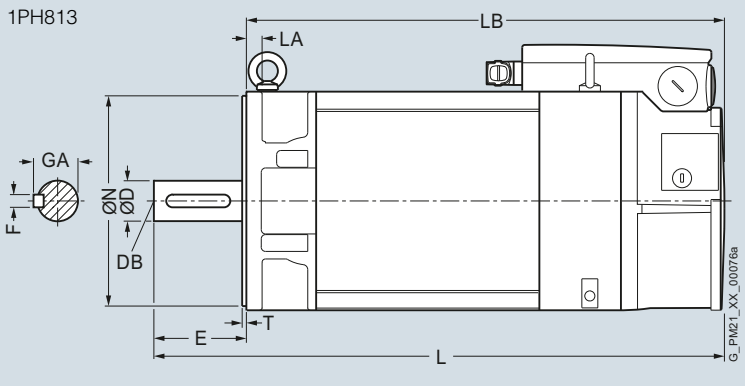
SIMOTICS M-1PH8 asynchronous motors – SH 132 – Forced ventilation

Dimensional drawings

For motor		Dimensions in mm (inches)													Shaft extension DE				
Shaft height	Type	IEC	A	AB	B	C	H	HA	HC	HD	HG	K	L	LB	**D**	DB	E	F	GA
1PH8, type of construction IM B3, forced ventilation																			
132	1PH8131		216 (8.50)	260 (10.24)	220.5 (8.68)	53 (2.09)	132 (5.20)	15 (0.59)	262 (10.31)	317.5 (12.50)	357.5 (14.07)	12 (0.47)	549 (21.61)	439 (17.28)	**48 (1.89)**	M16	110 (4.33)	14 (0.55)	51.5 (2.03)
	1PH8133				265.5 (10.45)								594 (23.39)	484 (19.06)					

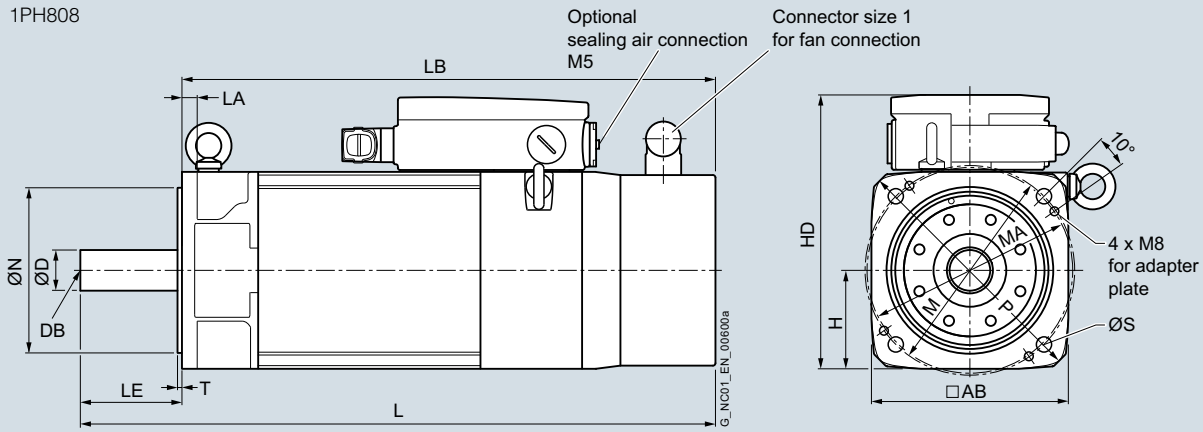


For motor		Dimensions in mm (inches)												Shaft extension DE				
Shaft height	Type	IEC	AB	H	HD	L	LA	LB	M	N	P	S	T	**D**	DB	E	F	GA
1PH8, type of construction IM B5, forced ventilation																		
132	1PH8131		260 (10.24)	130 (5.12)	315.5 (12.42)	549 (21.61)	18 (0.71)	439 (17.28)	300 (11.81)	250 (9.84)	340 (13.39)	18 (0.71)	5 (0.20)	**48 (1.89)**	M16	110 (4.33)	14 (0.55)	51.5 (2.03)
	1PH8133					594 (23.39)		484 (19.06)										



Dimensional drawings

For motor		Dimensions in mm (inches)													Shaft extension DE		
Shaft height	Type	IEC	AB	H	HD	L	LA	LB	M	MA	N	P	S	T	**D**	DB	LE
1PH8 Premium Performance, type of construction IM B5, forced ventilation, solid shaft																	
80	1PH8081		155 (6.10)	77.5 (3.05)	213.5 (8.41)	375 (14.75)	12 (0.45)	325 (12.80)	165 (6.50)	162 (6.38)	130 (5.12)	200 (7.87)	12 (0.47)	3.5 (0.14)	**24 (0.94)**	M6	50 (1.97)
	1PH8083					425 (16.73)		375 (14.75)									
	1PH8087					475 (18.70)		425 (16.73)									

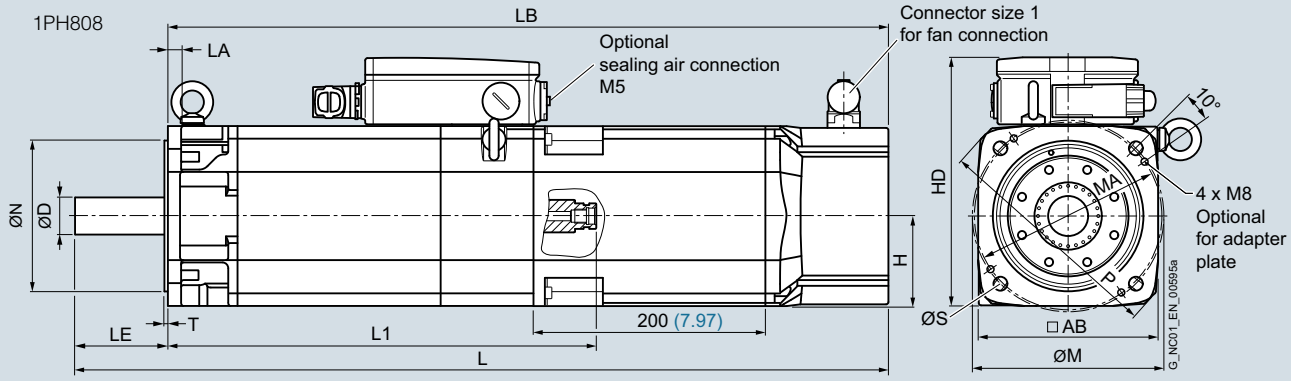


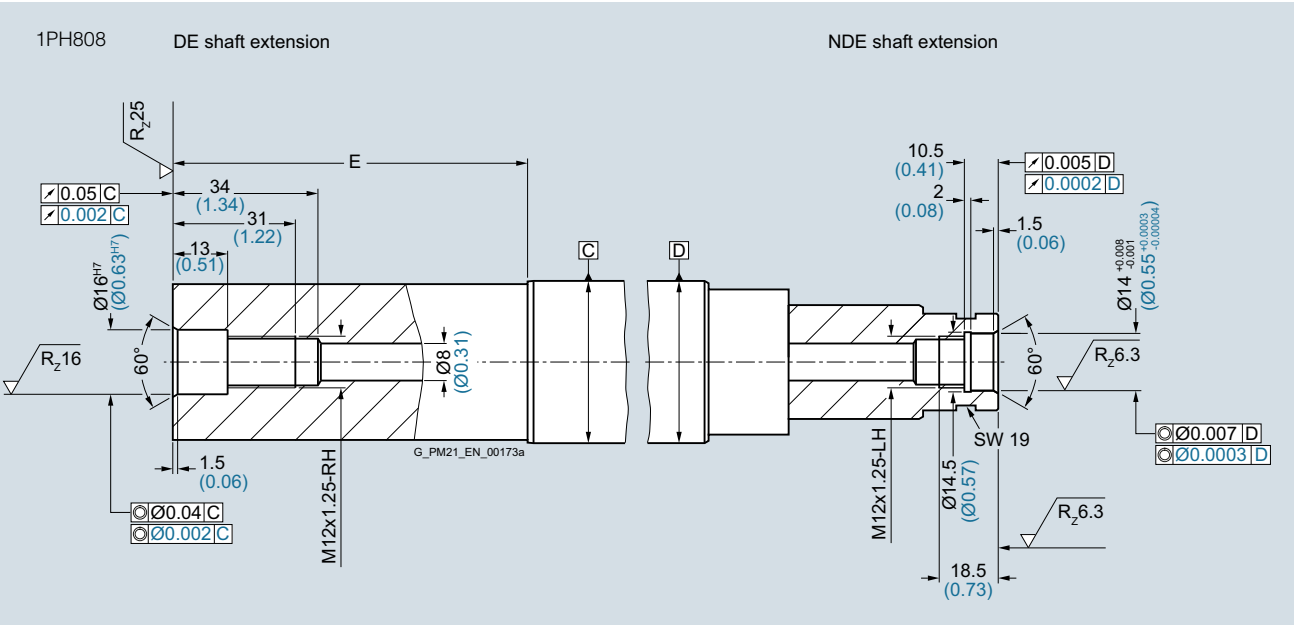
5

SIMOTICS M-1PH8 Premium Performance asynchronous motors – SH 80 – Forced ventilation – Hollow shaft

Dimensional drawings

For motor		Dimensions in mm (inches)														Shaft extension DE		
Shaft height	Type	IEC	AB	H	HD	L	LA	LB	L1	M	MA	N	P	S	T	**D**	E	LE
1PH8 Premium Performance, type of construction IM B5, forced ventilation, hollow shaft																		
80	1PH8081		155 (6.10)	77.5 (3.05)	213.5 (8.41)	575 (22.64)	12 (0.45)	525 (20.67)	269.3 (10.60)	165 (6.50)	162 (6.38)	130 (5.12)	200 (7.87)	12 (0.47)	3.5 (0.14)	**24 (0.94)**	50 (1.97)	50 (1.97)
	1PH8083					625 (24.61)		575 (22.64)	319.3 (12.57)									
	1PH8087					675 (26.57)		625 (24.61)	369.3 (14.54)									





Overview

Absolute encoders, incremental encoders and mounting accessories

The built-on optoelectronic rotary encoders sense distances, angles of rotation or speeds in machines. They can be used in conjunction with computerized numerical controls, programmable logic controllers, drives and position displays, e.g. for:

- SINUMERIK CNC controls
- SIMOTION Motion Control Systems
- SIMATIC programmable logic controllers
- SINAMICS 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 while the power is off are not recorded.
- Absolute encoders, on the other hand, also record these movements while the power is off and return the actual position after power on. Travel to a reference point is not necessary.

Design

All encoders are available in Synchro flange and clamp flange versions. Encoders with a Synchro flange can be attached to the machine with 3 clamps or mounted with axial screws. 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 DC version supports longer cable lengths. Most control systems apply the supply voltage directly on the measuring circuit connector. With SINAMICS, the power supply for the measuring systems is provided via the Sensor Modules.

For rotary encoders with cables, the cable length including the connector 1 m.

The following bending radii must be observed for the cable to the encoder:

- One-time bending: ≥ 20 mm
- Continuous bending: ≥ 75 mm

Function

Incremental encoder (sin/cos 1 V_{pp}/RS422) with cable and connector, clamp flange or Synchro flange

Incremental encoders deliver a defined number of electrical pulses per revolution, 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:

- Analog signals sin/cos with 1 V_{pp} level
  Better resolution can be achieved for encoders with sinusoidal signals by interpolating them in the higher-level controller.
- RS422 difference signals (TTL)
  In the case of RS422 incremental encoders (TTL), the resolution can be improved by a factor of four by means of edge evaluation.

Technical specifications

Product name	Incremental encoder with sin/cos 1 V_{pp} 6FX2001-3....	Incremental encoder with RS422 (TTL) 6FX2001-2....
Operating voltage V_p on encoder	5 V DC ± 10 %	5 V DC ± 10 % or 10 ... 30 V DC
Limit frequency, typical	≥ 100 kHz (-3 dB) ≥ 200 kHz (-6 dB)	–
Scanning frequency, max.	–	300 kHz
No-load current consumption, max.	150 mA	150 mA
Signal level	Sinusoidal 1 V_{pp}	RS422 (TTL)
Outputs protected against short-circuit to 0 V	Yes	Yes
Switching time (10 ... 90 %) (for 1 m cable and recommended input circuit)	–	Rise/fall time t_+/t_- ≤ 50 ns
Phase angle, signal A to B	90° ± 10°el.	90°
• Edge spacing, min. at 300 kHz	–	≥ 0.45 µs

Technical specifications (continued)

Product name	Incremental encoder with sin/cos 1 V_{pp} 6FX2001-3....	Incremental encoder with RS422 (TTL) 6FX2001-2....
Cable length to downstream electronics, max. [1]	150 m	100 m
LED failure monitoring	–	High-resistance driver
Resolution, max.	2500 S/R	5000 S/R
Accuracy (in angular seconds)	± 18 mech. × 3600/ number of signals/ revolution *z*	± 18 mech. × 3600/ number of signals/ revolution *z*
Speed, max.		
• Electrical	(18×10^6 rpm)/ number of signals/ revolution (at -6 dB)	(18×10^6 rpm)/ number of signals/ revolution
• Mechanical	12000 rpm	12000 rpm
Friction torque (at 20 °C)	≤ 0.01 Nm	≤ 0.01 Nm
Starting torque (at 20 °C)	≤ 0.01 Nm	≤ 0.01 Nm
Shaft loading capacity		
• $n \leq 6000$ rpm		
- Axial	40 N	40 N
- Radial at shaft extension	60 N	60 N
• $n > 6000$ rpm		
- Axial	10 N	10 N
- Radial at shaft extension	20 N	20 N
Shaft diameter		
• Synchro flange	6 mm	6 mm
• Clamp flange	10 mm	10 mm
Shaft length		
• Synchro flange	10 mm	10 mm
• Clamp flange	20 mm	20 mm
Angular acceleration, max.	10^5 rad/s^2	10^5 rad/s^2
Moment of inertia of rotor	1.45×10^{-6} kgm^2	1.45×10^{-6} kgm^2
Vibration (55 … 2000 Hz) to EN 60068-2-6	≤ 300 m/s^2	≤ 300 m/s^2
Shock acc. to EN 60068-2-27		
• 2 ms	≤ 2000 m/s^2	≤ 2000 m/s^2
• 6 ms	≤ 1000 m/s^2	≤ 1000 m/s^2
Degree of protection acc. to DIN EN 60529 (IEC 60529)		
• Without shaft input	IP67	IP67
• With shaft input	IP64	IP64
Ambient temperature		
Operation		
• Flange outlet or fixed cable		
- At V_p = 5 V ±10 %	-40 ... +100 °C	-40 ... +100 °C
- At V_p = 10 … 30 V	–	-40 ... +70 °C
• Flexible cable		
- At V_p = 5 V ±10 %	-10 ... +100 °C	-10 ... +100 °C
- At V_p = 10 … 30 V	–	-10 ... +70 °C
Weight, approx.	0.3 kg	0.3 kg
EMC	Tested in accordance with the guidelines for electromagnetic compatibility 89/336/EEC and the regulations of the EMC guidelines (generic standards)	
Approvals, according to	CE, cULus	CE, cULus

S/R = signals/revolution

Selection and ordering data

Description	Article No.
Incremental encoder with sin/cos 1 V_{pp}	
5 V DC supply voltage	
Synchro flange and connection via	
• Axial flange outlet	**6FX2001-3G** ■■■
• Radial flange outlet	**6FX2001-3E** ■■■
• Cable 1 m with connector [2]	**6FX2001-3C** ■■■
Resolution	
1000 S/R	**B 0 0**
1024 S/R	**B 0 2**
2500 S/R	**C 5 0**
Incremental encoder with RS422 (TTL)	
5 V DC supply voltage	
Synchro flange and connection via	
• Axial flange outlet	**6FX2001-2G** ■■■
• Radial flange outlet	**6FX2001-2E** ■■■
• Cable 1 m with connector [2]	**6FX2001-2C** ■■■
Clamp flange and connection via	
• Axial flange outlet	**6FX2001-2R** ■■■
• Radial flange outlet	**6FX2001-2P** ■■■
• Cable 1 m with connector [2]	**6FX2001-2M** ■■■
10 ... 30 V DC supply voltage	
Synchro flange and connection via	
• Axial flange outlet	**6FX2001-2H** ■■■
• Radial flange outlet	**6FX2001-2F** ■■■
• Cable 1 m with connector [2]	**6FX2001-2D** ■■■
Clamp flange and connection via	
• Axial flange outlet	**6FX2001-2S** ■■■
• Radial flange outlet	**6FX2001-2Q** ■■■
• Cable 1 m with connector [2]	**6FX2001-2N** ■■■
Resolution	
500 S/R	**A 5 0**
1000 S/R	**B 0 0**
1024 S/R	**B 0 2**
1250 S/R	**B 2 5**
1500 S/R	**B 5 0**
2000 S/R	**C 0 0**
2048 S/R	**C 0 4**
2500 S/R	**C 5 0**
3600 S/R	**D 6 0**
5000 S/R	**F 0 0**

[1] With recommended cable and input circuitry of the downstream electronics, observe max. permissible cable length of module to be evaluated.

[2] Universal integrated cable outlet for axial and radial outlet direction.

Function

Absolute encoder with DRIVE-CLiQ

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.

Single-turn encoders

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° the position values are repeated.

Multi-turn encoders

Multi-turn 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.

Technical specifications

Product name	Absolute encoder with DRIVE-CLiQ 6FX2001-5.D..-0AA1
Operating voltage V_p on encoder	24 V DC - 15 % + 20 %
Current consumption, approx.	
• Single-turn	245 mA
• Multi-turn	325 mA
Interface	DRIVE-CLiQ
Data output	DRIVE-CLiQ
Short-circuit strength	Yes
Transmission rate	100 Mbits
Speed, max.	
• Electrical	14000 rpm
• Mechanical	
- Single-turn	12000 rpm
- Multi-turn	10000 rpm
Cable length to downstream electronics, max. [1]	100 m
Connection	DRIVE-CLiQ connector, radial
Resolution	
• Single-turn	22 bit
• Multi-turn	34 bit (22 bit single-turn + 12 bit multi-turn)
Incremental track	2048 S/R, 1 V_{pp} (internal only)
Code type	
• Sampling	Gray
• Transmission	DRIVE-CLiQ
Parameterization capability	
• Counting direction	Yes
Accuracy (in angular seconds)	± 36
Friction torque (at 20 °C)	≤ 0.01 Nm
Starting torque (at 20 °C)	≤ 0.01 Nm
Shaft loading capacity	
• $n \leq 6000$ rpm	
- Axial	40 N
- Radial at shaft extension	60 N
• $n > 6000$ rpm	
- Axial	10 N
- Radial at shaft extension	20 N
Shaft diameter	
• Synchro flange	6 mm
• Clamp flange	10 mm
• Torque arm Hollow shaft	10 mm or 12 mm
Shaft length	
• Synchro flange	10 mm
• Clamp flange	20 mm

S/R = signals/revolution

[1] Observe the maximum permissible cable length of the connected module.

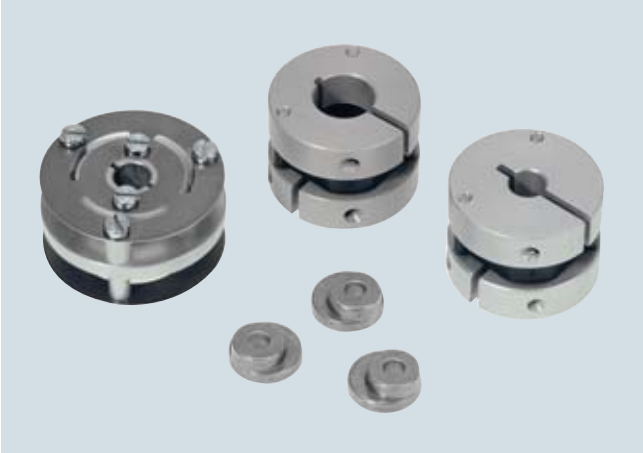
Technical specifications (continued)

Product name	Absolute encoder with DRIVE-CLiQ 6FX2001-5.D..-0AA1
Angular acceleration, max.	10^5 rad/s^2
Moment of inertia of rotor	
• Solid shaft	1.90×10^{-6} kgm^2
• Hollow shaft	2.80×10^{-6} kgm^2
Vibration (55 … 2000 Hz) acc. to EN 60068-2-6	≤ 100 m/s^2
Shock acc. to EN 60068-2-27	
• 2 ms	≤ 2000 m/s^2
• 6 ms	≤ 1000 m/s^2
Degree of protection acc. to DIN EN 60529 (IEC 60529)	
• Without shaft input	IP67
• With shaft input	IP64
Ambient temperature	
• Operation	-20 ... +100 °C
Weight, approx.	
• Single-turn	0.4 kg
• Multi-turn	0.5 kg
EMC	Tested in accordance with DIN EN 50081 and EN 50082
Approvals, according to	CE, cULus

Selection and ordering data

Description	Article No.
Absolute encoder with DRIVE-CLiQ	
24 V DC supply voltage	
Radial connection	
• Synchro flange Solid shaft	**6FX2001-5FD ■ ■ -0AA1**
• Clamp flange Solid shaft	**6FX2001-5QD ■ ■ -0AA1**
• Torque arm Hollow shaft diameter 10 mm	**6FX2001-5VD ■ ■ -0AA1**
• Torque arm Hollow shaft diameter 12 mm	**6FX2001-5WD ■ ■ -0AA1**
Resolution	
• Single-turn 22 bit	**1 3**
• Multi-turn 34 bit	**2 5**

Overview



Couplings and clamps

Couplings and clamps

Couplings and clamp straps are available as mounting accessories for the built-on rotary encoders. The clamp straps are used to fix the encoders with Synchro flange.

Signal connector as mating connector

A signal connector is available as mating connector for encoders with flange outlet or with cable and connector. The connector with 12 contacts is suitable for all incremental encoders.

Signal connector

A signal connector is available as replacement for encoders with cable and connector.

Technical specifications

Product name	Spring disk coupling 6FX2001-7KF10 6FX2001-7KF06	Plug-in coupling 6FX2001-7KS06 6FX2001-7KS10
Transmission torque, max.	0.8 Nm	0.7 Nm
Shaft diameter		
• Both ends	6 mm	6 mm or 10 mm
• d_1/d_2	6 mm/5 mm	–
Center offset of shafts, max.	0.4 mm	0.5 mm
Axial offset	± 0.4 mm	± 0.5 mm
Angular displacement of shafts, max.	3°	1°
Torsional rigidity	150 Nm/rad	31 Nm/rad
Lateral spring stiffness	6 N/mm	10 N/mm
Moment of inertia	19 gcm^2	20 gcm^2
Speed, max.	12000 rpm	12000 rpm
Ambient temperature		
• Operation	-40 ... +150 °C	-40 ... +80 °C
Weight, approx.	16 g	20 g

Selection and ordering data

Description	Article No.
Spring disk coupling Shaft diameter: • 6 mm/6 mm • 6 mm/5 mm	 **6FX2001-7KF10** **6FX2001-7KF06**
Plug-in coupling Shaft diameter: • 6 mm/6 mm • 10 mm/10 mm	 **6FX2001-7KS06** **6FX2001-7KS10**
Clamp (1 unit) For encoders with Synchro flange (3 units are required.)	**6FX2001-7KP01**
Signal connector with cap nut (1 unit) Mating connector for incremental encoder with RS422 (TTL) and sin/cos 1 V_{pp} 12-pin, insulator with 12 socket contacts 0.08 ... 0.22 mm^2 and 0.20 ... 0.56 mm^2, 2 × cable clamping 6.5 ... 10 mm and 10.1 ... 13 mm	**6FX2003-0SU12**
Signal connector with external thread for encoders with cable (1 unit) Replacement connector for incremental encoders with RS422 (TTL) and sin/cos 1 V_{pp} 12-pin, insulator with 12 pin contacts 0.20 ... 0.56 mm^2, 2 × cable clamping 6.5 ... 10 mm and 10.1 ... 13 mm	**6FX2003-0SA12**

MOTION-CONNECT connection systems

General information

Overview

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

The following variants of MOTION-CONNECT cable are available as fully-assembled power and signal cables or sold by the meter:

- **MOTION-CONNECT 500**
  - Cost-effective solution for predominantly fixed installation
  - Suitable for low mechanical loading
  - Tested for travel distances of up to 5 m
- **MOTION-CONNECT 800PLUS**
  - Meets requirements for use in cable carriers
  - Suitable for high mechanical loading
  - Oil resistance
  - Tested for travel distances of up to 50 m

Benefits

The pre-assembled MOTION-CONNECT cables ensure high quality and system-tested, problem-free operation.

SPEED-CONNECT

The pre-assembled cables with SPEED-CONNECT connectors enable fast, stable and reliable connections. With a short rotation as far as the stop, the cap nut of the connector secures the connection.

Cables with SPEED-CONNECT connectors are available for SIMOTICS S-1FK7 and SIMOTICS M-1PH808/-1PH810 motors.

Application

MOTION-CONNECT cables are intended for use in machines. They are not suitable for building technology applications or outdoor installation.

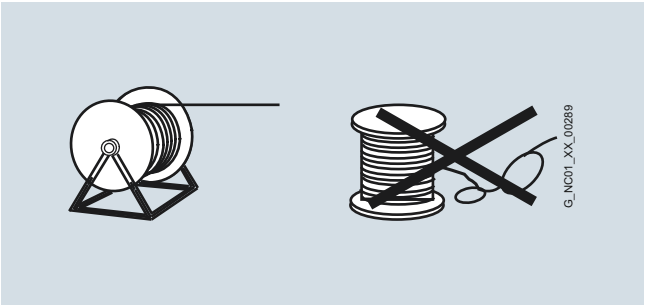
MOTION-CONNECT cables are tested in a cable carrier with horizontal travel distance and are also designed for cable carrier installation. They are not self-supporting.

The pre-assembled cables can be ordered in length units of 10 cm and can be extended, if necessary.

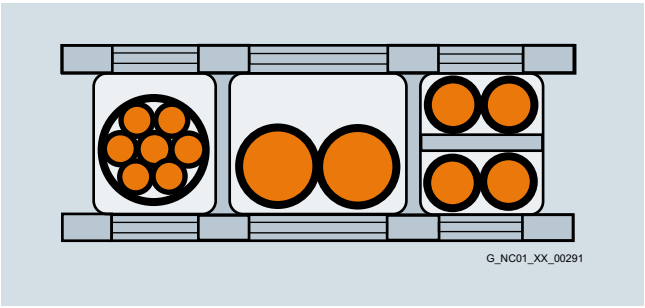
When cable lengths (basic cables and extensions) are determined for the systems and applications described in this catalog, the technically permissible maximum cable lengths (e.g. 25 m) specified in the catalog must be observed. Malfunctions can occur if longer cables are used.

Siemens AG assumes no liability for correct transmission of signals or power in this case.

Function



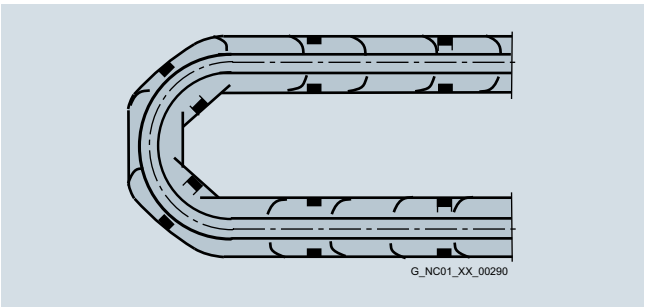
The cables must be removed from the drum without twisting, i.e. the cables must be unwound and must never be lifted over the drum flange in loops.



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

When inserting pre-assembled cables into the cable carrier, do **not** pull at the connector, as this may damage the strain relief or cable clamping.

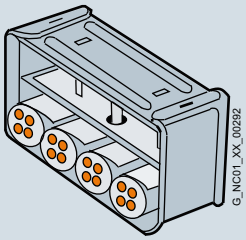
The cables must not be fixed in the carrier and must be freely movable.



The cables must be able to be moved without applying force in particular in the bending radii of the carrier. The specified minimum bending radii must be adhered to.

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.

Function (continued)



MOTION-CONNECT cables are tested in a cable carrier. The cables are attached at one end by means of strain relief to the moving ends of the cable carrier. Strain relief is applied over a wide area of the cable jacket surface without crimping the cable.

Cables must be installed in accordance with the instructions supplied by the cable carrier manufacturer.

Notes:

If, for example, pre-assembled cables are installed in a cable carrier in such a way that the connector would inhibit assembly, pre-assembled cables without assembled connector can also be supplied (power and signal cables[1]).
In this case, the contacts of the cables are crimped and the connector enclosure is supplied separately. After installing the cables, the customer assembles the connector enclosure.

In case of vibration load and with horizontal or vertical cable entries, we recommend that the cable is additionally fixed if between the cable strain relief on the cable carrier and the terminal at the motor part of the cable is hanging loose or is not routed. To prevent machine vibrations being transmitted to the connectors, the cable should be fixed at the moving part where the motor is mounted.

Representation in connection overviews

Symbol	Explanation
	Connector with pin contacts
	Connector with socket contacts
	Exposed core ends
	Cable not included in the scope of delivery. Cable must be supplied by the customer.

More information

Current carrying capacity for power and signal cables

The current carrying capacity of PVC/PUR-insulated copper cables is specified for installation type C under continuous operating conditions in the table with reference to an ambient air temperature of 40 °C. For other ambient temperatures, the values must be corrected by the derating factors from the table.

Current-carrying capacity of cables with copper cores according to EN 60204-1 rms 50/60 Hz AC or DC in amps for installation type C Multi-core cables, vertically or horizontally on walls/open, without protection tubes and installation ducts/with contact	
Cross-section mm^2	Current A
Electronics (one control circuit pair)	
0.20	4.4
0.50	7.5
0.75	9.5
Power (one symmetrically loaded AC cable)	
0.75	9.8
1.00	11.7
1.50	15.2
2.50	21
4	28
6	36

Derating factors for power and signal cables

Ambient air temperature °C	Derating factor accord. to EN 60204-1, Table D.1
30	1.15
35	1.08
40	1.00
45	0.91
50	0.82
55	0.71
60	0.58

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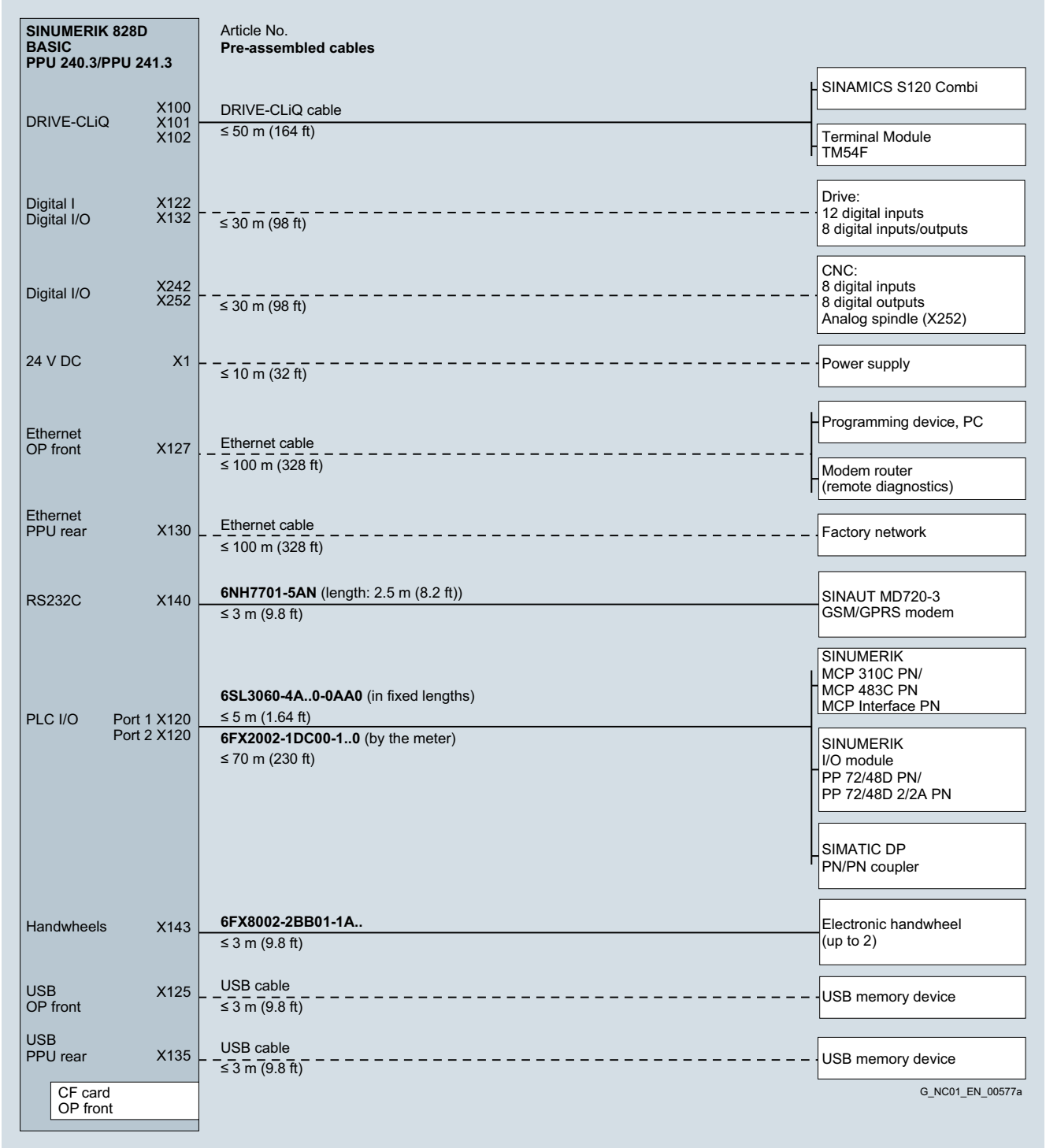
[1] Not applicable to DRIVE-CLiQ signal cables.

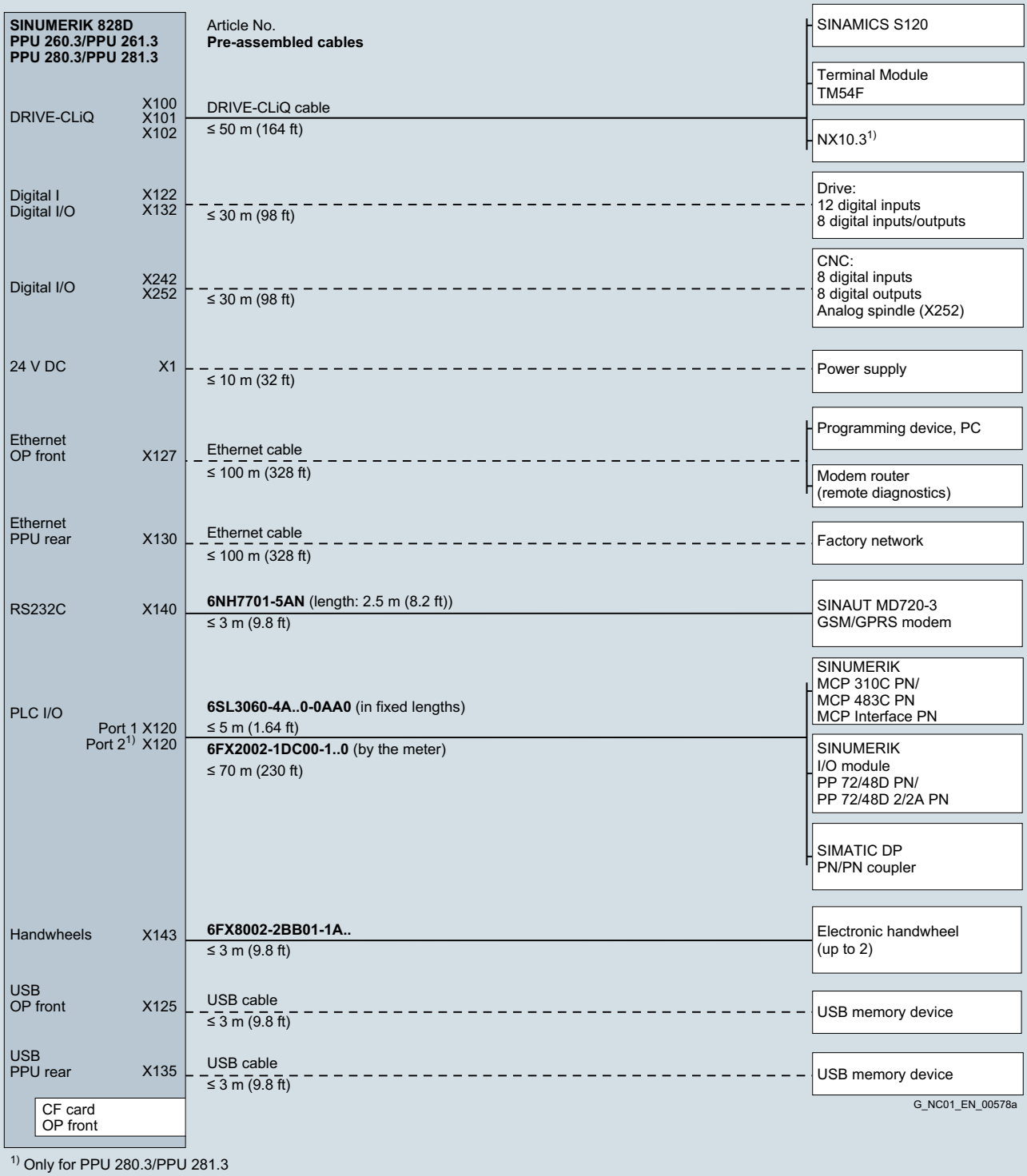
Integration

Connection overview of SINUMERIK 828D BASIC



Integration (continued)

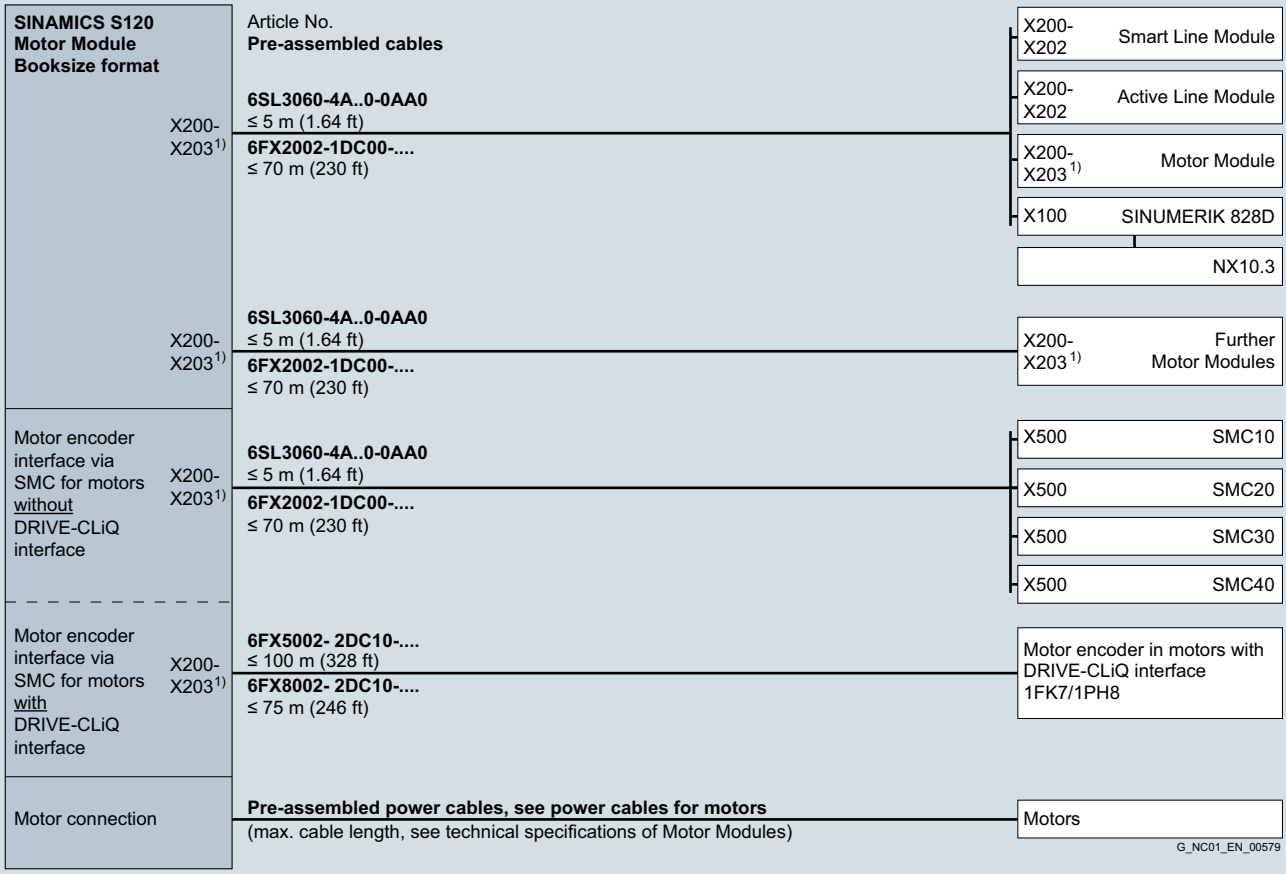
Connection overview of SINUMERIK 828D



1) Only for PPU 280.3/PPU 281.3

Integration (continued)

Connection overview of SINAMICS S120 Motor Modules in booksize format



1) For Single Motor Module: X200-X202
For Double Motor Module: X200-X203

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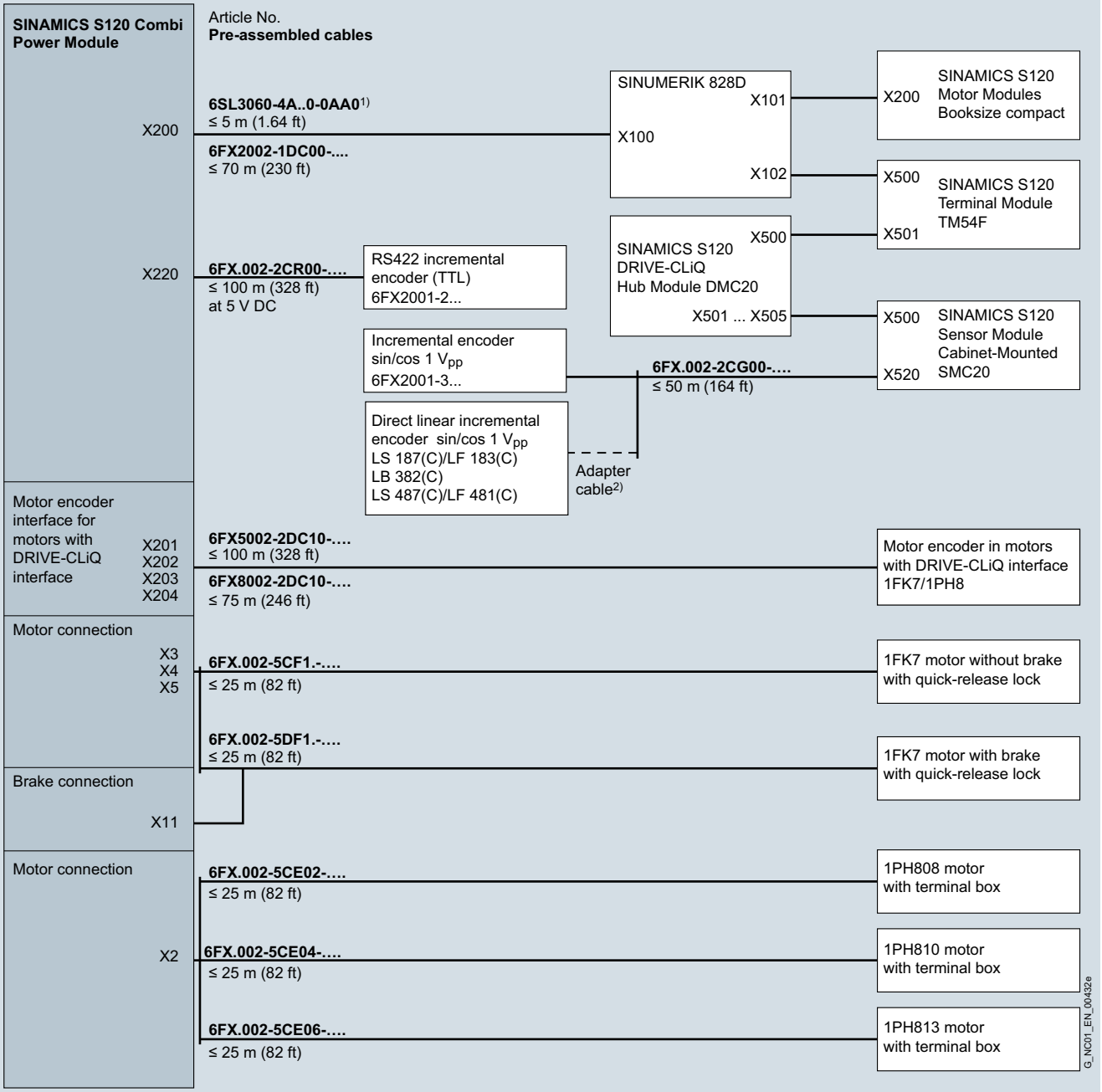
Integration (continued)

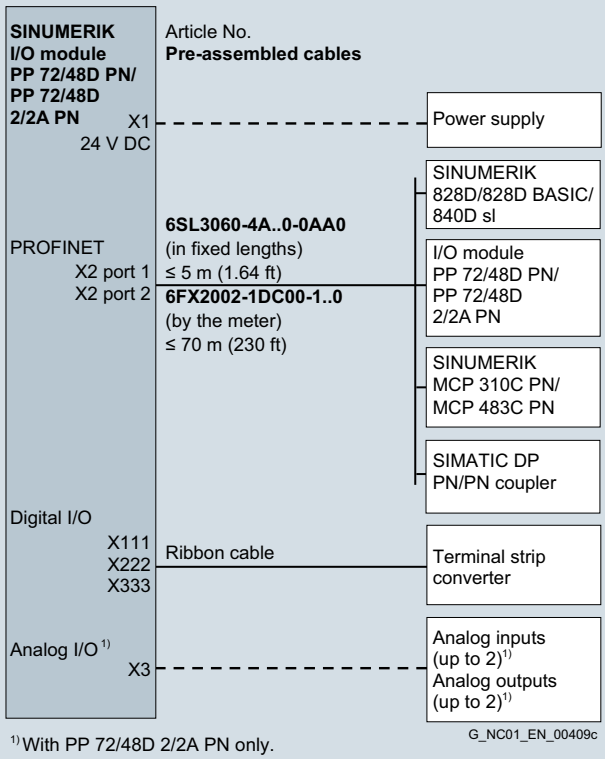
Connection overview of SINAMICS S120 Combi Power Modules



1) For standard configuration with the modules mounted directly adjacent to one another.
2) Adapter cable available from measuring system manufacturer.

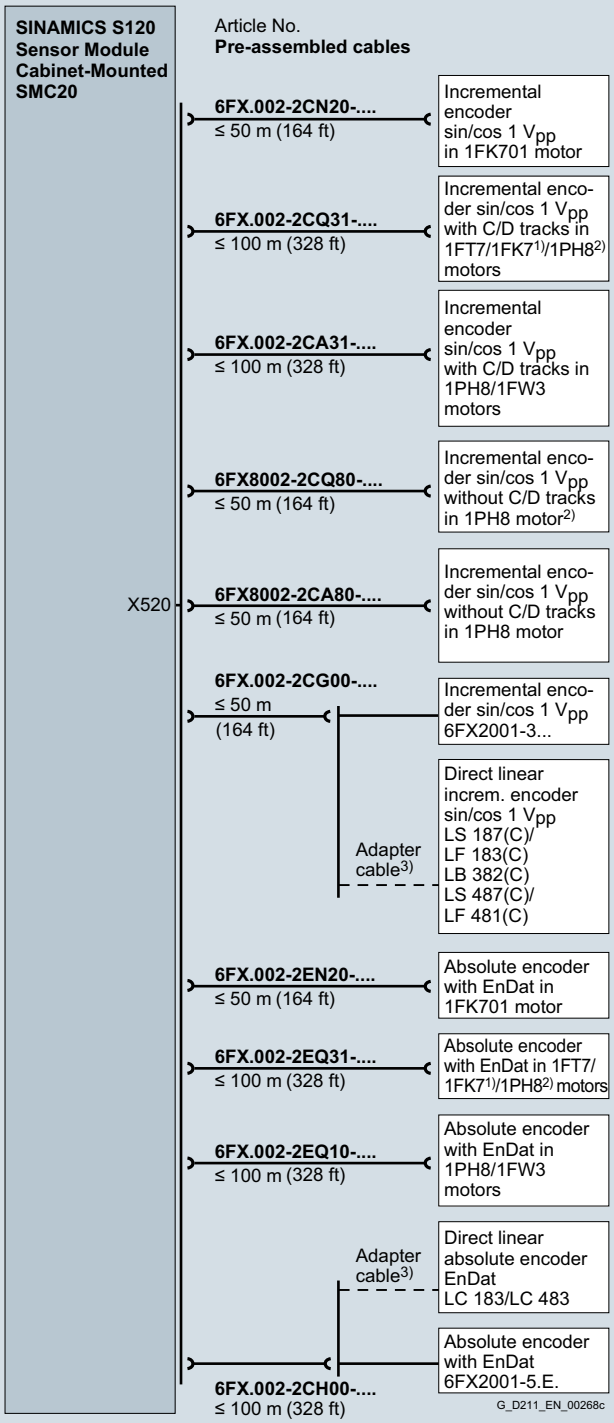
Integration (continued)

Connection overview of SINUMERIK PP 72/48D PN and PP 72/48D 2/2A PN I/O modules



1) With PP 72/48D 2/2A PN only.

Connection overview of SINAMICS S120 Sensor Module Cabinet-Mounted SMC20



1) Not for 1FK701 motor.
2) Possible for 1PH808/1PH810/1PH813/1PH816 motors.
3) Adapter cable available from measuring system manufacturer.

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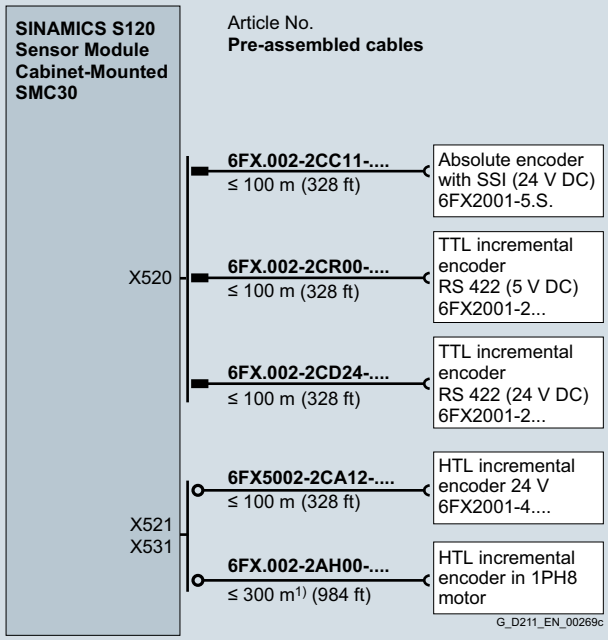
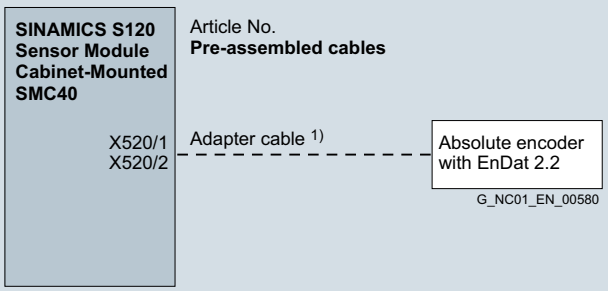
Integration (continued)

Connection overview of SINAMICS S120 Sensor Module Cabinet-Mounted SMC30



1) Applies to HTL encoders with bipolar signal evaluation or for evaluation of difference signals A*, A and B*, B; for HTL encoders with unipolar signal evaluation the permissible cable length is reduced to 100 m (328 ft).

Connection overview of SINAMICS S120 Sensor Module Cabinet-Mounted SMC40



1) Adapter cable between SMC40 and absolute encoder with EnDat 2.2 available from encoder manufacturer.

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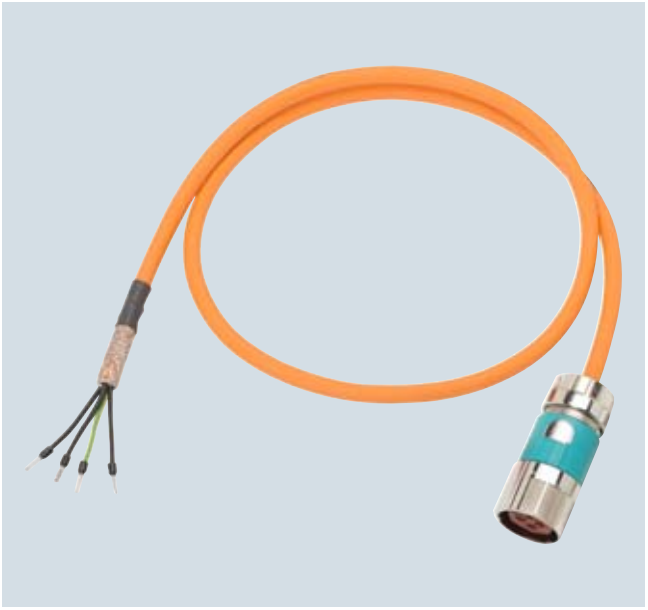
Overview



Power cable for connecting a SIMOTICS S-1FK7 motor with SPEED-CONNECT connector to a SINAMICS S120 Combi Power Module

The synchronous and asynchronous motors are connected to the Motor Modules or Power Modules by means of MOTION-CONNECT power cables.

The pre-assembled MOTION-CONNECT power cables are of high quality and offer safety with problem-free functioning.

Type of delivery for pre-assembled power cables

Pre-assembled power cables can be ordered in units of 10 cm up to a maximum length of 299 m.

The cables are supplied on reels up to 30 kg or 100 m. Above 30 kg or 100 m, cable drums are used instead of reels. This applies to both pre-assembled power cables and cables sold by the meter.

Type of delivery for power cables sold by the meter

Cross-section	MOTION-CONNECT 500 MOTION-CONNECT 800PLUS
Fixed lengths	
1.5 mm^2 and 2.5 mm^2	50 m, 100 m, 200 m, 500 m
Variable length, available in exact meter lengths	
4 mm^2 and 6 mm^2	≤ 500 m

Technical specifications

Product name	MOTION-CONNECT 500 power cables 6FX500.-.....-....	MOTION-CONNECT 800PLUS power cables 6FX800.-.....-....
Approvals, according to • VDE[1]/RoHS conformity • cURus or UR/CSA[2]	 Yes UL758-CSA-C22.2-N.210.2-M90	 Yes UL758-CSA-C22.2-N.210.2-M90
Rated voltage V_0/V • Power conductors • Signal conductors	 600 V/1000 V 24 V (EN) 1000 V (UL/CSA)	 600 V/1000 V 24 V (EN) 1000 V (UL/CSA)
Test voltage, rms • Power conductors • Signal conductors	 4 kV 2 kV	 4 kV 2 kV
Operating temperature on the surface • Fixed installation • Flexible installation	 -20 … +80 °C 0 … 60 °C	 -50 … +80 °C -20 … +60 °C
Tensile stress, max. • Fixed installation • Flexible installation	 50 N/mm^2 20 N/mm^2	 50 N/mm^2 20 N/mm^2
Smallest bending radius • Fixed installation • Flexible installation	 5 × D_{max} See selection and ordering data	 4 × D_{max} See selection and ordering data
Torsional stress	Absolute 30°/m	Absolute 30°/m
Bending	100000	10 million
Traversing velocity	30 m/min	Up to 300 m/min
Acceleration	2 m/s^2	Up to 50 m/s^2
Insulation material, incl. jacket	CFC/silicone-free	CFC/halogen/silicone-free IEC 60754-1/DIN VDE 0472-815
Oil resistance	EN 60811-2-1 (mineral oil only)	EN 60811-2-1
Outer jacket	PVC DESINA color orange RAL 2003	PUR, HD22.10 S2 (VDE 0282, Part 10) DESINA color orange RAL 2003
Flame-retardant	EN 60332-1-1 to 1-3	EN 60332-1-1 to 1-3

[1] The respective registration number is printed on the cable jacket.

[2] The UR-CSA File No. is printed on the cable jacket.

Selection and ordering data

Power cables for SIMOTICS S-1FK7 motors with SPEED-CONNECT connector

Connection method, Power/Motor Module end	Number of cores × cross-section	Connector size, motor end	**Pre-assembled cable with SPEED-CONNECT connector**	**Cable sold by the meter**[1]	D_{max}		Weight (cable sold by the meter)		Smallest perm. bending radius[2]	
					6FX5	**6FX8**	**6FX5**	**6FX8**	**6FX5**	**6FX8**
	mm^2		Article No.	Article No.	mm	mm	kg/m	kg/m	mm	mm
SIMOTICS S-1FK7 motors without holding brake on SINAMICS S120 Combi Power Modules										
Exposed core ends[3]	4 × 1.5	1	**6FX■002-5CF10-....**	**6FX■008-1BB11-....**	8.4	9.5	0.12	0.15	155	75
		1.5	**6FX■002-5CF14-....**							
SIMOTICS S-1FK7 motors with holding brake on SINAMICS S120 Combi Power Modules										
Exposed core ends[3]	4 × 1.5+2 × 1.5	1	**6FX■002-5DF10-....**	**6FX■008-1BA11-....**	10.8	12.0	0.22	0.23	195	90
		1.5	**6FX■002-5DF14-....**							
SIMOTICS S-1FK7 motors without holding brake on SINAMICS S120 Motor Modules in booksize compact format										
Exposed core ends	4 × 1.5	1	**6FX■002-5CG10-....**	**6FX■008-1BB11-....**	8.4	9.5	0.12	0.15	155	75
		1.5	**6FX■002-5CG22-....**							
	4 × 2.5	1	**6FX■002-5CG12-....**	**6FX■008-1BB21-....**	10.0	11.0	0.21	0.20	180	90
		1.5	**6FX■002-5CG32-....**							
SIMOTICS S-1FK7 motors with holding brake on SINAMICS S120 Motor Modules in booksize compact format										
Exposed core ends	4 × 1.5+2 × 1.5	1	**6FX■002-5DG10-....**	**6FX■008-1BA11-....**	10.8	12.0	0.22	0.23	195	90
		1.5	**6FX■002-5DG22-....**							
	4 × 2.5+2 × 1.5	1	**6FX■002-5DG12-....**	**6FX■008-1BA21-....**	12.4	13.8	0.25	0.30	225	105
		1.5	**6FX■002-5DG32-....**							
SIMOTICS S-1FK7 motors without holding brake on SINAMICS S120 Motor Modules in booksize format										
Connector[4]	4 × 1.5	1	**6FX■002-5CN01-....**	**6FX■008-1BB11-....**	8.4	9.5	0.12	0.15	155	75
		1.5	**6FX■002-5CN21-....**							
	4 × 2.5	1	**6FX■002-5CN11-....**	**6FX■008-1BB21-....**	10.0	11.0	0.21	0.20	180	90
		1.5	**6FX■002-5CN31-....**							
SIMOTICS S-1FK7 motors with holding brake on SINAMICS S120 Motor Modules in booksize format										
Connector[4]	4 × 1.5+2 × 1.5	0.5	**6FX■002-5DN20-....**	**6FX■008-1BA11-....**	10.8	12.0	0.22	0.23	195	90
		1	**6FX■002-5DN01-....**							
		1.5	**6FX■002-5DN21-....**							
	4 × 2.5+2 × 1.5	1	**6FX■002-5DN11-....**	**6FX■008-1BA21-....**	12.4	13.8	0.25	0.30	225	105
		1.5	**6FX■002-5DN31-....**							

MOTION-CONNECT 500	**5**			**5**	
MOTION-CONNECT 800PLUS	**8**			**8**	
Length code		**....**			**....**

[1] Note type of delivery.
[2] Valid for installation in a cable carrier.
[3] Length of core ends for power is 55 mm and length of brake core ends is 250 mm.
[4] For SINAMICS S120 Motor Modules 3 A to 30 A in booksize format.

Power cables for SIMOTICS M-1PH8 motors with terminal box

Selection and ordering data

Power cables for SIMOTICS M-1PH8 motors with terminal box

Motor Type	Thread	Number of cores × cross-section mm²	Connection method Power/Motor Module end	**Pre-assembled cable** Article No.	**Cable sold by the meter**[1] Article No.	D_{max} **6FX5** mm	D_{max} **6FX8** mm	Weight (cable sold by the meter) **6FX5** kg/m	Weight (cable sold by the meter) **6FX8** kg/m	Smallest perm. bending radius[2] **6FX5** mm	Smallest perm. bending radius[2] **6FX8** mm
SIMOTICS M-1PH8 motors with terminal box on SINAMICS S120 Combi Power Modules											
M-1PH808	M25	4 × 2.5	Exposed core ends[3]	**6FX■002-5CE02-....**	**6FX8008-1BB21-....**	11.0	11.0	0.21	0.20	180	90
M-1PH810	M32	4 × 4	Exposed core ends[3]	**6FX■002-5CE04-....**	**6FX8008-1BB31-....**	11.4	12.3	0.27	0.31	210	100
M-1PH813	M40	4 × 6	Exposed core ends[3]	**6FX■002-5CE06-....**	**6FX8008-1BB41-....**	20.0	15.1	0.37	0.42	245	120
SIMOTICS M-1PH8 motors with terminal box on SINAMICS S120 Motor Modules in booksize compact format											
M-1PH808	M25	4 × 2.5	Exposed core ends[4]	**6FX8002-5CR10-....**	**6FX8008-1BB21-....**	–	11.0	–	0.20	–	90
M-1PH810	M32	4 × 2.5	Exposed core ends[4]	**6FX8002-5CR11-....**	**6FX8008-1BB21-....**	–	11.0	–	0.20	–	90
SIMOTICS M-1PH8 motors with terminal box on SINAMICS S120 Motor Modules in booksize format											
M-1PH808	M25	4 × 2.5	Connector[5]	**6FX8002-5CP10-....**	**6FX8008-1BB21-....**	–	11.0	–	0.20	–	90
M-1PH810	M32	4 × 2.5	Connector[5]	**6FX8002-5CP11-....**	**6FX8008-1BB21-....**	–	11.0	–	0.20	–	90

MOTION-CONNECT 500				**5**							
MOTION-CONNECT 800PLUS				**8**				**8**			
Length code				**....**				**....**			

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1) Note type of delivery.
2) Valid for installation in a cable carrier.
3) Length of core ends for power is 55 mm and length of brake core ends is 250 mm.
4) Length of core ends: 300 mm. 4 M8 cable lugs and 4 M6 cable lugs are also included in the scope of supply of the cables.
5) For SINAMICS S120 Motor Modules 3 A to 30 A in booksize format.

Overview

MOTION-CONNECT DRIVE-CLiQ signal cable with IP20/IP67 connector

Signal cables are pre-assembled and are sold by the meter for the connection of a variety of components.

The following different types of cable are available:

- DRIVE-CLiQ signal cables
- MOTION-CONNECT DRIVE-CLiQ signal cables
- MOTION-CONNECT pre-assembled signal cables

Type of delivery for pre-assembled signal cables

Pre-assembled signal cables are available in units of 10 cm.

The cables are supplied on reels up to 30 kg or 100 m. Above 30 kg or 100 m, cable drums are used instead of reels.

Application

DRIVE-CLiQ signal cables

DRIVE-CLiQ signal cables are used to connect components with DRIVE-CLiQ connections which have a separate or external 24 V DC power supply.

MOTION-CONNECT DRIVE-CLiQ signal cables

MOTION-CONNECT DRIVE-CLiQ signal cables with 24 V DC cores are used whenever components with DRIVE-CLiQ connections must meet high requirements such as mechanical stress and oil resistance, e.g. where a connection is made outside the cabinet between Power Modules/Motor Modules and SIMOTICS S-1FK7/ SIMOTICS M-1PH8 motors with DRIVE-CLiQ interface.

MOTION-CONNECT pre-assembled signal cables

MOTION-CONNECT pre-assembled signal cables are used whenever motor encoders on motors without DRIVE-CLiQ interface are connected to Sensor Modules.

Technical specifications

Product name	DRIVE-CLiQ signal cables	DRIVE-CLiQ signal cables MOTION-CONNECT 500	DRIVE-CLiQ signal cables MOTION-CONNECT 800PLUS
	6FX2...-1DC..-....	6FX5...-.DC..-....	6FX8...-.DC..-....
Approvals, according to			
• cURus or UR/CSA[1)]	UL STYLE 2502/CSA-N.210.2-M90	UL STYLE 2502/CSA-N.210.2-M90	UL STYLE 2502/CSA-N.210.2-M90
• RoHS conformity	Yes	Yes	Yes
Rated voltage	30 V	30 V	30 V
Test voltage, rms	500 V	500 V	500 V
Operating temperature on the surface			
• Fixed installation	-20 … +80 °C	-20 … +80 °C	-50 … +80 °C
• Flexible installation	–	0 … 60 °C	-20 … +60 °C
Tensile stress, max.			
• Fixed installation	45 N/mm^2	80 N/mm^2	50 N/mm^2
• Flexible installation	–	30 N/mm^2	20 N/mm^2
Smallest bending radius			
• Fixed installation	50 mm	35 mm	35 mm
• Flexible installation	–	125 mm	75 mm

[1)] The UR-CSA File No. is printed on the cable jacket.

Technical specifications (continued)

Product name	DRIVE-CLiQ signal cables 6FX2...-1DC..-....	DRIVE-CLiQ signal cables MOTION-CONNECT 500 6FX5...-.DC..-....	DRIVE-CLiQ signal cables MOTION-CONNECT 800PLUS 6FX8...-.DC..-....
Torsional stress	–	Absolute 30°/m	Absolute 30°/m
Bending	–	100000	10 million
Traversing velocity	–	30 m/min	300 m/min
Acceleration	–	2 m/s^2	Up to 50 m/s^2
Insulation material, incl. jacket	CFC/silicone-free	CFC/silicone-free	CFC/halogen/silicone-free IEC 60754-1/DIN VDE 0472-815
Oil resistance	EN 60811-2-1	EN 60811-2-1 (mineral oil only)	EN 60811-2-1
Outer jacket	PVC Gray RAL 7032	PVC DESINA color green RAL 6018	PUR, HD22.10 S2 (VDE 0282, Part 10) DESINA color green RAL 6018
Flame-retardant	EN 60332-1-1 to 1-3	EN 60332-1-1 to 1-3	EN 60332-1-1 to 1-3

Degree of protection of the pre-assembled signal cables and their extensions when closed and connected: IP67.

Product name	MOTION-CONNECT 500 signal cables 6FX500.-.....-....	MOTION-CONNECT 800PLUS signal cables 6FX800.-.....-....
Approvals, according to		
• cURus or UR/CSA[1)]	UL758-CSA-C22.2-N.210.2-M90	UL758-CSA-C22.2-N.210.2-M90
• RoHS conformity	Yes	Yes
Rated voltage	30 V	30 V
Test voltage, rms	500 V	500 V
Operating temperature on the surface		
• Fixed installation	-20 … +80 °C	-50 … +80 °C
• Flexible installation	0 … 60 °C	-20 … +60 °C
Tensile stress, max.		
• Fixed installation	50 N/mm^2	50 N/mm^2
• Flexible installation	20 N/mm^2	20 N/mm^2
Smallest bending radius		
• Fixed installation	60 mm	4 × D_{max}
• Flexible installation	100 mm	70 mm
Torsional stress	Absolute 30°/m	Absolute 30°/m
Bending	2 million	10 million
Traversing velocity	180 m/min	Up to 300 m/min
Acceleration	5 m/s^2	Up to 50 m/s^2
Insulation material, incl. jacket	CFC/silicone-free	CFC/halogen/silicone-free IEC 60754-1/DIN VDE 0472-815
Oil resistance	EN 60811-2-1 (mineral oil only)	EN 60811-2-1
Outer jacket	PVC DESINA color green RAL 6018	PUR, HD22.10 S2 (VDE 0282, Part 10) DESINA color green RAL 6018
Flame-retardant	EN 60332-1-1 to 1-3	EN 60332-1-1 to 1-3

Degree of protection of the pre-assembled signal cables and their extensions when closed and connected: IP67.

1) The UR-CSA File No. is printed on the cable jacket.

Selection and ordering data

Pre-assembled DRIVE-CLiQ signal cables without 24 V DC cores

Type	Length	D_{max}	Degree of protection Connector	**DRIVE-CLiQ signal cable** without 24 V DC cores
	m	mm		Article No.
Fixed lengths 	0.11		IP20/IP20	**6SL3060-4AB00-0AA0**
	0.16			**6SL3060-4AD00-0AA0**
	0.21			**6SL3060-4AF00-0AA0**
	0.26			**6SL3060-4AH00-0AA0**
	0.31			**6SL3060-4AK00-0AA0**
	0.36			**6SL3060-4AM00-0AA0**
	0.41			**6SL3060-4AP00-0AA0**
	0.60			**6SL3060-4AU00-0AA0**
	0.95			**6SL3060-4AA10-0AA0**
	1.20			**6SL3060-4AW00-0AA0**
	1.45			**6SL3060-4AF10-0AA0**
	2.80			**6SL3060-4AJ20-0AA0**
	5.00			**6SL3060-4AA50-0AA0**
To the decimeter 	max. 70	7.0	IP20/IP20	**6FX2002-1DC00-....**

Pre-assembled MOTION-CONNECT DRIVE-CLiQ signal cables with 24 V DC cores

Type	Usage	Length, max.	D_{max}	Degree of protection Connector	**MOTION-CONNECT DRIVE-CLiQ signal cable** with 24 V DC cores
		m	mm		Article No.
To the decimeter 	For built-in or built-on encoder systems with DRIVE-CLiQ. For example, for making the connection between SIMOTICS motors and SINAMICS S120 Motor Modules or Power Modules.	75	7.1	IP20/IP67	**6FX8002-2DC10-....**
		100	7.1	IP20/IP67	**6FX5002-2DC10-....**

MOTION-CONNECT 500	**5**	
MOTION-CONNECT 800PLUS	**8**	
Length code		**....**

Signal cables for direct or external measuring systems with full-thread connector

Selection and ordering data

Pre-assembled signal cables for direct or external measuring systems with full-thread connector

Encoder system	Connection via	Length, max.	D_{max}	Degree of protection Connector[1]	**Basic cable**	**Extension**
		m	mm		Article No.	Article No.
Absolute encoder with EnDat	SMC20	100	9.8	IP20/IP67	**6FX■002-2EQ10-....**	**6FX■002-2EQ14-....**
Absolute encoder with EnDat 6FX2001-5.E..	SMC20	100	9.2	IP20/IP67	**6FX■002-2CH00-....**	**6FX■002-2AD04-....**
Absolute encoder with SSI 6FX2001-5.S.. 24 V DC						
Clock-pulse rate 100 ... 250 kHz	SMC30	100	9.3	IP20/IP67	**6FX■002-2CC11-....**	**6FX■002-2CB54-....**
Incremental encoder sin/cos 1 V_{pp} 2048 S/R, with C and D tracks	SMC20	100	9.8	IP20/IP67	**6FX■002-2CA31-....**	**6FX■002-2CA34-....**
Incremental encoder sin/cos 1 V_{pp} 256 and 512 S/R, without C and D tracks	SMC20	50	9.2	IP20/IP67	**6FX8002-2CA80-....**	**6FX■002-2CA34-....**
HTL incremental encoder	SMC30	300[2]	9.3	IP20/IP67	**6FX■002-2AH00-....**	**6FX■002-2AH04-....**
Incremental encoder sin/cos 1 V_{pp} without C and D tracks 6FX2001-3	SMC20	50	9.3	IP20/IP67	**6FX■002-2CG00-....**	**6FX■002-2CB54-....**
HTL incremental encoder 24 V DC 6FX2001-4	SMC30	100	9.3	–/IP67	**6FX5002-2CA12-....**	**–**
TTL incremental encoder RS422 6FX2001-2						
• 5 V DC	SMC30	100	9.3	IP20/IP67	**6FX■002-2CR00-....**	**6FX■002-2CB54-....**
• 24 V DC	SMC30	100	9.3	IP20/IP67	**6FX■002-2CD24-....**	**6FX■002-2CB54-....**

MOTION-CONNECT 500						**5**				**5**		
MOTION-CONNECT 800PLUS						**8**				**8**		
Length code								**....**				**....**

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

The maximum specified cable length (basic cable and extensions) must not be exceeded. The total maximum length is reduced by 2 m for each interruption point.

[1] The specification of the degree of protection refers to the basic cable.

[2] Applicable to HTL encoders with bipolar signal evaluation or for evaluation of the difference signals A*, A and B*, B; for HTL encoders with unipolar signal evaluation, the permissible cable length is reduced to 100 m.

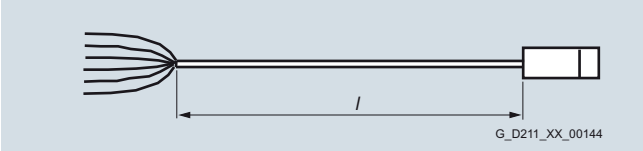
Overview

Length	Article No. supplement			
Length code for pre-assembled cables	**6FX....-.....-**	■	■	■ ■
0 m		**1**		
100 m		**2**		
200 m		**3**		
0 m			**A**	
10 m			**B**	
20 m			**C**	
30 m			**D**	
40 m			**E**	
50 m			**F**	
60 m			**G**	
70 m			**H**	
80 m			**J**	
90 m			**K**	
0 m				**A**
1 m				**B**
2 m				**C**
3 m				**D**
4 m				**E**
5 m				**F**
6 m				**G**
7 m				**H**
8 m				**J**
9 m				**K**
0 m				**0**
0.1 m				**1**
0.2 m				**2**
0.3 m				**3**
0.4 m				**4**
0.5 m				**5**
0.6 m				**6**
0.7 m				**7**
0.8 m				**8**
Examples:	1.0 m	1	A	B 0
	2.2 m	1	A	C 2
	8.0 m	1	A	J 0
	299.0 m	3	K	K 0

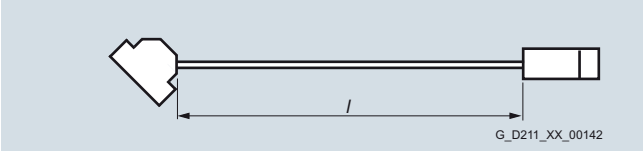
Length	Article No. supplement			
Length code for power and signal cables, sold by the meter[1)]	**6FX.008-.....-**	■	■	**A 0**
50 m		**1**	**F**	
100 m		**2**	**A**	
200 m		**3**	**A**	
500 m		**6**	**A**	

More information

Definition of lengths for pre-assembled cables



Cable with exposed core ends and pre-assembled connector



Cable with pre-assembled connectors at both ends

Tolerances:

- Cable lengths up to 10 m: ± 2 %
- Cable lengths of 10 m and longer: ± 1 %

[1)] Note type of delivery (up to 2.5 mm^2 in fixed lengths, above in exact meter lengths).

Notes

Services and training

On-site service

Overview

Equipment package SINUMERIK 828D BASIC, SINAMICS S120 Combi and SIMOTICS M-1PH8, as well as SIMOTICS S-1FK7 motors

On-site service

For the SINUMERIK 828D BASIC and SINUMERIK 828D and the associated components[1], you will receive a free on-site service contract for a period of 24 months from Siemens Industry Sector IA & DT.
The control is automatically registered on dispatch from the factory and the 24-month on-site service contract period begins. When arrival at the final destination or second commissioning is registered online (identSNAPSHOT) within 24 months following dispatch, the on-site service contract period is extended to 36 months.

On-site service includes:

- Provision of servicing personnel
- On-site diagnostics
- Fault correction on site
- Proof of fault correction

The fault correction is carried out by repairing and/or replacing faulty components.

Benefits

- You benefit because the contract period for on-site service is extended to 36 months when final acceptance by your customer (second commissioning) is registered.
- You can contractually extend the period for on-site service by an additional 6, 12, 24 or 36 months.
- This contract extension is effective from expiry of the 36-month on-site service and must be purchased before it expires.

Selection and ordering data

Description	Article No.
Extension of on-site service	**6FC8520-0RX00 - ■ AA2**
For SINUMERIK 828D BASIC and SINUMERIK 828D and the associated components from Siemens I IA & DT on machine tools	
• Contract extension by 6 months	**0**
• Contract extension by 12 months	**1**
• Contract extension by 24 months	**2**
• Contract extension by 36 months	**3**

More information

Further information about the conditions and the scope of the on-site service contract can be found at:

www.siemens.com/automation/oss

For further information about online registration with identSNAPSHOT, visit:

www.siemens.com/identsnapshot

[1] Not applicable to complete motor spindles.

Overview

Comprehensive documentation is available for the SINUMERIK 828D BASIC and SINUMERIK 828D CNCs and the SINAMICS S120 Combi drive system, ranging from the Operating Manual, Programming Manual or Configuration Manual up to the Commissioning Manual.

Information is available in the following formats:

- Paper version, printed copy
- PDF file for downloading from the Internet

www.siemens.com/automation/support

You can find additional information on the Internet at:

www.siemens.com/motioncontrol/docu

Selection and ordering data

Description	Article No.
Specific documentation for SINUMERIK 828D	
PPU Manual SINUMERIK 828D	
• Chinese Simplified	**6FC5397-2DP40-3RA3**
• Chinese Traditional	**6FC5397-2DP40-3MA3**
• German	**6FC5397-2DP40-3AA3**
• English	**6FC5397-2DP40-3BA3**
• Korean	**6FC5397-2DP40-3LA3**
Commissioning Manual SINUMERIK 828D Turning and Milling	
• Chinese Simplified	**6FC5397-3DP40-3RA1**
• Chinese Traditional	**6FC5397-3DP40-3MA1**
• German	**6FC5397-3DP40-3AA1**
• English	**6FC5397-3DP40-3BA1**
• Korean	**6FC5397-3DP40-3LA1**
Commissioning Manual SINUMERIK 828D/840D sl SINUMERIK Integrate for Engineering Access MyMachine /OPC UA	
• German	**6FC5397-1DP40-3AA2**
• English	**6FC5397-1DP40-3BA2**
Service Manual SINUMERIK 828D	
• Chinese Simplified	**6FC5397-5DP40-0RA0**
• Chinese Traditional	**6FC5397-5DP40-0MA0**
• German	**6FC5397-5DP40-0AA0**
• English	**6FC5397-5DP40-0BA0**
• French	**6FC5397-5DP40-0DA0**
• Italian	**6FC5397-5DP40-0CA0**
• Korean	**6FC5397-5DP40-0LA0**
• Portuguese	**6FC5397-5DP40-0KA0**
• Spanish	**6FC5397-5DP40-0EA0**
Parameter Manual Parameter Description SINAMICS S120 SINUMERIK 828D	
• Chinese Simplified	**6FC5397-8DP40-3RA0**
• German	**6FC5397-8DP40-3AA0**
• English	**6FC5397-8DP40-3BA0**

Selection and ordering data (continued)

Description	Article No.
Specific documentation for SINUMERIK 828D/SINAMICS S120	
Diagnostics Manual SINUMERIK 828D/SINAMICS S120	
• Chinese Simplified	**6FC5398-8BP40-3RA1**
• Chinese Traditional	**6FC5398-8BP40-3MA1**
• German	**6FC5398-8BP40-3AA1**
• English	**6FC5398-8BP40-3BA1**
• French	**6FC5398-8BP40-3DA1**
• Italian	**6FC5398-8BP40-3CA1**
• Japanese	**6FC5398-8BP40-3TA1**
• Korean	**6FC5398-8BP40-3LA1**
• Polish	**6FC5398-8BP40-3NA1**
• Portuguese	**6FC5398-8BP40-3KA1**
• Russian	**6FC5398-8BP40-3PA1**
• Swedish	**6FC5398-8BP40-3FA1**
• Spanish	**6FC5398-8BP40-3EA1**
• Czech	**6FC5398-8BP40-3UA1**
• Hungarian	**6FC5398-8BP40-3QA1**
Parameter Manual Machine Data SINUMERIK 828D/SINAMICS S120	
• Chinese Simplified	**6FC5397-4DP40-3RA1**
• German	**6FC5397-4DP40-3AA1**
• English	**6FC5397-4DP40-3BA1**
Parameter Manual NC variable and interface signals SINUMERIK 828D/SINAMICS S120	
• German	**6FC5397-4DP41-0AA0**
• English	**6FC5397-4DP41-0BA0**
Specific documentation for SINAMICS S120 Combi	
Manual SINAMICS S120 Combi	
• Chinese Simplified	**6SL3097-4AV00-0RP2**
• Chinese Traditional	**6SL3097-4AV00-0MP2**
• German	**6SL3097-4AV00-0AP3**
• English	**6SL3097-4AV00-0BP3**
• Korean	**6SL3097-4AV00-0LP2**
• Portuguese	**6SL3097-4AV00-0KP2**

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Selection and ordering data (continued)

Description	Article No.
General documentation for SINUMERIK 828D	
Operating Manual SINUMERIK 840D sl/828D Turning	
• Chinese Simplified	**6FC5398-8CP40-3RA1**
• Chinese Traditional	**6FC5398-8CP40-3MA1**
• Danish	**6FC5398-8CP40-3GA1**
• German	**6FC5398-8CP40-3AA1**
• English	**6FC5398-8CP40-3BA1**
• Finnish	**6FC5398-8CP40-3HA1**
• French	**6FC5398-8CP40-3DA1**
• Italian	**6FC5398-8CP40-3CA1**
• Japanese	**6FC5398-8CP40-3TA1**
• Korean	**6FC5398-8CP40-3LA1**
• Dutch	**6FC5398-8CP40-3JA1**
• Polish	**6FC5398-8CP40-3NA1**
• Portuguese	**6FC5398-8CP40-3KA1**
• Romanian	**6FC5398-8CP40-3XC1**
• Russian	**6FC5398-8CP40-3PA1**
• Swedish	**6FC5398-8CP40-3FA1**
• Slovakian	**6FC5398-8CP40-3SA1**
• Slovenian	**6FC5398-8CP40-3WA1**
• Spanish	**6FC5398-8CP40-3EA1**
• Thai	**6FC5398-8CP40-3XE1**
• Czech	**6FC5398-8CP40-3UA1**
• Turkish	**6FC5398-8CP40-3VA1**
• Hungarian	**6FC5398-8CP40-3QA1**
Operating Manual SINUMERIK 840D sl/828D Milling	
• Chinese Simplified	**6FC5398-7CP40-3RA1**
• Chinese Traditional	**6FC5398-7CP40-3MA1**
• Danish	**6FC5398-7CP40-3GA1**
• German	**6FC5398-7CP40-3AA1**
• English	**6FC5398-7CP40-3BA1**
• Finnish	**6FC5398-7CP40-3HA1**
• French	**6FC5398-7CP40-3DA1**
• Italian	**6FC5398-7CP40-3CA1**
• Japanese	**6FC5398-7CP40-3TA1**
• Korean	**6FC5398-7CP40-3LA1**
• Dutch	**6FC5398-7CP40-3JA1**
• Polish	**6FC5398-7CP40-3NA1**
• Portuguese	**6FC5398-7CP40-3KA1**
• Romanian	**6FC5398-7CP40-3XC1**
• Russian	**6FC5398-7CP40-3PA1**
• Swedish	**6FC5398-7CP40-3FA1**
• Slovakian	**6FC5398-7CP40-3SA1**
• Slovenian	**6FC5398-7CP40-3WA1**
• Spanish	**6FC5398-7CP40-3EA1**
• Thai	**6FC5398-7CP40-3XE1**
• Czech	**6FC5398-7CP40-3UA1**
• Turkish	**6FC5398-7CP40-3VA1**
• Hungarian	**6FC5398-7CP40-3QA1**

Description	Article No.
General documentation for SINUMERIK 828D *(continued)*	
Operating Manual SINUMERIK Operate Universal	
• Chinese Simplified	**6FC5398-6AP40-3RA1**
• Chinese Traditional	**6FC5398-6AP40-3MA1**
• Danish	**6FC5398-6AP40-3GA1**
• German	**6FC5398-6AP40-3AA1**
• English	**6FC5398-6AP40-3BA1**
• Finnish	**6FC5398-6AP40-3HA1**
• French	**6FC5398-6AP40-3DA1**
• Italian	**6FC5398-6AP40-3CA1**
• Japanese	**6FC5398-6AP40-3TA1**
• Korean	**6FC5398-6AP40-3LA1**
• Dutch	**6FC5398-6AP40-3JA1**
• Polish	**6FC5398-6AP40-3NA1**
• Portuguese	**6FC5398-6AP40-3KA1**
• Romanian	**6FC5398-6AP40-3XC1**
• Russian	**6FC5398-6AP40-3PA1**
• Swedish	**6FC5398-6AP40-3FA1**
• Slovakian	**6FC5398-6AP40-3SA1**
• Slovenian	**6FC5398-6AP40-3WA1**
• Spanish	**6FC5398-6AP40-3EA1**
• Thai	**6FC5398-6AP40-3XE1**
• Czech	**6FC5398-6AP40-3UA1**
• Turkish	**6FC5398-6AP40-3VA1**
• Hungarian	**6FC5398-6AP40-3QA1**

Selection and ordering data (continued)

Description	Article No.
General documentation for SINUMERIK 828D (continued)	
Programming Manual Fundamentals SINUMERIK 840D sl/828D	
• Chinese Simplified	**6FC5398-1BP40-3RA1**
• Chinese Traditional	**6FC5398-1BP40-3MA1**
• German	**6FC5398-1BP40-3AA1**
• English	**6FC5398-1BP40-3BA1**
• French	**6FC5398-1BP40-3DA1**
• Italian	**6FC5398-1BP40-3CA1**
• Japanese	**6FC5398-1BP40-3TA1**
• Korean	**6FC5398-1BP40-3LA1**
• Polish	**6FC5398-1BP40-3NA1**
• Portuguese	**6FC5398-1BP40-3KA1**
• Russian	**6FC5398-1BP40-3PA1**
• Swedish	**6FC5398-1BP40-3FA1**
• Spanish	**6FC5398-1BP40-3EA1**
• Thai	**6FC5398-1BP40-3XE1**
• Czech	**6FC5398-1BP40-3UA1**
• Hungarian	**6FC5398-1BP40-3QA1**
Programming Manual Job Planning SINUMERIK 840D sl/828D	
• Chinese Simplified	**6FC5398-2BP40-3RA1**
• Chinese Traditional	**6FC5398-2BP40-3MA1**
• German	**6FC5398-2BP40-3AA1**
• English	**6FC5398-2BP40-3BA1**
• French	**6FC5398-2BP40-3DA1**
• Italian	**6FC5398-2BP40-3CA1**
• Japanese	**6FC5398-2BP40-3TA1**
• Korean	**6FC5398-2BP40-3LA1**
• Dutch	**6FC5398-2BP40-3JA1**
• Polish	**6FC5398-2BP40-3NA1**
• Portuguese	**6FC5398-2BP40-3KA1**
• Russian	**6FC5398-2BP40-3PA1**
• Swedish	**6FC5398-2BP40-3FA1**
• Spanish	**6FC5398-2BP40-3EA1**
• Thai	**6FC5398-2BP40-3XE1**
• Czech	**6FC5398-2BP40-3UA1**
• Hungarian	**6FC5398-2BP40-3QA1**
Programming Manual ISO Turning SINUMERIK 840D sl/828D	
• Chinese Simplified	**6FC5398-5BP40-3RA0**
• Chinese Traditional	**6FC5398-5BP40-3MA0**
• German	**6FC5398-5BP40-3AA0**
• English	**6FC5398-5BP40-3BA0**
• French	**6FC5398-5BP40-3DA0**
• Italian	**6FC5398-5BP40-3CA0**
• Japanese	**6FC5398-5BP40-3TA0**
• Korean	**6FC5398-5BP40-3LA0**
• Portuguese	**6FC5398-5BP40-3KA0**
• Spanish	**6FC5398-5BP40-3EA0**

Description	Article No.
General documentation for SINUMERIK 828D (continued)	
Programming Manual ISO Milling SINUMERIK 840D sl/828D	
• Chinese Simplified	**6FC5398-7BP40-3RA0**
• Chinese Traditional	**6FC5398-7BP40-3MA0**
• German	**6FC5398-7BP40-3AA0**
• English	**6FC5398-7BP40-3BA0**
• French	**6FC5398-7BP40-3DA0**
• Italian	**6FC5398-7BP40-3CA0**
• Japanese	**6FC5398-7BP40-3TA0**
• Korean	**6FC5398-7BP40-3LA0**
• Portuguese	**6FC5398-7BP40-3KA0**
• Spanish	**6FC5398-7BP40-3EA0**
Programming Manual Measuring Cycles SINUMERIK 840D sl/828D	
• Chinese Simplified	**6FC5398-4BP40-3RA1**
• Chinese Traditional	**6FC5398-4BP40-3MA1**
• German	**6FC5398-4BP40-3AA1**
• English	**6FC5398-4BP40-3BA1**
• French	**6FC5398-4BP40-3DA1**
• Italian	**6FC5398-4BP40-3CA1**
• Japanese	**6FC5398-4BP40-3TA1**
• Korean	**6FC5398-4BP40-3LA1**
• Polish	**6FC5398-4BP40-3NA1**
• Portuguese	**6FC5398-4BP40-3KA1**
• Russian	**6FC5398-4BP40-3PA1**
• Swedish	**6FC5398-4PB40-3FA1**
• Spanish	**6FC5398-4BP40-3EA1**
• Czech	**6FC5398-4BP40-3UA1**
• Hungarian	**6FC5398-4BP40-3QA1**
Function Manual Basic Functions	
• German	**6FC5397-0BP40-3AA1**
• English	**6FC5397-0BP40-3BA1**
• Japanese	**6FC5397-0BP40-3TA1**
Function Manual Extended Functions	
• German	**6FC5397-1BP40-3AA1**
• English	**6FC5397-1BP40-3BA1**
• Japanese	**6FC5397-1BP40-3TA1**
Function Manual Special Functions	
• German	**6FC5397-2BP40-3AA1**
• English	**6FC5397-2BP40-3BA1**
Function Manual ISO Dialects	
• German	**6FC5397-7BP40-3AA0**
• English	**6FC5397-7BP40-3BA0**
SIMATIC NET GPRS/GSM Modem SINAUT MD720-3 System Manual	On product CD-ROM in scope of delivery of modem
• English/German	
SIMATIC NET Quad-Band GSM Antenna SINAUT 794-4MR Operating Instructions	On product CD-ROM in scope of delivery of modem
• English/German	

Overview

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

Siemens Industry Training provides you with comprehensive support in solving your tasks.

Training by the market leader in the industry enables you to make independent decisions with confidence. 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.

First-class know-how directly pays for itself: In shorter startup times, high-quality end products, faster troubleshooting and reduced downtimes. In other words, increased profits and lower costs.

Achieve more with Siemens Industry Training

- Shorter times for startup, maintenance and servicing
- Optimized production operations
- Reliable configuration and startup
- Minimization of plant downtimes
- Flexible plant adaptation to market requirements
- Compliance with quality standards in production
- Increased employee satisfaction and motivation
- Shorter familiarization times following changes in technology and staff

Contact

Our worldwide contacts can be found at:

www.siemens.com/sitrain

or let us advise you personally.

Siemens Industry Training Customer Support Germany:

Phone: +49 911 895-7575

Fax: +49 911 895-7576

E-mail: info@sitrain.com

Highlights Siemens Industry Training

Top trainers

Our trainers are skilled teachers with direct practical experience. Course developers have close contact with product development, and directly pass on their knowledge to the trainers.

Practical experience

The practical experience of our trainers enables them to teach theory effectively. But since theory can be pretty drab, we attach great importance to practical exercises which can comprise up to half of of the course time. You can therefore immediately implement your new knowledge in practice. We train you on state-of-the-art methodically/didactically designed training equipment. This training approach will give you all the confidence you need.

Wide variety

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

Tailor-made training

We are only a short distance away. You can find us at more than 50 locations in Germany, and in 62 countries worldwide. You wish to have individual training instead of one of our 300 courses? Our solution: We will provide a program tailored exactly to your personal requirements. Training can be carried out in our Training Centers or at your company.

Overview

SinuTrain for SINUMERIK Operate is a PC-based CNC training/programming software package. SinuTrain for SINUMERIK Operate enables completely identical operator control and CNC programming as on SINUMERIK CNCs that are equipped with the graphical user interface SINUMERIK Operate.

SinuTrain for SINUMERIK Operate taps into the following applications:

- Self-study or professional training of SINUMERIK operation and CNC programming
- Offline CNC program creation and simulation
- Professional presentation of SINUMERIK operation and CNC programming

To allow you to experience the advantages of using SinuTrain for SINUMERIK Operate, we can provide a trial version for 60 days. The trial version can be ordered on DVD-ROM for a nominal charge, or downloaded free of charge from the Internet.

Benefits

- User-friendly, accurate simulation of operation and CNC programming of SINUMERIK controls on the PC
- Maximum compatibility thanks to integrated original SINUMERIK CNC software
- Accurate simulation of machine operation with integrated virtual machine control panel
- State-of-the-art fully graphical CNC user interface with moving picture sequences for clarification of technological sequences (Animated Elements)
- Optimum training software with a wide CNC programming spectrum – from ISO and CNC high-level language to fully graphical machining step programming
- High process safety through realistic graphical CNC simulation – including multi-channel machining operations

Function

Technologies

SinuTrain for SINUMERIK Operate can be used for the following machining technologies:

- Turning with/without ShopTurn
- Milling with/without ShopMill
- Universal for other technologies[1)] as well as multi-channel capability

Adaptation to the machine

CNC programs created with SinuTrain for SINUMERIK Operate can be used on real machines. However, this requires SinuTrain to be adapted to the SINUMERIK configuration of the machine. This adaptation can be made either by the user with SinuTrain MCT or by a Siemens service specialist.

To allow operation of a larger array of machinery, several different configurations can be stored in SinuTrain for SINUMERIK Operate. In order to ensure maximum compatibility with different SINUMERIK software versions on the machine, multiple copies of SinuTrain for SINUMERIK Operate can be installed in the relevant software versions on one PC.

Accurate simulation of real operator control on the machine

With its fully-fledged, virtual machine control panel, SinuTrain for SINUMERIK Operate offers functions such as CNC Start, CNC Stop or feedrate and spindle override and can therefore be operated just like a real machine.

Online help

Like a SINUMERIK CNC, SinuTrain for SINUMERIK Operate also offers comprehensive online help. In addition, the SinuTrain DVD-ROM includes training manuals for the self-study of SINUMERIK operating and programming procedures.

Programming, simulation and printing

- DIN/ISO programming with programGUIDE
- ShopTurn/ShopMill machining step programming
- Multi-channel programming with programSYNC
- Fully-fledged graphical CNC simulation
- TCP/IP Ethernet networking with machines
- Print function for DIN/ISO and ShopTurn/ShopMill machining step programs
- Integrated CAD reader for importing DXF files

1) For other technologies, consultation with the relevant machine manufacturer is recommended to ensure that the software can be optimally adapted to the CNC of the machine.

SinuTrain for SINUMERIK Operate

Integration

SinuTrain for SINUMERIK Operate can be used for:

- SINUMERIK 828D BASIC from software release 4.5 SP2
- SINUMERIK 828D from software release 4.5 SP2
- SINUMERIK 840D sl from CNC software release 4.5 SP2

Requirements:

Hardware

- PC with 1.5 GHz processor (single core)
- RAM: 1 GB
- Hard disk: 3 GB of free memory space
- DVD drive for installation from DVD
- Graphic card: Minimum resolution 640 × 480 pixels
- USB interface
- Mouse, keyboard

Software

- Operating system
  - Windows 7 Home Basic, Home Premium, Professional, Ultimate, Enterprise (32 bit/64 bit)
  - Windows XP Professional SP3
- Adobe Acrobat Reader

Selection and ordering data

Description	Article No.
SinuTrain for SINUMERIK Operate Version 4.5	
SINUMERIK 840D sl SINUMERIK 828D BASIC/828D with CNC software 4.5 SP2 Turning/Milling/Universal multi-channel capability	
On DVD-ROM Languages: Chinese Simplified, English, French, German, Italian, Spanish	
• Single-user license	**6FC5870-4YC41-0YA0**
• Upgrade for single-user license[1)]	**6FC5870-4YC41-0YC0**
• Classroom license (18)	**6FC5870-8YC41-0YA0**
• Upgrade for classroom license (18)[1)]	**6FC5870-8YC41-0YC0**
• SinuTrain Trial	**6FC5870-0YC41-0YA0**
Machine adaptation for SinuTrain	
• Machine adaptation by Siemens[2)]	**6FC5088-4AA22-4AB1**
• SinuTrain MCT (Machine Configuration Tool)	**6FC5870-0CC41-0YA0**

More information

The first steps in working with SINUMERIK Operate can be learned quickly and easily through a web-based training program.

A trial version of SinuTrain for SINUMERIK Operate is available for download on the Internet.

You can find additional information on the Internet at:

www.cnc4you.siemens.com

1) With the upgrade license, you can upgrade an existing complete SinuTrain, SinuTrain ShopTurn or SinuTrain ShopMill to SinuTrain for SINUMERIK Operate V4.5. Prerequisite for the upgrade license is an existing, valid license key for SinuTrain versions 6.3, 7.3, 7.5, 2.6 or 4.4, this excludes SinuTrain Trial/Promotion and SinuTrain Trial BASIC.

2) Services for machine adaptation:
You provide a complete file for NC series startup by email.
You will then receive a file for importing into SinuTrain by email.
For more information, please contact your Siemens branch.

SINUMERIK 828D BASIC training case

Overview

SINUMERIK 828D BASIC training case

The SINUMERIK 828D BASIC training case is used for the realistic practice of operating, programming, installation and service tasks.

Design

The SINUMERIK 828D BASIC training case contains:

- SINUMERIK 828D BASIC PPU 241.3 including system software and software options
- SINUMERIK MCP 483 PN machine control panel
- SINUMERIK PP 72/48D 2/2A PN I/O module
- SINAUT MD720-3 GSM/GPRS modem, including antenna
- SITOP 24 V 10 A power supply
- Industrial Ethernet Switch SCALANCE XB005 unmanaged

The SINUMERIK 828D BASIC training case is designed for table set-up and is supplied in a Peli protector case with integrated rigid foam inlay. The extendable handle and the rollers in the base make the case easy to transport.

Technical specifications

Product name	SINUMERIK 828D BASIC training case 6AG1067-1AA24-0AA0
Supply voltage	230 V AC
Degree of protection to DIN VDE 0470 Part 1/EN 60529 (IEC 60529)	IP00
Ambient temperature	
• Storage	-20 ... +60 °C
• Transport	-20 ... +60 °C
• Operation	5 ... 40 °C
Dimensions (W × H × D)	650 × 500 × 250 mm
Weight, approx.	30 kg

Selection and ordering data

Description	Article No.
SINUMERIK 828D BASIC training case	**6AG1067-1AA24-0AA0**

SINUMERIK 828D training case

Overview

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Technical specifications

Product name	SINUMERIK 828D training case 6AG1067-1AA13-0AA0
Supply voltage	230 V AC
Degree of protection to DIN VDE 0470 Part 1/EN 60529 (IEC 60529)	IP00
Ambient temperature	
• Storage	-20 ... +60 °C
• Transport	-20 ... +60 °C
• Operation	5 ... 40 °C
Dimensions (W × H × D)	650 × 500 × 250 mm
Weight, approx.	30 kg

Selection and ordering data

Description	Article No.
SINUMERIK 828D training case	**6AG1067-1AA13-0AA0**

Comprehensive teaching support for educational institutions

Cooperates with Education

Automation

SIEMENS

Siemens Automation Cooperates with Education (SCE) offers a global system for sustained support of technical skills. SCE supports educational institutions in their teaching assignment in the industrial automation sector and offers added value in the form of partnerships, technical expertise, and know-how. As the technological leader, our comprehensive range of services can support you in the knowledge transfer for Industry 4.0.

Our services at a glance

- Training curriculums for your lessons
- Trainer packages for hands-on learning
- Courses convey up-to-date, specialist knowledge
- Support for your projects/textbooks
- Complete didactic solutions from our partners
- Personal contact for individual support

Training curriculums for your lessons

Use our profound industrial know-how for practice-oriented and individual design of your course. We offer you more than 100 didactically prepared training curriculums on the topics of automation and drives technology free of charge. These materials are perfectly matched to your curricula and syllabuses, and optimally suited for use with our trainer packages. This takes into account all aspects of a modern industrial solution: installation, configuration, programming, and commissioning. All documents, including projects, can be individually matched to your specific requirements.

Particular highlights:

- With the new SIMATIC PCS 7 curriculums and trainer packages, you can pass on basic, practice-oriented PCS 7 knowledge at universities within about 60 hours (= 1 semester), using plant simulation.
- The new TIA Portal training materials for SIMATIC S7-1200 are available in English, German, French, Italian, Spanish and Chinese for download.

www.siemens.com/sce/documents

Trainer packages for hands-on learning

Our SCE trainer packages offer a specific combination of original industrial components which are perfectly matched to your requirements and can be conveniently used in your course. These price reduced bundles available exclusively to schools include innovative and flexible hardware and software packages. SCE can currently offers more than 90 SCE trainer packages including related equipment. These cover both the factory and process automation sectors. You can use them to impart the complete course contents on industrial automation at a very low cost.

Trainer packages are available for:

- Introduction to automation technology with LOGO! logic module and SIMATIC S7-1200 compact controller
- PLC engineering with SIMATIC S7 hardware and STEP 7 software (S7-300, S7-1500 and TIA Portal)
- Operator control and monitoring with SIMATIC HMI
- Industrial networking over bus systems with SIMATIC NET (PROFINET, PROFIBUS, IO-Link)
- Sensor systems with VISION, RFID and SIWAREX
- Process automation with SIMATIC PCS 7
- Power Monitoring Devices SENTRON PAC4200
- Motor Management SIMOCODE
- Networked drive and motion technologies with SINAMICS/SIMOTION
- CNC programming with SinuTrain

Important ordering notes:

Only the following institutions are authorized to obtain trainer packages: vocational schools, Colleges and Universities, in-house vocational training departments, non commercial research institutions and non commercial training departments.

To purchase a trainer package, you require a specific end-use certificate, which you can obtain from your regional sales office.

www.siemens.com/sce/tp

Comprehensive teaching support for educational institutions (continued)

Courses convey up-to-date specialist knowledge

Profit from our excellent know-how as the leader in industrial technologies. We offer you specific courses for automation and drive technology worldwide. These support you in the practice-oriented transferring of product and system know-how, are in conformance with curriculums, and derived from the training fields. Compact technical courses especially for use at universities are also available.

Our range of courses comprises a wide variety of training modules based on the principle of Totally Integrated Automation (TIA). The focus is on the same subject areas as with the SCE trainer packages.

Every PLC and drive course is oriented on state-of-the-art technology. Your graduates can thus be prepared optimally for their future professional life.

In some countries we are offering classes based on our training curriculums. Please inquire with your SCE contact partner.

www.siemens.com/sce/contact

Support for your projects/textbooks

Automation and drive technology is characterized by continuous and rapid developments. Service and Support therefore play an important role.

We can provide you with consulting for selected projects and support from your personal SCE contact as well as our web based and regional Customer Support.

As a particular service, SCE supports technical authors with our know-how as well as with intensive technical consulting. Siemens library of special textbooks covering the industrial automation sector provides an additional resource for you and your students. These can be found at the SCE web site.

www.siemens.com/sce/contact
www.siemens.com/sce/books

Complete didactic solutions

Our partners for learning systems offer a wide range of training systems and solutions for use in your courses or laboratory.

These models have been designed based on our trainer packages and thus save you the time and cost of self-construction of individual components. The Partner systems provide you with simple and effective help in the fulfillment of your teaching assignment.

www.siemens.com/sce/partner

Contact for individual support

You can find your personal SCE contact on our Internet site. Your local SCE Promoter will answer all your questions concerning the complete SCE offering, and provide you with timely and competent information about innovations. When you encounter challenges, you can profit from our global team of excellence.

If a direct SCE contact is not listed for your country, please contact your local Siemens office.

www.siemens.com/sce/contact

SCE Support Finder for your Internet request

You are an educator and need support on the topic of industry automation? Send us your request:

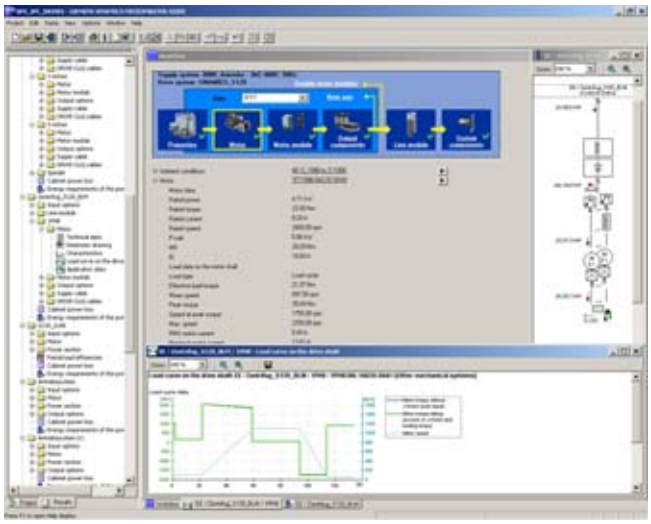
www.siemens.com/sce/supportfinder

Scan the QR code for further information (SCE homepage)

8

SIZER for Siemens Drives engineering tool

Overview



The following drives and controls can be engineered in a user-friendly way using the SIZER for Siemens Drives engineering tool:

- SINAMICS low-voltage and MICROMASTER 4 drive systems
- Motor starters
- SINUMERIK CNC control
- SIMOTION Motion Control System
- SIMATIC Technology

It provides support when setting up the technologies involved in the hardware and firmware components required for a drive task. SIZER for Siemens Drives covers the full range of operations required to configure a complete drive system, from basic single drives to demanding multi-axis applications.

SIZER for Siemens Drives supports all of the configuring steps in a workflow:

- Configuring the line supply infeed
- Designing the motor and gearbox, including calculation of mechanical transmission elements
- Configuring the drive components
- Compiling the required accessories
- Selecting the line-side and motor-side power options, e.g. cables, filters, and reactors

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

The SIZER for Siemens Drives user interface is available in English, French, German and Italian.

The drive configuration is saved in a project. In the project, the components and functions used are displayed in a hierarchical tree structure.

The project view permits the configuration of drive systems and the copying/inserting/modifying of drives already configured.

Overview (continued)

The configuration process produces the following results:

- A parts list of the required components (export to Excel, use of the Excel data sheet for import to SAP)
- Technical specifications of the system
- Characteristic curves
- Statements on line harmonic distortions
- Mounting arrangement of drive and control components and dimensional drawings of motors
- Energy requirements of the configured application

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

Support is provided by the technological online help menu:

- Detailed technical specifications
- Information about the drive systems and their components
- Decision-making criteria for the selection of components
- Online help in English, French, German, Italian, Chinese and Japanese

System requirements

- PG or PC with Pentium III min. 800 MHz (> 1 GHz recommended)
- 512 MB RAM (1 GB RAM recommended)
- At least 4.1 GB of free hard disk space
- An additional 100 MB of free hard disk space on the Windows system drive
- Screen resolution 1024 × 768 pixels (1280 × 1024 pixels recommended)
- Operating system:
  - Windows XP Home Edition SP2
  - Windows XP Professional 32 bit SP2
  - Windows XP Professional 64 bit SP2
  - Windows Vista Business
  - Windows 7 Ultimate 32 bit
  - Windows 7 Professional 32 bit
- Microsoft Internet Explorer V5.5 SP2

Selection and ordering data

Description	Article No.
SIZER for Siemens Drives engineering tool For SINAMICS and MICROMASTER on DVD-ROM Languages: English, French, German, Italian	**6SL3070-0AA00-0AG0**

More information

The SIZER for Siemens Drives engineering tool is available free on the Internet at:

www.siemens.com/sizer

8

Overview

Configuring drive system products

The Drive Technology Configurator (DT Configurator) helps you to select the optimum products for your application – starting with gear units, motors, converters and the associated options and components and ending with controllers, software licenses and connection technology. Whether with little or detailed knowledge of products: preselected product groups, targeted navigation through selection menus and direct product selection through entry of the article number support quick, efficient and convenient configuration.

In addition to all this, comprehensive documentation comprising technical data sheets, operating instructions, certificates and 2D/3D dimensional drawings can be selected in the DT Configurator. The products that you select can be directly ordered by transferring a parts lists to the shopping cart of the Industry Mall.

DT Configurator – efficient drive configuration:

- Quick and easy configuration of drive components
- Configuration of drive systems for pumps, fans and compressor applications from 1 kW to 2.6 MW
- Selection from a wide range of products
- Comprehensive documentation
- Support for retrofit projects
- Direct ordering via the Industry Mall

System requirements:

- Internet access as well as a standard browser (e.g. Internet Explorer V7.0 and higher, Firefox V5.0 and higher)
- Documentation (data sheets, dimensional drawings, etc.) is output in PDF or RTF format
- Registration is not required to use the DT Configurator

Selection and ordering data

Description	Article No.
Interactive Catalog CA 01 DVD-ROM including DT Configurator selection guide, German	**E86060-D4001-A510-D4-7600**

More information

Online access to DT Configurator

For more information about the DT Configurator selection tool, visit:

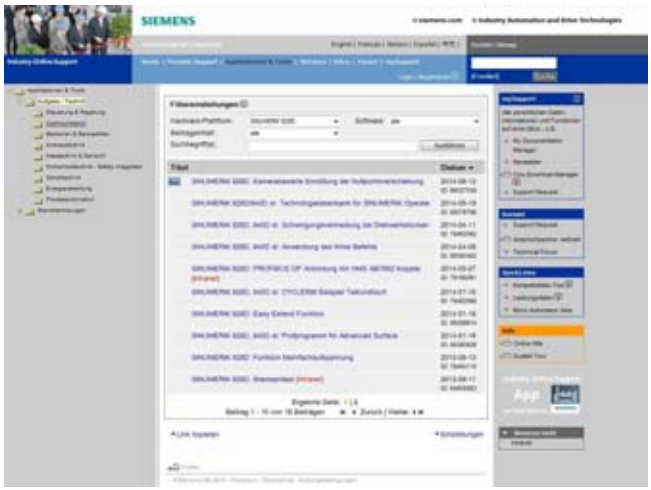
www.siemens.com/dtconfigurator

Offline access to the DT Configurator in the Interactive Catalog CA 01

The DT Configurator is also integrated in the Interactive Catalog CA 01 on DVD – the offline version of Siemens Industry Mall. The Interactive Catalog CA 01 can be ordered from the relevant Siemens sales office or via the Internet:

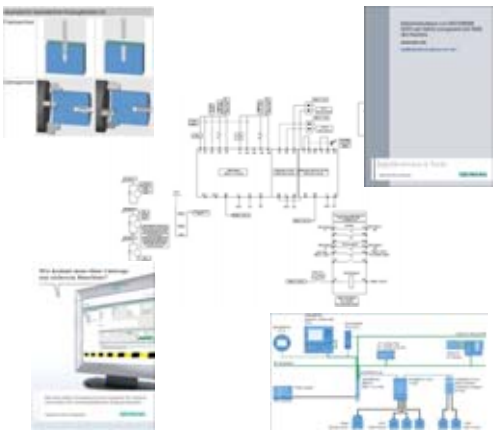
www.siemens.com/automation/CA01

Overview



Application examples

Descriptions of real, functioning and sector-neutral solutions, comprising a solution path, performance/power data, configuring instructions and the tested program code.



Benefits

The application examples show you solutions for typical automation tasks as example. You can use this as a suggestion or basis for your own solutions.

More information

You can find application examples on the Internet at:

www.siemens.com/automation/support

Or please contact your Siemens representative.

Overview

The SINUMERIK Solution Partners supplement the open SINUMERIK CNCs with their own solutions:

- Specific add-on functions, e.g. tool breakage monitoring
- Supplementary add-on components, e.g. robots, tools or measuring instruments
- Tailored services for the CNC machine tool, e.g. machine modernization

The solutions of the SINUMERIK Solution Partners are certified and therefore offer a high degree of reliability and compatibility in productive use with the SINUMERIK CNC in production.

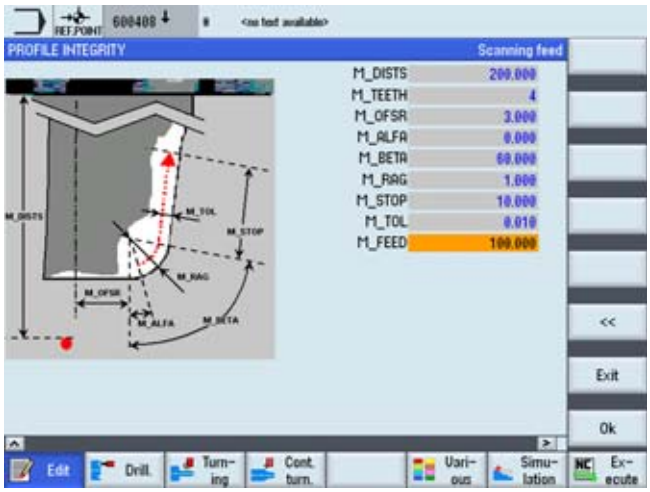
SINUMERIK Solution Partners assume responsibility for their own solutions, products and services.

More information

You can find additional information on the Internet at:

www.siemens.com/sinumerik/solutionpartner

Overview



Laser Tool Setter – Automatic non-contact tool setting, part probing, machine and tool monitoring on machine tools

Marposs provides measuring cycles for part probing and tool setting which work in synergy with Marposs Probing Systems. The specific user interface makes programming easy.

All the necessary measurements can be performed on the workpiece and on the tool for rapid setup of the machine. High-speed monitoring of the part, before and after the machining cycle, as well as continuous monitoring of the machining conditions, can be performed by Marposs Probing and Monitoring Systems.

Benefits

- Fast, automatic and precise workpiece setup
- Tool presetting in machine condition to compensate axes thermal drift
- Tool and process monitoring to keep high production quality
- Part inspection on machine to avoid repositioning

Function

Tool measurements with Mida laser:

- Length and diameter of the tool
- Axial breakage
- Cutters integrity
- Cutters radius
- Compensation of the thermal drift of the machine axes

Part measurements with Mida spindle probes:

- Part positioning
- Measuring of drilled holes, pins, pockets and shoulders
- Single surface measurement
- Measuring the internal and external cross-arm

Machine and tool monitoring with MMS:

- Performance (tool breakage and wear)
- Force (cutting force optimization)
- Vibrations (machine condition and tool unbalancing)
- Temperature (overheating of bearings)
- Displacement (spindle growth)

More information

Please contact:

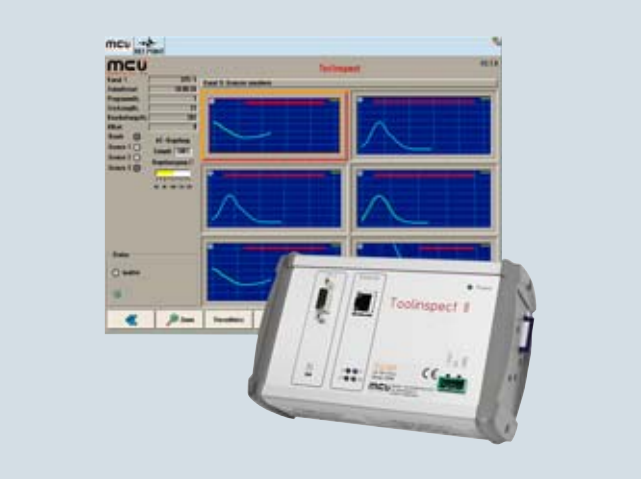
MARPOSS S.p.A.

Tel.: +39 051 899534
E-mail: marposs4partner@marposs.com
www.marposs.com

9

MCU GmbH & Co. KG – Tool and process monitoring

Overview



Toolinspect II for tool and process monitoring

The Toolinspect II module communicates with the SINUMERIK CNC via PROFINET or PROFIBUS DP. Visualization on the operator panel of the CNC is implemented with the module via a TCP/IP interface.

Benefits

- Easy operation using 3 function keys
- Tool damage detected immediately (real time system)
- Machine cycle time is not increased
- Automatic adaptation to any type of machining without intervention by the machine operator
- Rugged flash memory

Function

- Control-integrated tool, process and machine analysis
- 19 languages available online and selectable at any time
- Adaptive control for roughing operations to reduce machining times (option)
- Automatic system and data backup on 4 GB SD card
- Read out of torque and path actual data
- Monitoring of up to 6 channels (6 simultaneous machining operations)
- Monitoring after tool change
- Integrated process analysis and process reports in PDF files and in Excel (option)
- Process analysis with evaluation capability for technologists and export function of the actual values and display of the data in Excel
- Evaluation of MDE production data and up to 250 faults (option)
- Link to SINUMERIK Integrate

More information

Please contact:

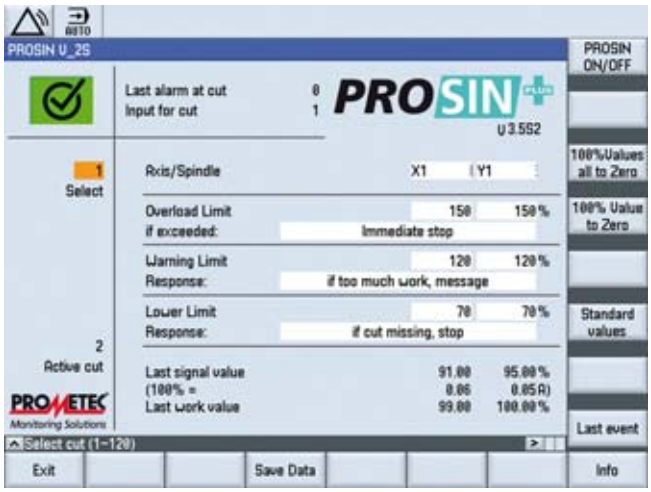
MCU GmbH & Co. KG

Max-Eyth-Straße 51
71364 WINNENDEN, Germany

Tel.: +49 7195 137538
Fax: +49 7195 137539
E-mail: vertrieb@mcu-gmbh.de
www.mcu-gmbh.de

PROMETEC GmbH – PROSIN^{PLUS}

Overview



PROSIN^{PLUS} –
Tool breakage and tools wear monitoring

The low-cost PROSIN^{PLUS} software permits direct access to the current values of the digital drives of the machine tool. If a tool breaks, the current of the associated drive changes; this value is increased in the case of a blunt tool. With PROSIN^{PLUS}, additional sensors and even complete monitoring units can be omitted.

A particular highlight of PROSIN^{PLUS} is the reliable detection of wear on rough-machining tools. This assumes mass production in which the batch size is significantly larger than the number of working tools.

PROSIN^{PLUS} is patented according to EP 1 276 027 and its derivations.

Benefits

- Break detection for drills, from approx. 2 mm (depending on rated spindle power)
- Protects machine, tool holder and tool from overload
- Reduces secondary damage resulting from tool breakage, tool wear, incorrect CNC parameter entries, incorrect clamping of the workpieces, etc.
- Suitable for mass production as well as small batch sizes

Function

- Operator control using SINUMERIK operator panels
- No additional hardware required
- Only one operator side and extremely easy to operate
- Very easy to retrofit
- Up to 120 different cuts of a CNC program can be monitored with 3 thresholds for missing tool, tool in contact with workpiece, tool wear, and tool overload

More information

Please contact:

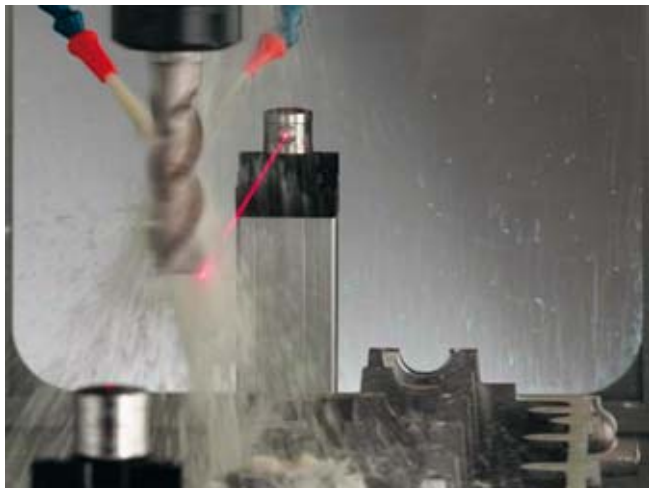
PROMETEC GmbH

Jülicher Straße 338
52070 AACHEN, Germany

Tel.: +49 241 16609-0
E-mail: prometec-de@prometec.com
www.prometec.com

Renishaw GmbH – Non-contact tool inspection

Overview



Non-contact tool inspection

Renishaw has developed software that can be used in conjunction with the systems for non-contact tool control NC1, NC3 and NC4.

The program routines contain the following functions:

- Static length measurement, e.g. drill, tap
- Length determination with spindle rotating, e.g. end mill, milling heads
- High-speed tool-breakage monitoring
- Automatic tool measuring
- Monitoring of the cutting edge geometry and profile monitoring for breakage of a single edge
- Temperature compensation

Renishaw systems for tool monitoring are available as carrier systems or module systems which cover a wide range of different applications. All systems use the MicroHole technology that provides protection to IP68 even during the measuring procedure. The NC4 system also offers an integrated PassiveSeal, which maintains full protection even if the compressed air supply is interrupted. Active drip suppression prevents false response caused by drops of coolant.

More information

Please contact:

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www.renishaw.de

EMUGE-FRANKEN GmbH & Co. KG – Precision tools

Overview

Precision tools that save time and money

EMUGE-FRANKEN is a group of companies that offers state-of-the-art thread cutting, testing, clamping and milling technology – and has done so for over 90 years.

Our products:

- Taps
- Thread gauges
- Thread cutters
- Tapping chucks
- Twist drills
- HSS milling cutters
- VHM milling cutters
- Threading dies
- Workpiece clamping

The broadly based customer sectors include, alongside the automotive industry, also the power plant and aeronautical industry, as well as mechanical and plant engineering. 50 % of the products are exported throughout the world.

Over 1000 employees in Lauf and Rückersdorf as well as 300 employees worldwide are responsible for the extensive range of products and services offered. All activities are targeted at optimizing manufacturing processes, to show the customer solutions that will save time and money.

With a range of tools that comprises more than 110000 items, EMUGE-FRANKEN covers a broad spectrum in order to satisfy the growing requirements of the market. Apart from the ex-stock standard product range, special tools are developed in cooperation with customers which are tuned to the respective process and to the machine requirements.

Benefits

A team of experts provides the following services for the products offered by EMUGE-FRANKEN:

- Worldwide hotline advice and support for the solution of technical problems
- Cooperation for planning overall concepts and suggestions for optimizing the production procedure at the customer's site
- Trials are implemented free-of-charge with customer-specific materials in a purpose-built test area for optimum tool selection and recommendation
- Development and construction of customer-specific special tools
- Deployment of service technicians
- Provision of product-related training and seminars worldwide

More information

EMUGE-FRANKEN is represented in 43 countries. You can find your local contact through our service centers in Lauf and Rückersdorf in Germany, or on the Internet.

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Factory for precision tools

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Quick Packages

Overview

Quick Packages are predefined packages for standard turning and milling machines which comprise drive and motors.

Quick Packages are combinations of the SINAMICS S120 Combi drive system, SIMOTICS S-1FK7 feed motors and SIMOTICS M-1PH8 spindle motors, which are optimally tailored to the mechanical properties of standard turning and milling machines.

Depending upon the machine model, a SINUMERIK 828D BASIC/ 828D CNC as well as the accessories listed in this catalog are added to the Quick Package.

Benefits

- Optimally matched components for turning and milling machines
- Drive packages suggested by Siemens mechatronics specialists
- Simple and fast dimensioning of the SINAMICS S120 Combi drive system
- Optimized logistics chain thanks to reduced variance

Configuration

Determining the QT... or QM... package number using the following package overview

- Technology selection: turning QT... or milling QM...
- Selection of the drive configuration using the electrical characteristics of the feed and spindle motors on the basis of the package overview
- Based on the characteristics of the SIMOTICS S-1FK7 feed motors, the corresponding row is selected in the package overview: With or without holding brake.
- Based on the characteristics of the SIMOTICS M-1PH8 spindle motors, the corresponding row is selected in the package overview: Type of construction IM B3 or IM B5.
- The package number required to order the package can be found at the intersection between the row and column. The appropriate SINAMICS S120 Combi drive system is determined with the help of the color code of the package number. The package number must be stated in the order.

Selection of the CNC and additional components from this catalog

- Selection of the CNC variant:
  - PPU 24x.3, PPU 26x.3 or PPU 28x.3
  - Horizontal or vertical
- Addition of the system software Turning or Milling on CompactFlash card. The package is delivered with the CompactFlash card preinstalled in the SINUMERIK 828.
- Selection of possible CNC options
- Addition of the MOTION-CONNECT connection system
- Addition of other accessories

For easier selection of the CNC and additional components, use of the SIZER for Siemens Drives engineering tool is recommended.

Example for ordering a Quick Package QM... for milling machines

1. Choose motors for feed, e.g. 11 Nm/16 Nm/16 Nm with holding brake, in the package overview.	1FK7063-2AF71-1RH1 1FK7083-2AC71-1RH1 1FK7083-2AC71-1RH1
2. Choose motor for spindle, e.g. 7 kW, type of construction IM B3, in the package overview.	1PH8105-1DF00-0LA1
3. Find SINAMICS S120 Combi drive system with the help of the color code of the package number in the package overview.	6SL3111-4VE21-6EA0
4. Use SIZER for Siemens Drives to determine the complete configuration including the motor selection from step 1 and step 2. During the configuration, verify whether the drive system corresponds to step 3.	
5. Find package number in the package overview, e.g. for SINUMERIK 828D BASIC PPU 240.3, and specify this together with the parts list in the order.	QMB3140407

Motor versions for Quick Packages

SIMOTICS S-1FK7 feed motors

- Compact or High Inertia
- Absolute encoder 20 bit + 12 bit multi-turn (AM20DQI encoder)
- DE shaft extension: Plain shaft
- Shaft and flange accuracy: Tolerance N
- Holding brake: With or without
- Degree of protection IP65
- Paint finish: Anthracite RAL 7016

SIMOTICS M-1PH8 spindle motors for turning machines

- 22 bit incremental encoder + commutation position 11 bit (IC22DQ encoder)
- Cooling: Forced ventilation from DE to NDE
- Type of construction: IM B3 or IM B5
- DE shaft extension: Plain shaft
- Bearing version: Standard
- Vibration severity: Grade S/A
- Shaft and flange accuracy: Tolerance R
- Cable connection: Terminal box top/cable entry from right/ signal connection DE

SIMOTICS M-1PH8 spindle motors for milling machines

- SIMOTICS M-1PH808: 20 bit incremental encoder without commutation position (IN20DQ encoder)
- SIMOTICS M-1PH810/1PH813: 22 bit incremental encoder + commutation position 11 bit (IC22DQ encoder)
- Cooling: Forced ventilation from DE to NDE
- Type of construction: IM B3 or IM B5
- DE shaft extension: Plain shaft
- Bearing version: Performance
- Vibration severity: Grade SPECIAL/B
- Shaft and flange accuracy: Tolerance SPECIAL
- Cable connection: Terminal box top/cable entry from right/ signal connection DE

More information

The Quick Packages cannot be ordered from the Siemens Industry Mall or Interactive Catalog CA 01.

For more information, please contact your Siemens branch.

Package overview

Feed motors

CT Compact
HI High Inertia

Axis 1				Axis 2			
Static torque	Rated speed			Static torque	Rated speed		
M_0	n_{rated}			M_0	n_{rated}		
Nm	rpm	Type	Article No.	Nm	rpm	Type	Article No.
6	3000	HI	1FK7060-3BF71-1R.1	6	3000	CT	1FK7060-2AF71-1R.1
6	3000	CT	1FK7060-2AF71-1R.1	6	3000	CT	1FK7060-2AF71-1R.1
6	3000	HI	1FK7060-3BF71-1R.1	8	3000	CT	1FK7080-2AF71-1R.1
6	3000	HI	1FK7060-3BF71-1R.1	11	2000	CT	1FK7063-2AC71-1R.1
6	3000	HI	1FK7060-3BF71-1R.1	11	3000	CT	1FK7063-2AF71-1R.1
6	3000	HI	1FK7060-3BF71-1R.1	16	2000	CT	1FK7083-2AC71-1R.1
8	3000	HI	1FK7062-3BF71-1R.1	8	3000	CT	1FK7080-2AF71-1R.1
8	3000	CT	1FK7080-2AF71-1R.1	8	3000	CT	1FK7080-2AF71-1R.1
8	3000	HI	1FK7062-3BF71-1R.1	11	2000	CT	1FK7063-2AC71-1R.1
8	3000	HI	1FK7062-3BF71-1R.1	12	3000	HI	1FK7081-3BF71-1R.1
11	2000	CT	1FK7063-2AC71-1R.1	11	2000	CT	1FK7063-2AC71-1R.1
11	3000	CT	1FK7063-2AF71-1R.1	11	3000	CT	1FK7063-2AF71-1R.1
11	3000	CT	1FK7063-2AF71-1R.1	12	3000	HI	1FK7081-3BF71-1R.1
11	3000	CT	1FK7063-2AF71-1R.1	16	2000	CT	1FK7083-2AC71-1R.1
11	3000	CT	1FK7063-2AF71-1R.1	20	2000	HI	1FK7084-3BC71-1R.1
16	2000	CT	1FK7083-2AC71-1R.1	16	2000	CT	1FK7083-2AC71-1R.1

Spindle motors

Rated power	Static torque	Rated current for S1 duty	Rated speed	
P_{rated}	M_0	I_{rated}	n_{rated}	
kW	Nm	A	rpm	Article No.
3.7	21	11.6	2000	1PH8083-1DG0.-0CA1
4.8	27	17.3	3000	1PH8087-1DM0.-0CA1
5.5	38	13.5	1500	1PH8103-1DF0.-0CA1
7	52	17.5	1500	1PH8105-1DF0.-0CA1
9	63	23.5	1500	1PH8107-1DF0.-0CA1
11	96	24	1500	1PH8131-1DF0.-0CA1
12	128	30	1000	1PH8133-1DD0.-0CA1

1FK7...-...71-1R■1

G Without holding brake
H With holding brake

1PH8...-1..0 ■-0CA1

0 Type of construction IM B3
2 Type of construction IM B5

10

Quick Packages for turning machines with SINAMICS S120 Combi Power Module for 3 axes

Package No.						
QT■2120004	QT■2120005	QT■2120006	QT■2120007			
QT■2020004	QT■2020005	QT■2020006	QT■2020007			
QT■2125004	QT■2125005	QT■2125006	QT■2125007			
		QT■2130006	QT■2130007			
		QT■2131006	QT■2131007			
				QT■2140009	QT■2140001	QT■2140002
QT■2625004	QT■2625005	QT■2625006	QT■2625007			
QT■2525004	QT■2525005	QT■2525006	QT■2525007			
		QT■2630006	QT■2630007			
			QT■2635007	QT■2635009	QT■2635001	
		QT■3030006	QT■3030007			
		QT■3131006	QT■3131007	QT■3131009	QT■3131001	QT■3131002
				QT■3135009	QT■3135001	QT■3135002
				QT■3140009	QT■3140001	QT■3140002
				QT■3151009	QT■3151001	QT■3151002
				QT■4040009	QT■4040001	QT■4040002

SINAMICS S120 Combi Power Modules for 3 axes

- 6SL3111-3VE21-6FA0 (16 kW/18 A)
- 6SL3111-3VE21-6EA0 (16 kW/24 A)
- 6SL3111-3VE22-0HA0 (20 kW/30 A)

Quick Package

QT■ .....

- **A** SINUMERIK 828D (PPU 260.3, PPU 261.3, PPU 280.3 or PPU 281.3)
- **B** SINUMERIK 828D BASIC (PPU 240.3 or PPU 241.3)

Package overview

Feed motors

CT Compact
HI High Inertia

Axis 1				Axis 2				Axis 3			
Static torque	Rated speed			Static torque	Rated speed			Static torque	Rated speed		
M_0	n_{rated}			M_0	n_{rated}			M_0	n_{rated}		
Nm	rpm	Type	Article No.	Nm	rpm	Type	Article No.	Nm	rpm	Type	Article No.
6	3000	HI	1FK7060-3BF71-1R.1	6	3000	HI	1FK7060-3BF71-1R.1	8	3000	CT	1FK7080-2AF71-1R.1
6	3000	HI	1FK7060-3BF71-1R.1	6	3000	HI	1FK7060-3BF71-1R.1	11	3000	CT	1FK7063-2AF71-1R.1
6	3000	HI	1FK7060-3BF71-1R.1	6	3000	HI	1FK7060-3BF71-1R.1	16	2000	CT	1FK7083-2AC71-1R.1
6	3000	HI	1FK7060-3BF71-1R.1	8	3000	HI	1FK7062-3BF71-1R.1	11	3000	CT	1FK7063-2AF71-1R.1
8	3000	HI	1FK7062-3BF71-1R.1	8	3000	HI	1FK7062-3BF71-1R.1	8	3000	CT	1FK7080-2AF71-1R.1
8	3000	HI	1FK7062-3BF71-1R.1	8	3000	HI	1FK7062-3BF71-1R.1	11	3000	CT	1FK7063-2AF71-1R.1
8	3000	HI	1FK7062-3BF71-1R.1	8	3000	HI	1FK7062-3BF71-1R.1	12	3000	HI	1FK7081-3BF71-1R.1
8	3000	HI	1FK7062-3BF71-1R.1	8	3000	HI	1FK7062-3BF71-1R.1	16	2000	CT	1FK7083-2AC71-1R.1
8	3000	HI	1FK7062-3BF71-1R.1	8	3000	HI	1FK7062-3BF71-1R.1	16	3000	CT	1FK7083-2AF71-1R.1
8	3000	HI	1FK7062-3BF71-1R.1	8	3000	HI	1FK7062-3BF71-1R.1	18	3000	CT	1FK7100-2AF71-1R.1
8	3000	HI	1FK7062-3BF71-1R.1	8	3000	HI	1FK7062-3BF71-1R.1	27	2000	CT	1FK7101-2AC71-1R.1
8	3000	HI	1FK7062-3BF71-1R.1	11	2000	CT	1FK7063-2AC71-1R.1	12	3000	HI	1FK7081-3BF71-1R.1
11	2000	CT	1FK7063-2AC71-1R.1	11	2000	CT	1FK7063-2AC71-1R.1	11	2000	CT	1FK7063-2AC71-1R.1
11	2000	CT	1FK7063-2AC71-1R.1	11	2000	CT	1FK7063-2AC71-1R.1	11	3000	CT	1FK7063-2AF71-1R.1
11	2000	CT	1FK7063-2AC71-1R.1	11	2000	CT	1FK7063-2AC71-1R.1	12	3000	HI	1FK7081-3BF71-1R.1
11	2000	CT	1FK7063-2AC71-1R.1	11	2000	CT	1FK7063-2AC71-1R.1	16	2000	CT	1FK7083-2AC71-1R.1
11	3000	CT	1FK7063-2AF71-1R.1	11	3000	CT	1FK7063-2AF71-1R.1	11	3000	CT	1FK7063-2AF71-1R.1
11	3000	CT	1FK7063-2AF71-1R.1	11	3000	CT	1FK7063-2AF71-1R.1	16	2000	CT	1FK7083-2AC71-1R.1
11	3000	CT	1FK7063-2AF71-1R.1	11	3000	CT	1FK7063-2AF71-1R.1	16	3000	CT	1FK7083-2AF71-1R.1
11	3000	CT	1FK7063-2AF71-1R.1	11	3000	CT	1FK7063-2AF71-1R.1	18	3000	CT	1FK7100-2AF71-1R.1
11	3000	CT	1FK7063-2AF71-1R.1	11	3000	CT	1FK7063-2AF71-1R.1	20	2000	CT	1FK7084-2AC71-1R.1
11	3000	CT	1FK7063-2AF71-1R.1	11	3000	CT	1FK7063-2AF71-1R.1	20	3000	CT	1FK7084-2AF71-1R.1
11	3000	CT	1FK7063-2AF71-1R.1	11	3000	CT	1FK7063-2AF71-1R.1	27	2000	CT	1FK7101-2AC71-1R.1
11	3000	CT	1FK7063-2AF71-1R.1	16	2000	CT	1FK7083-2AC71-1R.1	16	2000	CT	1FK7083-2AC71-1R.1

Spindle motors

Rated power	Static torque	Rated current for S1 duty	Rated speed	
P_{rated}	M_0	I_{rated}	n_{rated}	
kW	Nm	A	rpm	Article No.
3.7	21	11.6	2000	1PH8083-1UG0.-0LA1
4.8	27	17.3	3000	1PH8087-1UM0.-0LA1
5.5	38	13.5	1500	1PH8103-1DF0.-0LA1
7	52	17.5	1500	1PH8105-1DF0.-0LA1
9	63	23.5	1500	1PH8107-1DF0.-0LA1
11	96	24	1500	1PH8131-1DF0.-0LA1
12	128	30	1000	1PH8133-1DD0.-0LA1

1FK7...-...71-1R■1

G Without holding brake
H With holding brake

1PH8...-1..0 ■-0LA1

0 Type of construction IM B3
2 Type of construction IM B5

Quick Packages for milling machines with SINAMICS S120 Combi Power Module for 4 axes

Package No.						
QM■2121254	QM■2121255	QM■2121256	QM■2121257	QM■2121259		
QM■2121314	QM■2121315	QM■2121316	QM■2121317	QM■2121319		
QM■2121404	QM■2121405	QM■2121406	QM■2121407	QM■2121409		
QM■2126314	QM■2126315	QM■2126316	QM■2126317	QM■2126319		
QM■2626254	QM■2626255	QM■2626256	QM■2626257	QM■2626259		
QM■2626314	QM■2626315	QM■2626316	QM■2626317	QM■2626319		
QM■2626354	QM■2626355	QM■2626356	QM■2626357	QM■2626359		
QM■2626404	QM■2626405	QM■2626406	QM■2626407	QM■2626409		
				QM■2626419	QM■2626411	QM■2626412
				QM■2626459	QM■2626451	QM■2626452
				QM■2626559	QM■2626551	QM■2626552
QM■2630354	QM■2630355	QM■2630356	QM■2630357	QM■2630359		
QM■3030304	QM■3030305	QM■3030306	QM■3030307	QM■3030309		
QM■3030314	QM■3030315	QM■3030316	QM■3030317	QM■3030319		
QM■3030354	QM■3030355	QM■3030356	QM■3030357	QM■3030359		
QM■3030404	QM■3030405	QM■3030406	QM■3030407	QM■3030409		
QM■3131314	QM■3131315	QM■3131316	QM■3131317	QM■3131319	QM■3131311	
		QM■3131406	QM■3131407	QM■3131409	QM■3131401	
		QM■3131416	QM■3131417	QM■3131419	QM■3131411	QM■3131412
				QM■3131459	QM■3131451	QM■3131452
			QM■3131507	QM■3131509	QM■3131501	
				QM■3131529	QM■3131521	QM■3131522
				QM■3131559	QM■3131551	QM■3131552
			QM■3140407	QM■3140409	QM■3140401	

SINAMICS S120 Combi Power Modules for 4 axes

- 6SL3111-4VE21-6FA0 (16 kW/18 A)
- 6SL3111-4VE21-6EA0 (16 kW/24 A)
- 6SL3111-4VE22-0HA0 (20 kW/30 A)

Quick Package

QM■ .....

- **A** SINUMERIK 828D (PPU 260.3, PPU 261.3, PPU 280.3 or PPU 281.3)
- **B** SINUMERIK 828D BASIC (PPU 240.3 or PPU 241.3)

Package overview

Feed motors

CT Compact
HI High Inertia

Axis 1				Axis 2				Axis 3			
Static torque	Rated speed			Static torque	Rated speed			Static torque	Rated speed		
M_0	n_{rated}			M_0	n_{rated}			M_0	n_{rated}		
Nm	rpm	Type	Article No.	Nm	rpm	Type	Article No.	Nm	rpm	Type	Article No.
12	3000	HI	1FK7081-3BF71-1R.1	12	3000	HI	1FK7081-3BF71-1R.1	12	3000	HI	1FK7081-3BF71-1R.1
12	3000	HI	1FK7081-3BF71-1R.1	12	3000	HI	1FK7081-3BF71-1R.1	16	2000	CT	1FK7083-2AC71-1R.1
12	3000	HI	1FK7081-3BF71-1R.1	12	3000	HI	1FK7081-3BF71-1R.1	16	3000	CT	1FK7083-2AF71-1R.1
12	3000	HI	1FK7081-3BF71-1R.1	12	3000	HI	1FK7081-3BF71-1R.1	18	3000	CT	1FK7100-2AF71-1R.1
12	3000	HI	1FK7081-3BF71-1R.1	12	3000	HI	1FK7081-3BF71-1R.1	20	2000	CT	1FK7084-2AC71-1R.1
12	3000	HI	1FK7081-3BF71-1R.1	12	3000	HI	1FK7081-3BF71-1R.1	20	3000	CT	1FK7084-2AF71-1R.1
12	3000	HI	1FK7081-3BF71-1R.1	12	3000	HI	1FK7081-3BF71-1R.1	27	2000	CT	1FK7101-2AC71-1R.1
12	3000	HI	1FK7081-3BF71-1R.1	20	2000	HI	1FK7084-3BC71-1R.1	20	2000	CT	1FK7084-2AC71-1R.1
12	3000	HI	1FK7081-3BF71-1R.1	20	2000	HI	1FK7084-3BC71-1R.1	20	3000	CT	1FK7084-2AF71-1R.1
16	2000	CT	1FK7083-2AC71-1R.1	16	2000	CT	1FK7083-2AC71-1R.1	16	2000	CT	1FK7083-2AC71-1R.1
16	2000	CT	1FK7083-2AC71-1R.1	16	2000	CT	1FK7083-2AC71-1R.1	16	3000	CT	1FK7083-2AF71-1R.1
16	2000	CT	1FK7083-2AC71-1R.1	16	2000	CT	1FK7083-2AC71-1R.1	18	3000	CT	1FK7100-2AF71-1R.1
16	2000	CT	1FK7083-2AC71-1R.1	16	2000	CT	1FK7083-2AC71-1R.1	20	2000	CT	1FK7084-2AC71-1R.1
16	2000	CT	1FK7083-2AC71-1R.1	16	2000	CT	1FK7083-2AC71-1R.1	20	3000	CT	1FK7084-2AF71-1R.1
16	2000	CT	1FK7083-2AC71-1R.1	16	2000	CT	1FK7083-2AC71-1R.1	27	2000	CT	1FK7101-2AC71-1R.1
16	2000	CT	1FK7083-2AC71-1R.1	20	2000	HI	1FK7084-3BC71-1R.1	20	2000	HI	1FK7084-3BC71-1R.1
20	2000	HI	1FK7084-3BC71-1R.1	20	2000	HI	1FK7084-3BC71-1R.1	20	2000	CT	1FK7084-2AC71-1R.1
20	2000	HI	1FK7084-3BC71-1R.1	20	2000	HI	1FK7084-3BC71-1R.1	20	3000	CT	1FK7084-2AF71-1R.1
20	2000	HI	1FK7084-3BC71-1R.1	20	2000	HI	1FK7084-3BC71-1R.1	27	2000	CT	1FK7101-2AC71-1R.1

Spindle motors

Rated power	Static torque	Rated current for S1 duty	Rated speed	
P_{rated}	M_0	I_{rated}	n_{rated}	
kW	Nm	A	rpm	Article No.
7	52	17.5	1500	1PH8105-1DF0.-0LA1
9	63	23.5	1500	1PH8107-1DF0.-0LA1
11	96	24	1500	1PH8131-1DF0.-0LA1
12	128	30	1000	1PH8133-1DD0.-0LA1

1FK7...-...71-1R■1

G	Without holding brake
H	With holding brake

1PH8...-1..0 ■-0LA1

0	Type of construction IM B3
2	Type of construction IM B5

10

Quick Packages for milling machines with SINAMICS S120 Combi Power Module for 4 axes

Package No.			
QM■3535357	QM■3535359	QM■3535351	
QM■3535407	QM■3535409	QM■3535401	
	QM■3535419	QM■3535411	QM■3535412
	QM■3535459	QM■3535451	QM■3535452
QM■3535507	QM■3535509	QM■3535501	
	QM■3535529	QM■3535521	QM■3535522
	QM■3535559	QM■3535551	QM■3535552
QM■3551507	QM■3551509	QM■3551501	
	QM■3551529	QM■3551521	QM■3551522
QM■4040407	QM■4040409	QM■4040401	
	QM■4040419	QM■4040411	QM■4040412
	QM■4040459	QM■4040451	QM■4040452
QM■4040507	QM■4040509	QM■4040501	
	QM■4040529	QM■4040521	QM■4040522
	QM■4040559	QM■4040551	QM■4040552
QM■4051517	QM■4051519	QM■4051511	
QM■5151507	QM■5151509	QM■5151501	
	QM■5151529	QM■4051521	QM■5151522
	QM■5151559	QM■5151551	QM■5151552

SINAMICS S120 Combi Power Modules for 4 axes

6SL3111-4VE21-6EA0 (16 kW/24 A)

6SL3111-4VE22-0HA0 (20 kW/30 A)

Quick Package

QM■ .....

A SINUMERIK 828D (PPU 260.3, PPU 261.3, PPU 280.3 or PPU 281.3)

B SINUMERIK 828D BASIC (PPU 240.3 or PPU 241.3)

Notes

Appendix

Overview

Many products in this catalog comply with UL/CSA and FM requirements and are labeled with the corresponding approval mark.

All of the approvals, certificates, declarations of conformity, test certificates, e.g. CE, UL, Safety Integrated have been performed with the associated system components as they are described in the Catalogs and Configuration Manuals.

The certificates are only valid if the products are used with the described system components, are installed according to the Installation Guidelines and are used for their intended purpose.

In other cases, the vendor of these products is responsible for arranging for new certificates to be issued.

UL: Underwriters Laboratories
Independent testing body in North America

Test symbol:

- **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 standards
- **UR** for built-in parts in end products, tested by UL in accordance with the UL standard
- **cUR** for built-in parts in end products, tested by UL in accordance with the CSA standard
- **cURus** for built-in parts in end products, tested by UL in accordance with the UL and CSA standards

Test standards:

- SINUMERIK: Standard UL 508
- SINAMICS: Standard UL 508C
- Motors: Standard UL 547

Product category/File No.:

- SINUMERIK: E164110
- SINAMICS: E192450
- Motors: E93429

TUV: TUV Rheinland of North America Inc.
Independent testing body in North America
National recognized testing laboratory (NRTL)

Test symbol:

- **cTUVus** Tested by TUV in accordance with the UL and CSA standards

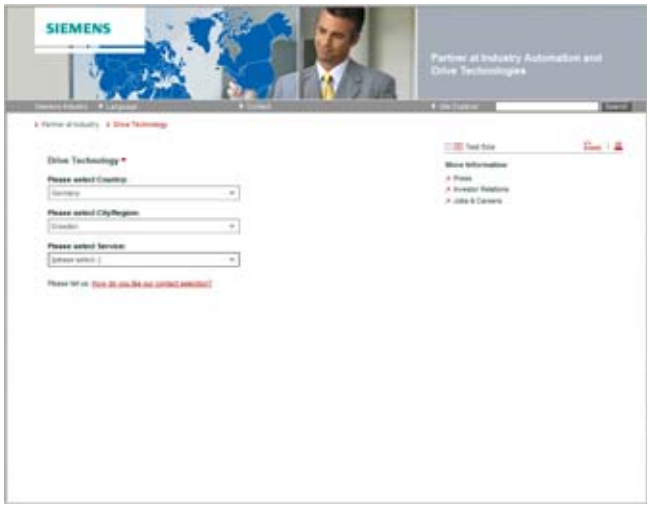
CSA: Canadian Standards Association
Independent testing body in Canada

Test symbol:

- **CSA** Tested by CSA in accordance with the CSA standard

Test standard:

- Standard CAN/CSA-C22.2 No. 0-M91/No. 14-05/No. 142-M1987



At Siemens Industry we are resolutely pursuing the same goal: long-term improvement of your competitive ability.
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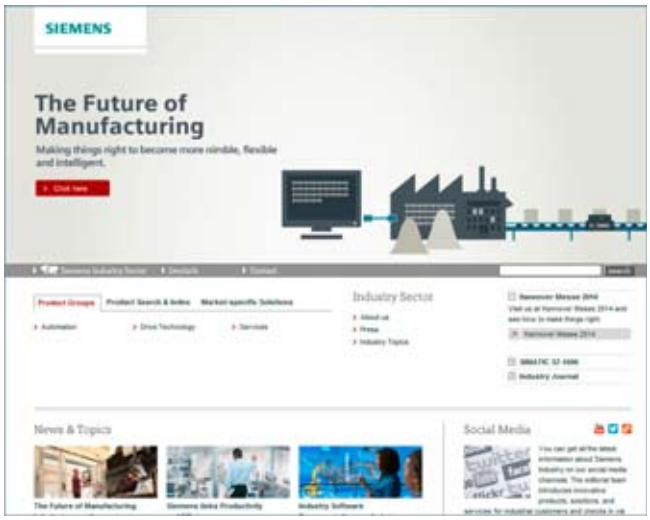
www.siemens.com/automation/partner

You start by selecting a

- Product group,
- Country,
- City,
- Service.

Information and ordering in the Internet and on DVD

Siemens Industry Automation and Drive Technologies 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.

Siemens Industry Automation and Drive Technologies 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

www.siemens.com/industry

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

Product Selection Using the Interactive Catalog CA 01 of Industry

Detailed information together with convenient interactive functions:
The interactive catalog CA 01 covers more than 80000 products and thus provides a full summary of the Siemens Industry Automation and Drive Technologies 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.

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Information on the interactive catalog CA 01 can be found in the Internet under

www.siemens.com/automation/ca01

or on DVD.

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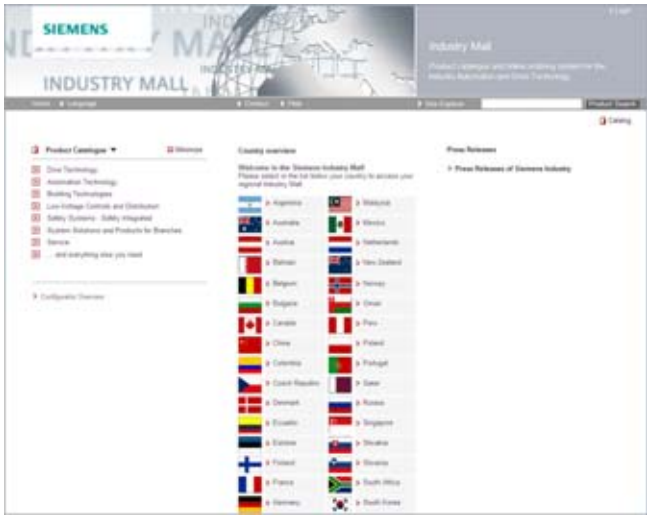

The Industry Mall is the electronic ordering platform of Siemens AG on the Internet. Here you have online access to a huge range of products presented in an informative and attractive way.

Data transfer via EDIFACT allows the whole procedure from selection through ordering to tracking and tracing of the order to be carried out. Availability checks, customer-specific discounts and preparation of quotes are also possible.

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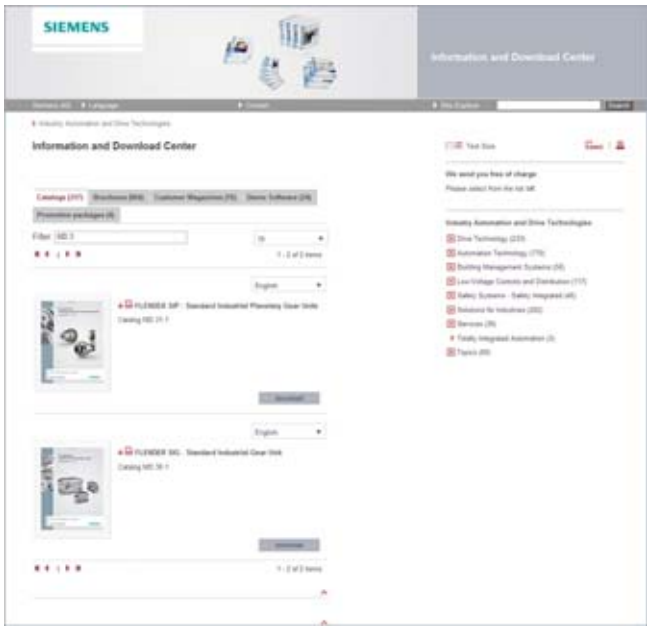
For example, powerful search functions make it easy to select the required products. Configurators enable you to configure complex product and system components quickly and easily. CAx data types are also provided here.

Please visit the Industry Mall on the Internet under:

www.siemens.com/industrymall

Downloading Catalogs



In addition to numerous other useful documents, you can also find the catalogs listed on the back inside cover of this catalog in the Information and Download Center. Without having to register, you can download these catalogs in PDF format or increasingly as digital page-turning e-books.

The filter dialog box above the first catalog displayed makes it possible to carry out targeted searches. If you enter “MD 3” for example, you will find both the MD 30.1 and MD 31.1 catalogs. If you enter “ST 70” both the ST 70 catalog and the associated news or add-ons are displayed.

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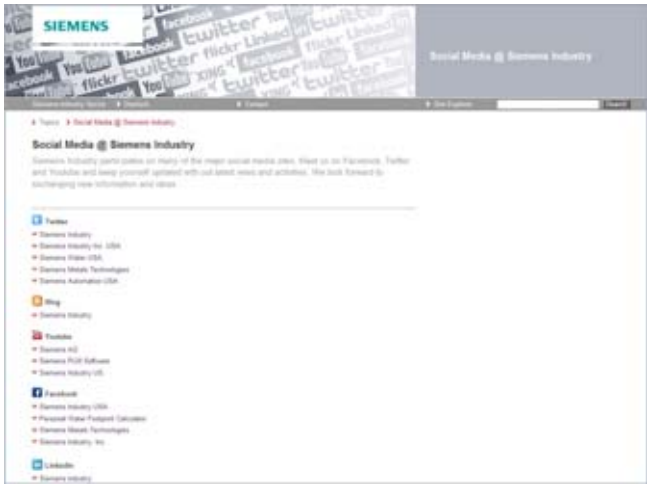
Social Media



Connect with Siemens through social media: visit our social networking sites for a wealth of useful information, demos on products and services, the opportunity to provide feedback, to exchange information and ideas with customers and other Siemens employees, and much, much more. Stay in the know and follow us on the ever-expanding global network of social media.

Connect with Siemens Industry at our central access point:

www.siemens.com/industry/socialmedia

Or via our product pages at:

www.siemens.com/automation

or

www.siemens.com/drives

To find out more about Siemens' current social media activities visit us at:

www.siemens.com/socialmedia

Mobile Media

Discover the world of Siemens.

We are also constantly expanding our offering of cross-platform apps for smartphones and tablets. You will find the current Siemens apps at the app store (iOS) or at Google Play (Android).

The Siemens app, for example, tells you all about the history, latest developments and future plans of the company – with informative pictures, fascinating reports and the most recent press releases.

Software licenses

Overview

Software types

Software requiring a license is categorized into types.
The following software types have been defined:

- Engineering software
- Runtime software

Engineering software

This includes all software products for creating (engineering) user software, e.g. for configuring, programming, parameterizing, testing, commissioning or servicing.

Data generated with engineering software and executable programs can be duplicated for your own use or for use by third-parties free-of-charge.

Runtime software

This includes all software products required for plant/machine operation, e.g. operating system, basic system, system expansions, drivers, etc.

The duplication of the runtime software and executable programs created with the runtime software for your own use or for use by third-parties is subject to a charge.

You can find information about license fees according to use in the ordering data (e.g. in the catalog). Examples of categories of use include per CPU, per installation, per channel, per instance, per axis, per control loop, per variable, etc.

Information about extended rights of use for parameterization/configuration tools supplied as integral components of the scope of delivery can be found in the readme file supplied with the relevant product(s).

License types

Siemens Industry Automation & Drive Technologies offers various types of software license:

- Floating license
- Single license
- Rental license
- Rental floating license
- Trial license
- Demo license
- Demo floating license

Floating license

The software may be installed for internal use on any number of devices by the licensee. Only the concurrent user is licensed. The concurrent user is the person using the program. Use begins when the software is started.
A license is required for each concurrent user.

Single license

Unlike the floating license, a single license permits only one installation of the software per license.

The type of use licensed is specified in the ordering data and in the Certificate of License (CoL). Types of use include for example per instance, per axis, per channel, etc.

One single license is required for each type of use defined.

Rental license

A rental license supports the "sporadic use" of engineering software. Once the license key has been installed, the software can be used for a specific period of time (the operating hours do not have to be consecutive).
One license is required for each installation of the software.

Rental floating license

The rental floating license corresponds to the rental license, except that a license is not required for each installation of the software. Rather, one license is required per object (for example, user or device).

Trial license

A trial license supports "short-term use" of the software in a non-productive context, e.g. for testing and evaluation purposes. It can be transferred to another license.

Demo license

The demo license support the "sporadic use" of engineering software in a non-productive context, for example, use for testing and evaluation purposes. It can be transferred to another license. After the installation of the license key, the software can be operated for a specific period of time, whereby usage can be interrupted as often as required.

One license is required per installation of the software.

Demo floating license

The demo floating license corresponds to the demo license, except that a license is not required for each installation of the software. Rather, one license is required per object (for example, user or device).

Certificate of license (CoL)

The CoL is the licensee's proof that the use of the software has been licensed by Siemens. A CoL is required for every type of use and must be kept in a safe place.

Downgrading

The licensee is permitted to use the software or an earlier version/release of the software, provided that the licensee owns such a version/release and its use is technically feasible.

Delivery versions

Software is constantly being updated.
The following delivery versions

- PowerPack
- Upgrade

can be used to access updates.

Existing bug fixes are supplied with the ServicePack version.

PowerPack

PowerPacks can be used to upgrade to more powerful software. The licensee receives a new license agreement and CoL (Certificate of License) with the PowerPack. This CoL, together with the CoL for the original product, proves that the new software is licensed.
A separate PowerPack must be purchased for each original license of the software to be replaced.

Upgrade

An upgrade permits the use of a new version of the software on the condition that a license for a previous version of the product is already held.
The licensee receives a new license agreement and CoL with the upgrade. This CoL, together with the CoL for the previous product, proves that the new version is licensed.
A separate upgrade must be purchased for each original license of the software to be upgraded.

Overview

ServicePack

ServicePacks are used to debug existing products. ServicePacks may be duplicated for use as prescribed according to the number of existing original licenses.

License key

Siemens Industry Automation & Drive Technologies supplies software products with and without license keys.

The license key serves as an electronic license stamp and is also the "switch" for activating the software (floating license, rental license, etc.).

The complete installation of software products requiring license keys includes the program to be licensed (the software) and the license key (which represents the license).

Software Update Service (SUS)

As part of the SUS contract, all software updates for the respective product are made available to you free of charge for a period of one year from the invoice date. The contract will automatically be extended for one year if it is not canceled three months before it expires.

The possession of the current version of the respective software is a basic condition for entering into an SUS contract.

You can download explanations concerning license conditions from www.siemens.com/automation/salesmaterial-as/catalog/en/terms_of_trade_en.pdf

Setup texts and software update services

Overview

The "General License Conditions for Software Products for Automation and Drives" are applicable for supplies and deliveries of I DT software products.

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.

Notice:
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-ROM 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 for 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.

Overview (continued)

Software update services

Order
To order the software update service, an article 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 posession at least of a 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.

More information

Security information

Siemens provides products and solutions with industrial security functions that support the secure operation of plants, solutions, machines, equipment and/or networks. They are important components in a holistic industrial security concept. With this in mind, Siemens' products and solutions undergo continuous development. Siemens recommends strongly that you regularly check for product updates.

For the secure operation of Siemens products and solutions, it is necessary to take suitable preventive action (e.g. cell protection concept) and integrate each component into a holistic, state-of-the-art industrial security concept. Third-party products that may be in use should also be considered.
For more information about industrial security, visit

www.siemens.com/industrialsecurity

Subject index

Article number index

Article number index

Article number index

Order code index

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Do the technical details meet your expectations? ☐

Is the information easy to find? ☐

How would you assess the graphics and tables? ☐

Can the texts be readily understood? ☐

Did you find any printing errors?

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./s)	2.645×10^{-6}	1.972×10^{-3}
(lb-in) (rpm)	1.587×10^{-5}	1.183×10^{-2}
(lb-ft) (deg./s)	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/s	degrees/s
rpm	1	0.105	6.0
rad/s	9.55	1	57.30
degrees/s	0.167	1.745×10^{-2}	1

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 $^5/_9$		multiply by $^9/_5$ 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.

Explanation of the raw material/metal surcharges[1)]

Surcharge calculation

To compensate for variations in the price of the raw materials silver, copper, aluminum, lead, gold, dysprosium[2)] and/or neodym[2)], surcharges are calculated on a daily basis using the so-called metal factor for products containing these raw materials. A surcharge for the respective raw material is calculated as a supplement to the price of a product if the basic official price of the raw material in question is exceeded.

The surcharges are calculated in accordance with the following criteria:

- Basic official price of the raw material
  Basic official price from the day prior to receipt of the order or prior to release order (daily price) for[3)]
  - Silver (sales price, processed)
  - Gold (sales price, processed)

  and for[4)]
  - Copper (lower DEL notation + 1 %)
  - Aluminum (aluminum in cables)
  - Lead (lead in cables)
- Metal factor of the products
  Certain products are displayed with a metal factor. The metal factor determines the official price (for those raw materials concerned) as of which the metal surcharges are applied and the calculation method used (weight or percentage method). An exact explanation is given below.

Structure of the metal factor

The metal factor consists of several digits; the first digit indicates whether the percentage method of calculation refers to the list price or a possible discounted price (customer net price) (L = list price / N = customer net price).

The remaining digits indicate the method of calculation used for the respective raw material. If no surcharge is added for a raw material, a "-" is used.

1st digit	List or customer net price using the percentage method
2nd digit	for silver (AG)
3rd digit	for copper (CU)
4th digit	for aluminum (AL)
5th digit	for lead (PB)
6th digit	for gold (AU)
7th digit	for dysprosium (Dy)[2)]
8th digit	for neodym (Nd)[2)]

Weight method

The weight method uses the basic official price, the daily price and the raw material weight. In order to calculate the surcharge, the basic official price must be subtracted from the daily price. The difference is then multiplied by the raw material weight.

The basic official price can be found in the table below using the number (1 to 9) of the respective digit of the metal factor. The raw material weight can be found in the respective product descriptions.

Percentage method

Use of the percentage method is indicated by the letters A-Z at the respective digit of the metal factor.

The surcharge is increased - dependent on the deviation of the daily price compared with the basic official price - using the percentage method in "steps" and consequently offers surcharges that remain constant within the framework of this "step range". A higher percentage rate is charged for each new step. The respective percentage level can be found in the table below.

Metal factor examples

L E A – – – – –

- Basis for % surcharge: List price
- Silver Basis 150 €, Step 50 €, 0.5 %
- Copper Basis 150 €, Step 50 €, 0.1 %
- No surcharge for aluminum
- No surcharge for lead
- No surcharge for gold
- No surcharge for dysprosium
- No surcharge for neodym

N – A 6 – – – –

- Basis for % surcharge: Customer net price
- No surcharge for silver
- Copper Basis 150 €, Step 50 €, 0.1 %
- Aluminum acc. to weight, basic offic. price 225 €
- No surcharge for lead
- No surcharge for gold
- No surcharge for dysprosium
- No surcharge for neodym

– – 3 – – – – –

- No basis necessary
- No surcharge for silver
- Copper acc. to weight, basic official price 150 €
- No surcharge for aluminum
- No surcharge for lead
- No surcharge for gold
- No surcharge for dysprosium
- No surcharge for neodym

1) Refer to the separate explanation on the next page regarding the raw materials dysprosium and neodym (= rare earths).
2) For a different method of calculation, refer to the separate explanation for these raw materials on the next page.
3) Source: Umicore, Hanau (www.metalsmanagement.umicore.com).
4) Source: German Trade Association for Cables and Conductors (www.kabelverband.org).

Explanation of the raw material/metal surcharges for dysprosium and neodym (rare earths)

Surcharge calculation

To compensate for variations in the price of the raw materials silver[1], copper[1], aluminum[1], lead[1], gold[1], dysprosium and/or neodym, surcharges are calculated on a daily basis using the so-called metal factor for products containing these raw materials. The surcharge for dysprosium and neodym is calculated as a supplement to the price of a product if the basic official price of the raw material in question is exceeded.

The surcharge is calculated in accordance with the following criteria:

- Basic official price of the raw material[2]
  Three-month basic average price (see below) in the period before the quarter in which the order was received or the release order took place (= average official price) for
  - dysprosium (Dy metal, 99 % min. FOB China; USD/kg)
  - neodym (Nd metal, 99 % min. FOB China; USD/kg)
- Metal factor of the products
  Certain products are displayed with a metal factor. The metal factor indicates (for those raw materials concerned) the basic official price as of which the surcharges for dysprosium and neodym are calculated using the weight method. An exact explanation of the metal factor is given below.

Three-month average price

The prices of rare earths vary according to the foreign currency, and there is no freely accessible stock exchange listing. This makes it more difficult for all parties involved to monitor changes in price. In order to avoid continuous adjustment of the surcharges, but to still ensure fair, transparent pricing, an average price is calculated over a three-month period using the average monthly foreign exchange rate from USD to EUR (source: European Central Bank). Since not all facts are immediately available at the start of each month, a one-month buffer is allowed before the new average price applies.

Examples of calculation of the average official price:

Period for calculation of the average price:	Period during which the order/release order is effected and the average price applies:
Sep 2012 - Nov 2012	Q1 in 2013 (Jan - Mar)
Dec 2012 - Feb 2013	Q2 in 2013 (Apr - Jun)
Mar 2013 - May 2013	Q3 in 2013 (Jul - Sep)
Jun 2013 - Aug 2013	Q4 in 2013 (Oct - Dec)

Structure of the metal factor

The metal factor consists of several digits; the first digit is not relevant to the calculation of dysprosium and neodym.

The remaining digits indicate the method of calculation used for the respective raw material. If no surcharge is added for a raw material, a "-" is used.

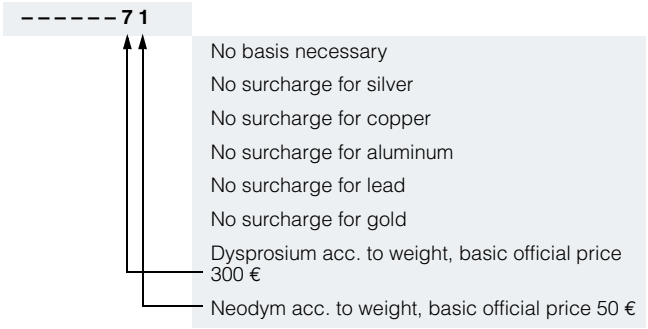
1st digit	List or customer net price using the percentage method
2nd digit	for silver (AG)[1]
3rd digit	for copper (CU)[1]
4th digit	for aluminum (AL)[1]
5th digit	for lead (PB)[1]
6th digit	for gold (AU)[1]
7th digit	for dysprosium (Dy)
8th digit	for neodym (Nd)

Weight method

The weight method uses the basic official price, the average price and the raw material weight. In order to calculate the surcharge, the basic official price must be subtracted from the average price. The difference is then multiplied by the raw material weight.

The basic official price can be found in the table below using the number (1 to 9) of the respective digit of the metal factor. Your Sales contact can inform you of the raw material weight.

Metal factor examples



[1] For a different method of calculation, refer to the separate explanation for these raw materials on the previous page.
[2] Source: Asian Metal Ltd (www.asianmetal.com)

Values of the metal factor

Percentage method	Basic official price in €	Step range in €	% surcharge 1st step	% surcharge 2nd step	% surcharge 3rd step	% surcharge 4th step	% surcharge per additional step
			Price in €	Price in €	Price in €	Price in €	
			150.01 - 200.00	200.01 - 250.00	250.01 - 300.00	300.01 - 350.00	
A	150	50	0.1	0.2	0.3	0.4	0.1
B	150	50	0.2	0.4	0.6	0.8	0.2
C	150	50	0.3	0.6	0.9	1.2	0.3
D	150	50	0.4	0.8	1.2	1.6	0.4
E	150	50	0.5	1.0	1.5	2.0	0.5
F	150	50	0.6	1.2	1.8	2.4	0.6
G	150	50	1.0	2.0	3.0	4.0	1.0
H	150	50	1.2	2.4	3.6	4.8	1.2
I	150	50	1.6	3.2	4.8	6.4	1.6
J	150	50	1.8	3.6	5.4	7.2	1.8
			175.01 - 225.00	225.01 - 275.00	275.01 - 325.00	325.01 - 375.00	
O	175	50	0.1	0.2	0.3	0.4	0.1
P	175	50	0.2	0.4	0.6	0.8	0.2
R	175	50	0.5	1.0	1.5	2.0	0.5
			225.01 - 275.00	275.01 - 325.00	325.01 - 375.00	375.01 - 425.00	
S	225	50	0.2	0.4	0.6	0.8	0.2
U	225	50	1.0	2.0	3.0	4.0	1.0
V	225	50	1.0	1.5	2.0	3.0	1.0
W	225	50	1.2	2.5	3.5	4.5	1.0
			150.01 - 175.00	175.01 - 200.00	200.01 - 225.00	225.01 - 250.00	
Y	150	25	0.3	0.6	0.9	1.2	0.3
			400.01 - 425.00	425.01 - 450.00	450.01 - 475.00	475.01 - 500.00	
Z	400	25	0.1	0.2	0.3	0.4	0.1
	Price basis (1st digit)						
L	Calculation based on the list price						
N	Calculation based on the customer net price (discounted list price)						
Weight method	**Basic official price in €**						
1	50	Calculation based on raw material weight					
2	100						
3	150						
4	175						
5	200						
6	225						
7	300						
8	400						
9	555						
Miscellaneous							
-	No metal surcharge						

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- the "General Terms of Payment"[1)] and,
- for software products, the "General License Conditions for Software Products for Automation and Drives for Customers with a Seat or Registered Office outside of Germany"[1)] and
- for other supplies and/or services, the "General Conditions for Supplies of Siemens Industry for Customers with a Seat or Registered Office outside of Germany"[1)].

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To compensate for variations in the price of raw materials (e.g. silver, copper, aluminum, lead, gold, dysprosium and neodym), surcharges are calculated on a daily basis using the so-called metal factor for products containing these raw materials. A surcharge for the respective raw material is calculated as a supplement to the price of a product if the basic official price of the raw material in question is exceeded.

The metal factor of a product indicates the basic official price (for those raw materials concerned) as of which the surcharges on the price of the product are applied, and with what method of calculation.

You will find a detailed explanation of the metal factor on the page headed "Metal surcharges".

To calculate the surcharge (except in the cases of dysprosium and neodym), the official price from the day prior to that on which the order was received or the release order was effected is used.

To calculate the surcharge applicable to dysprosium and neodym ("rare earths"), the corresponding three-month basic average price in the quarter prior to that in which the order was received or the release order was effected is used with a one-month buffer (details on the calculation can be found in the explanation of the metal factor).

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