SIEMENS

Motion Control

SINUMERIK 808

Equipment for Machine Tools

Catalog
NC 81.1

Edition
2019

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Related catalogs

Motion Control NC 62 SINUMERIK 840 Equipment for Machine Tools E86060-K4462-A101-A2-7600	
Motion Control NC 82 SINUMERIK 828 Equipment for Machine Tools E86060-K4482-A101-A6-7600	
Motion Control Drives D 31.1 SINAMICS Inverters for Single-Axis Drives Built-In Units E86060-K5531-A111-A1-7600	
Motion Control Drives D 31.2 SINAMICS Inverters for Single-Axis Drives Distributed Inverters E86060-K5531-A121-A1-7600	
SITRAIN Training for Industry www.siemens.com/sitrain	
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SINUMERIK 808
Equipment for Machine Tools

Motion Control

Catalog NC 81.1 · 2019

Supersedes:
Catalog NC 81.1 · 2018

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-D8-7500

Please contact your local Siemens branch.

NEW

Click on an Article No. in the catalog PDF to call it up in the Industry Mall and to obtain all the information.

Article No.
6SL3070-0AA00-0AG0
6SL3072-0AA00-0AG0

Or directly on the Internet, e.g.
www.siemens.com/product?6SL3070-0AA00-0AG0

IQNet
THE INTERNATIONAL CERTIFICATION NETWORK

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Digital Enterprise

The building blocks that ensure everything works together perfectly in the digital enterprise

Digitalization is already changing all areas of life and existing business models. It is placing greater pressure on industry while at the same time creating new business opportunities. Today, thanks to scalable solutions from Siemens, companies can already become a digital enterprise and ensure their competitiveness.

Industry faces tremendous challenges

Reduce time-to-market

Today manufacturers have to bring products to market at an ever-increasing pace despite the growing complexity of these products. In the past, a major manufacturer would push aside a small one, but now it is a fast manufacturer that overtakes a slow one.

Boost flexibility

Consumers want customized products, but at a price they would pay for a mass-produced item. That only works if production is more flexible than ever before.

Improve quality

To ensure a high level of quality while meeting legal requirements, companies have to establish closed quality loops and enable the traceability of products.

Boost efficiency

Today the product itself needs to be sustainable and environmentally friendly, while energy efficiency in production has become a competitive advantage.

Increase security

Increasing networking escalates the threat to production facilities of cyberattacks. Today more than ever, companies need suitable security measures.

The digital enterprise has already become a reality

To fully benefit from all the advantages of digitalization, companies first have to achieve complete consistency of their data. Fully digitally integrated business processes, including those of suppliers, can help to create a digital representation of the entire value chain. This requires

- the integration of industrial software and automation,
- expansion of the communication networks,
- security in automation,
- and the use of business-specific industrial services.

MindSphere

The cloud-based open IoT operating system from Siemens

With MindSphere, Siemens offers a cost-effective and scalable cloud platform as a service (PaaS) for the development of applications. The platform, designed as an open operating system for the Internet of Things, makes it possible to improve the efficiency of plants by collecting and analyzing large volumes of production data.

Totally Integrated Automation (TIA)

Where digitalization becomes reality

Totally Integrated Automation (TIA) ensures the seamless transition from the virtual to the real world. It already encompasses all the necessary conditions for transforming the benefits of digitalization into true added value. The data that will form the digital twin for actual production is generated from a common base.

Digital Plant
Learn more about the digital enterprise for the process industry
www.siemens.com/ digitalplant

Digital Enterprise Suite
Learn more about the digital enterprise for the discrete industry
www.siemens.com/ digital-enterprise-suite

Integrated Drive Systems

Faster on the market and in the black with Integrated Drive Systems

Integrated Drive Systems are Siemens' trendsetting answer to the high degree of complexity that characterizes drive and automation technology today. The world's only true one-stop solution for entire drive systems is characterized in particular by its threefold integration: Horizontal, vertical, and lifecycle integration ensure that every drive system component fits seamlessly into the whole system, into any automation environment, and even into the entire lifecycle of a plant.

The outcome is an optimal workflow – from engineering all the way to service that entails more productivity, increased efficiency, and better availability. That's how Integrated Drive Systems reduce time to market and time to profit.

Horizontal integration

Integrated drive portfolio: The core elements of a fully integrated drive portfolio are frequency converters, motors, couplings, and gear units. At Siemens, they're all available from a single source. Perfectly integrated, perfectly interacting. For all power and performance classes. As standard solutions or fully customized. No other player in the market can offer a comparable portfolio. Moreover, all Siemens drive components are perfectly matched, so they are optimally interacting.
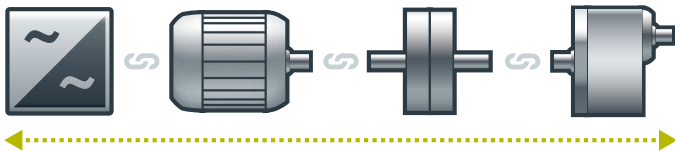
You can boost the availability of your application or plant to up to

99%*

*e.g., conveyor application

Vertical integration

Thanks to **vertical integration**, the complete drive train is seamlessly integrated in the entire automation environment – an important prerequisite for production with maximum value added. Integrated Drive Systems are part of Totally Integrated Automation (TIA), which means that they are perfectly embedded into the system architecture of the entire industrial production process. This enables optimal processes through maximum communication and control.
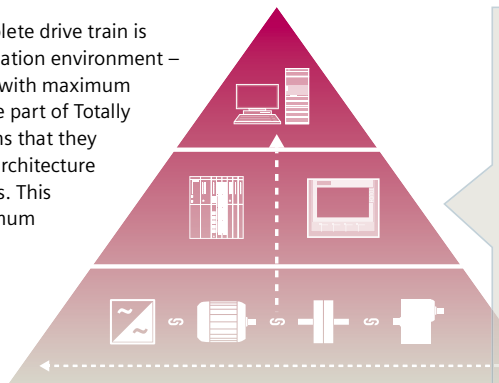
With TIA Portal you can cut your engineering time by up to

30%

Lifecycle integration

Lifecycle integration adds the factor of time: Software and service are available for the entire lifecycle of an Integrated Drive System. That way, important optimization potential for maximum productivity, increased efficiency, and highest availability can be leveraged throughout the system's lifecycle – from planning, design, and engineering to operation, maintenance, and all the way even to modernization.

With Integrated Drive Systems, assets become important success factors. They ensure shorter time to market, maximum productivity and efficiency in operation, and shorter time to profit.
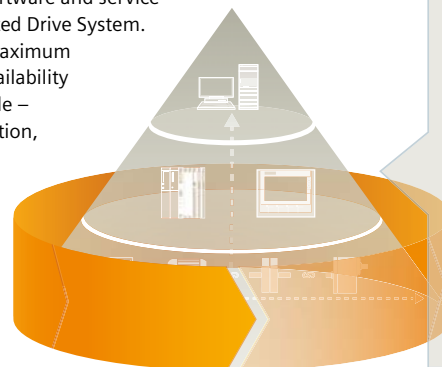
With Integrated Drive Systems you can reduce your maintenance costs by up to

15%

www.siemens.com/ids

1

Introduction

Introduction

How to use this catalog

1

■ **Overview**

	See chapter
my CNC/drive/motor order list ?	
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SINUMERIK 808D ADVANCED	
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Technical specifications of CNC	**3**
Selection and ordering data of CNC	
Feed and spindle drive solution SINAMICS V70/ SIMOTICS S-1FL6/SIMOTICS M-1PH1	**3**
Technical specifications of drive modules, motors and cables	
Selection and ordering data of drive modules, motors and cables	
Dimensional drawings of drive modules, motors and cables	
Example packages to cross-check my order list	**3**
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Technical specifications of CNC accessories	
Selection and ordering data of CNC accessories	
Dimensional drawings of CNC accessories	
Services and training	**5**
Material warranty and on-site service	
System documentation	
Training portfolio	
SINUMERIK 808D on PC (training and offline programming system for PC)	
Spindle solution	
my CNC/drive/motor order list !	

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Overview

Handwheels

Digital tool probe[1]

USB stick

SINUMERIK 808D
ADVANCED

Drive bus

SINAMICS V70
spindle drive

SINAMICS V70
servo drive

SINAMICS V70
servo drive

SINAMICS V70
servo drive

TTL

Spindle
encoder

Ribbon cable

Ethernet/
factory
network

USB

Terminal strip
converter

SINUMERIK 808D MCP

PLC
process signals

Notebook

[1] Only used for milling version

SIMOTICS
M-1PH1
asynchronous
main spindle motor

SIMOTICS
S-1FL6
synchronous
feed motor

SIMOTICS
S-1FL6
synchronous
feed motor

SIMOTICS
S-1FL6
synchronous
feed motor

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SINUMERIK 808D ADVANCED system

Introduction
SINUMERIK 808D ADVANCED

1

■ **Overview**

Small, robust, easy, simply smart

The operator-panel-based CNC SINUMERIK 808D ADVANCED is extremely compact, rugged and very easy to maintain. With variable software options and high-dynamic servo drive systems, the SINUMERIK 808D ADVANCED system is offering the latest CNC solution for high-performance basic machines.
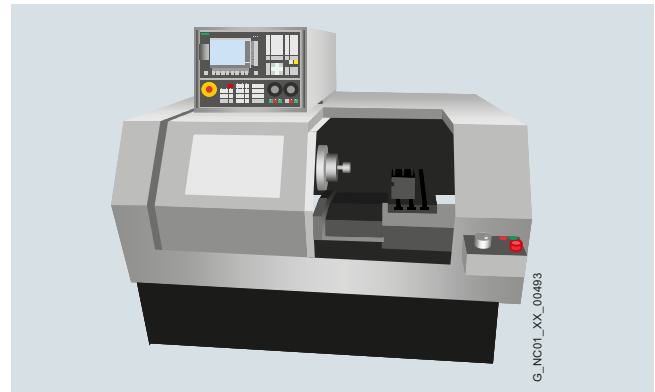

Preconfigured for basic standard turning machines …

The SINUMERIK 808D ADVANCED T CNC is perfectly preconfigured to meet the requirements of modern standard turning machines. Intelligent CNC features such as full servo controlled rigid tapping or the flying switchover between spindle and C axis enable most precise and fastest turning operation.

Perfectly preconfigured for:

■ SINUMERIK 808D ADVANCED T:
  Up to 6 axes/spindles in one machining channel with/without driven tool

■ Preconfigured system software for inclined bed fully automated lathes and flat bed semi-automatic lathes

… and basic standard milling machines

The SINUMERIK 808D ADVANCED M CNC is perfectly preconfigured to meet the requirements of modern standard milling machines.

■ SINUMERIK 808D ADVANCED M:
  Up to 6 axes/spindles in one machining channel

■ Preconfigured system software for vertical machining centers
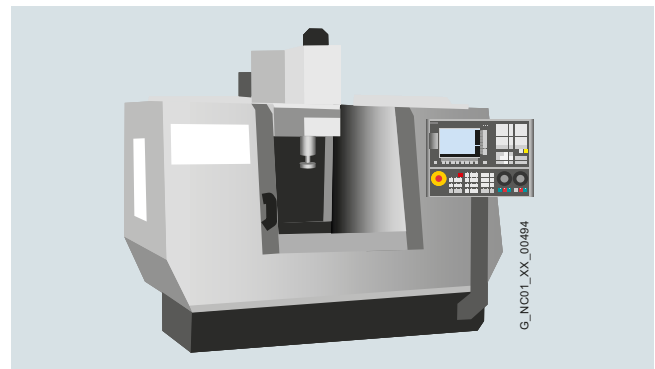
■ **Overview**

SINAMICS V70, SIMOTICS S-1FL6 and SIMOTICS M-1PH1

SINAMICS V70 servo drives, SIMOTICS S-1FL6 feed motors and SIMOTICS M-1PH1 main spindle motors are designed for the maximum cutting performance for the basic turning and milling machine tool applications. The bus communication with the SINUMERIK 808D ADVANCED CNC system, threefold overload capacity and the 20 bit high-resolution absolute encoder installed in SIMOTICS S-1FL6 feed motors and SIMOTICS M-1PH1 main spindle motors allow to increase the precision and efficiency of the machines.

With a robust design, SINAMICS V70 together with SIMOTICS S-1FL6 feed motors and SIMOTICS M-1PH1 main spindle motors are perfectly prepared for maximum availability even in harsh environments.

Up to 36 months material warranty and on-site service

Siemens offers a standard material warranty and free on-site service period of 24 months for the SINUMERIK 808D ADVANCED and the associated components. Warranty can be easily extended up to 36 months by end user registration.

Moreover, Siemens ensures elimination of any defects on the components free of cost on site during the warranty period.

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

www.siemens.com/automation/oss

Introduction

MOTION-CONNECT connection systems

1

◾ **Overview**

MOTION-CONNECTION 300 connection system

The MOTION-CONNECT 300 cables in this catalog are suitable for use with standard turning and milling machines.

The use of pre-assembled MOTION-CONNECT 300 cables ensures high quality and system-tested, problem-free operation.

Degree of protection of pre-assembled power and signal cables and their extensions is IP65 when closed and connected unless otherwise stated.

MOTION-CONNECT 300 cables are not suitable for outdoor use.

MOTION-CONNECT cables are approved for a maximum horizontal traverse path of 5 m.

To maximize the service life of the cable carrier and cables, cables in the carrier made from different materials must be separated in the cable carrier using spacers. 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 different outer diameters should be separated by spacers as well.

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 cable carrier. They must be freely movable.

The cables must be able to be moved without applying force, specifically 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 from the end points of the moving parts in a dead zone.

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

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.

The cables must be unwound without twisting.

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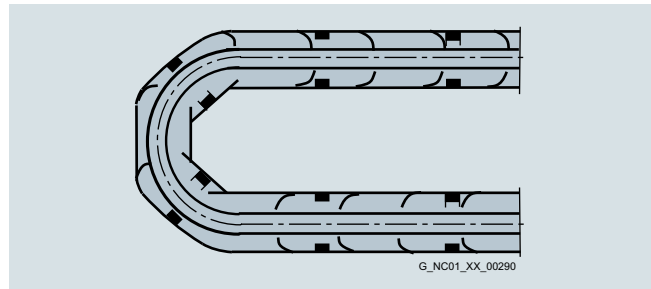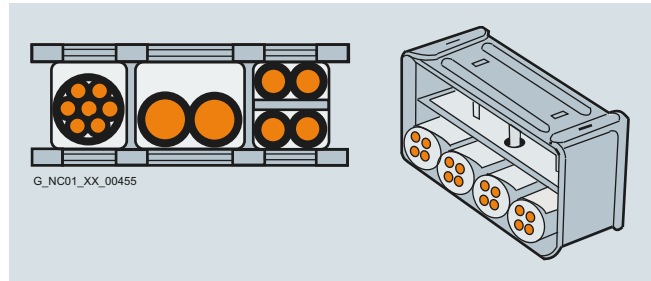
Derating factors for power and signal cables

Ambient air temperature °C (°F)	Derating factor according to EN 60204-1 Table D.1
30 (86)	1.15
35 (95)	1.08
40 (104)	1.00
45 (113)	0.91
50 (122)	0.82
55 (131)	0.71
60 (140)	0.58

The functionality of the SINUMERIK 808D ADVANCED CNCs PPU 15x and PPU 16x 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 that are available with SINUMERIK 808D ADVANCED controls. The information in the overview of SINUMERIK 808D ADVANCED functions is based on the following software version:

CNC	Software version
SINUMERIK 808D ADVANCED PPU 15x.3/PPU 16x.3	4.90

Overview of functions
SINUMERIK 808D ADVANCED CNC controls

Control structure and configuration/Connectable drives/Connectable measuring systems

✓ Basic version O Option – Not available	Article No.	SINUMERIK 808D ADVANCED			
		PPU 15x.3		PPU 16x.3	
	Note	Turning	Milling	Turning	Milling
Control structure and configuration					
Panel-based control system comprising:					
• Compact operator panel		✓	✓	✓	✓
• CNC/PLC Control Unit		✓	✓	✓	✓
• Onboard digital PLC inputs/outputs		✓	✓	✓	✓
• CF card with system software Export version		Turning	Milling	Turning	Milling
SINUMERIK operator panel CNC:					
• Operator panel layout horizontal/vertical		✓/✓	✓/✓	✓/✓	✓/✓
• Color display		8.4"	8.4"	8.4"	8.4"
• Display resolution		800 × 600	800 × 600	800 × 600	800 × 600
• Integrated CNC keyboard with hard keys		✓	✓	✓	✓
• Specific CNC keyboard layout for		Turning	Milling	Turning	Milling
• Operator panel with Simplified Chinese layout		✓	✓	✓	✓
• Operator panel with English layout		✓	✓	✓	✓
SINUMERIK Operate BASIC		✓	✓	✓	✓
Quantity of bus interfaces for axis converter		1	1	1	1
Quantity of analog ±10 V interfaces for spindle converter		1	1	1	1
Channels/mode groups MG:					
• Maximum configuration		1	1	1	1
CNC user memory (buffered) for CNC part programs	The 1.25 MB memory is for storing and editing the user program. There is another 500 MB memory for NC program storage.	1.25 MB	1.25 MB	1.25 MB	1.25 MB
Axes/spindles:					
• Basic quantity of axes/spindles		3	4	3	4
• Maximum configuration axes/spindles		4	4	6	6
• Axis/spindle, each additional	6FC5800-0AK70-0YB0	O	–	O	O
• Additional 1 positioning axis/auxiliary spindle	6FC5800-0AK80-0YB0	O	–	O	O
Connectable drives					
Feed drives:					
• SINAMICS V70 via bus interface		O	O	O	O
Spindles:					
• Analog Drive Interface		O	O	O	O
SINAMICS V70 spindle via bus interface		O	O	O	O
Connectable measuring systems					
Number of measuring systems per axis, max.		1	1	1	1
Encoder installed in SIMOTICS S-1FL6 feed motors		✓	✓	✓	✓
Encoder installed in SIMOTICS M-1PH1 main spindle motors		✓	✓	✓	✓
RS422 (TTL) direct incremental spindle encoder	6FX2001-2E...	O	O	O	O

✓ Basic version O Option − Not available	Article No.	SINUMERIK 808D ADVANCED			
		PPU 15x.3		PPU 16x.3	
	Note	**Turning**	**Milling**	**Turning**	**Milling**
Operation					
Machine Control Panel:					
• SINUMERIK 808D MCP horizontal:					
- English layout	6FC5303-0AF35-0AA0	O	O	O	O
- Simplified Chinese layout	6FC5303-0AF35-0CA0	O	O	O	O
• SINUMERIK 808D MCP vertical:					
- English layout	6FC5303-0AF35-2AA0	O	O	O	O
- Simplified Chinese layout	6FC5303-0AF35-2CA0	O	O	O	O
• SINUMERIK 808D MCP vertical: with handwheel slot					
- English layout	6FC5303-0AF35-3AA0	O	O	O	O
- Simplified Chinese layout	6FC5303-0AF35-3CA0	O	O	O	O
• 3rd-party MCP via onboard digital PLC inputs/outputs		O	O	O	O
Number of digital tool probes, max.		−	1	−	1
Number of electronic handwheels RS422 5 V DC, max.		2	2	2	2
Electronic handwheels 5 V DC:					
• With 120 mm × 120 mm front panel	6FC9320-5DB01	O	O	O	O
• With 76.2 mm × 76.2 mm front panel	6FC9320-5DC01	O	O	O	O
• Without front panel, without setting wheel	6FC9320-5DF01	O	O	O	O
• Without front panel, with setting wheel	6FC9320-5DM00	O	O	O	O
Axis functions					
Feedrate override		0 ... 200 %	0 ... 200 %	0 ... 200 %	0 ... 200 %
Feedrate override axis-specific		0 ... 200 %	0 ... 200 %	0 ... 200 %	0 ... 200 %
Traversing range decades		± 9	± 9	± 9	± 9
Rotary axis, turning endlessly		✓	✓	✓	✓
Velocity, max.		300 m/s	300 m/s	300 m/s	300 m/s
Acceleration with jerk limitation		✓	✓	✓	✓
Programmable acceleration		✓	✓	✓	✓
Feedrate interpolation		✓	✓	✓	✓
Separate path feed for corners and chamfers		✓	✓	✓	✓
Velocity-dependent feed forwad control		✓	✓	✓	✓
Friction compensation		✓	✓	✓	✓
Auto Servo Tuning AST		✓	✓	✓	✓
Direct Servo Control DSC		✓	✓	✓	✓
TRANSMIT/TRACYL Transformation without Y axis	6FC5800-0AS50-0YB0	−	−	O	O
Pair of synchronized axes (gantry axes), basic	6FC5800-0AS51-0YB0	−	−	O	O
Contour handwheel	6FC5800-0AM08-0YB0	O	O	O	O
Generic coupling, CP-Basic, e.g. multi-edge turning	6FC5800-0AM72-0YB0	−	−	O	−

2

Overview of functions
SINUMERIK 808D ADVANCED CNC controls

Spindle functions/Interpolations/Measuring functions/Motion-synchronous actions

| ✓ Basic version
O Option
– Not available | Article No. | SINUMERIK 808D ADVANCED | | | |
| | | PPU 15x.3 | | PPU 16x.3 | |
	Note	Turning	Milling	Turning	Milling
Spindle functions					
Spindle speed, analog		✓	✓	✓	✓
Spindle speed, max. programmable value range (display ± 999999999.9999)		$10^6 ... 10^{-4}$	$10^6 ... 10^{-4}$	$10^6 ... 10^{-4}$	$10^6 ... 10^{-4}$
Spindle override		0 ... 200 %	0 ... 200 %	0 ... 200 %	0 ... 200 %
Gear stages		5	5	5	5
Intermediate gear		✓	✓	✓	✓
Automatic gear stage selection		✓	✓	✓	✓
Oriented spindle stop	Requires direct spindle encoder.	✓	✓	✓	✓
Spindle speed limitation min./max.		✓	✓	✓	✓
Constant cutting rate		✓	✓	✓	✓
Spindle control via PLC (positioning, oscillation)		✓	✓	✓	✓
Changeover to axis mode	Requires servo spindle and direct encoder.	✓	✓	✓	✓
Axis synchronization on-the-fly	Requires servo spindle and direct encoder.	✓	✓	✓	✓
Thread run-in and run-out programmable		✓	✓	✓	✓
Thread cutting with constant or variable pitch		✓	✓	✓	✓
Tapping with compensating chuck/rigid tapping	Requires servo spindle and direct encoder.	✓	✓	✓	✓
Interpolations					
Linear interpolation axes, max.		3	3	3	4
Circle via center point and end point		✓	✓	✓	✓
Circle via interpolation point		✓	✓	✓	✓
Helical interpolation		✓	✓	✓	✓
Continuous-path mode with programmable rounding clearance		✓	✓	✓	✓
Advanced Surface look ahead, velocity control and CNC block compression		–	–	–	✓
High-speed setting cycle CYCLE832		–	–	–	✓
Look ahead (number of blocks)		1	50	1	150
Measuring functions					
Measuring in JOG: • Number of probes (switching) with/without deletion of distance-to-go		–	1	–	1
Motion-synchronous actions					
CNC inputs/outputs, high-speed: • Digital inputs CNC onboard		3	3	3	3
- Digital inputs cycle time		0.2 ms	0.2 ms	0.2 ms	0.2 ms
• Digital outputs CNC onboard		1	1	1	1
- Digital outputs cycle time		0.3 ms	0.3 ms	0.3 ms	0.3 ms
Synchronized actions and high-speed auxiliary function output incl. 3 synchronous functions		✓	✓	✓	✓
Positioning axes and spindles via synchronized actions (command axes)		✓	✓	✓	✓

2

| ✓ Basic version
O Option
− Not available | Article No. | SINUMERIK 808D ADVANCED | | | |
| | | PPU 15x.3 | | PPU 16x.3 | |
	Note	**Turning**	**Milling**	**Turning**	**Milling**
Open Architecture					
Customizable HMI:					
• Customizable screens in the HMI		✓	✓	✓	✓
• Input screens for customized user cycles		✓	✓	✓	✓
CNC programming language					
Programming methods:					
• SINUMERIK style programming language (DIN 66025 and high-level language expansion)		✓	✓	✓	✓
• ISO code		✓	✓	✓	✓
Main program call from main program and subroutine		✓	✓	✓	✓
Subprogram levels, max.		11	11	11	11
Number of subprogram passes		≤ 9999	≤ 9999	≤ 9999	≤ 9999
Number of levels for skip blocks		1	1	1	1
Polar coordinates		✓	✓	✓	✓
Dimensions metric/inch, changeover:					
• Manually		✓	✓	✓	✓
• Via program		✓	✓	✓	✓
Inverse-time feedrate		✓	✓	✓	✓
Auxiliary function output:					
• Via M word, max. programmable value range		INT 2^{31-1}	INT 2^{31-1}	INT 2^{31-1}	INT 2^{31-1}
• Via H word, max. programmable value range REAL ± 3.4028 ex 38 (display ± 999999999.9999)		INT -2^{31} ... 2^{31-1}	INT -2^{31} ... 2^{31-1}	INT -2^{31} ... 2^{31-1}	INT -2^{31} ... 2^{31-1}
Basic frames, max. number		1	1	1	1
Settable offsets, max. number		6	6	32	32
Work offsets, programmable (frames)		✓	✓	✓	✓
Global and local user data		✓	✓	✓	✓
Global program user data		✓	✓	✓	✓
SINUMERIK high-level CNC language with:					
• Frame concept TRANS/ROT/SCALE/MIRROR		✓	✓	✓	✓
• User variables, configurable		✓	✓	✓	✓
• Predefined user variables (arithmetic parameters)		✓	✓	✓	✓
• Predefined user variables (arithmetic parameters), configurable		✓	✓	✓	✓
• Read/write system variables		✓	✓	✓	✓
• Indirect programming		✓	✓	✓	✓
• Program jumps and branches		✓	✓	✓	✓
• Arithmetic and trigonometric functions		✓	✓	✓	✓
• Compare operations and logic combinations		✓	✓	✓	✓
• Macro techniques		✓	✓	✓	✓
• Control structures IF-ELSE-ENDIF		✓	✓	✓	✓
• Control structures WHILE, FOR, REPEAT, LOOP		✓	✓	✓	✓
• STRING functions		✓	✓	✓	✓

2

Overview of functions
SINUMERIK 808D ADVANCED CNC controls

Technology cycles/Canned cycles

✓ Basic version O Option – Not available	Article No.	SINUMERIK 808D ADVANCED			
		PPU 15x.3		PPU 16x.3	
	Note	Turning	Milling	Turning	Milling
Technology cycles					
Technology cycles for SINUMERIK style programming language:					
• Drilling, centering – CYCLE81		✓	✓	✓	✓
• Drilling, counterboring – CYCLE82		✓	✓	✓	✓
• Deep-hole drilling – CYCLE83		✓	✓	✓	✓
• Rigid tapping – CYCLE84		✓	✓	✓	✓
• Tapping with compensating chuck – CYCLE840		✓	✓	✓	✓
• Reaming 1 – CYCLE85		✓	✓	✓	✓
• Boring – CYCLE86		✓	✓	✓	✓
• Position pattern: Row of holes – HOLES1		–	✓	–	✓
• Position pattern: Circle of holes – HOLES2		–	✓	–	✓
• Cutoff - CYCLE92		✓	–	✓	–
• Groove – CYCLE93		✓	–	✓	–
• Undercut (forms E and F according to DIN) – CYCLE94		✓	–	✓	–
• Contour cutting with relief cut – CYCLE95		✓	–	✓	–
• Thread undercut – CYCLE96		✓	–	✓	–
• Thread chaining – CYCLE98		✓	–	✓	–
• Thread cutting – CYCLE99		✓	–	✓	–
• Face milling – CYCLE71		–	✓	–	✓
• Contour milling – CYCLE72		–	✓	–	✓
• Milling a rectangular spigot – CYCLE76		–	✓	–	✓
• Milling a circular spigot – CYCLE77		–	✓	–	✓
• Long holes located on a circle – LONGHOLE		–	✓	–	✓
• Slots on a circle – SLOT1		–	✓	–	✓
• Circumferential slot – SLOT2		–	✓	–	✓
• Milling a rectangular pocket – POCKET3		–	✓	–	✓
• Milling a circular pocket – POCKET4		–	✓	–	✓
• Thread milling – CYCLE90		–	✓	–	✓
• High-speed settings – CYCLE832		–	✓	–	✓
Canned cycles					
Canned cycles for ISO code milling:					
• High-speed deep hole drilling cycle with chip breakage (G73)		–	✓	–	✓
• Drilling a left-hand thread without any compensating chuck cycle (G74)		–	✓	–	✓
• Fine drilling cycle (G76)		–	✓	–	✓
• Deselection of a fixed cycle (G80)		–	✓	–	✓
• Drilling cycle, counterboring (G81)		–	✓	–	✓
• Countersink drilling cycle (G82)		–	✓	–	✓
• Deep hole drilling cycle with chip removal (G83)		–	✓	–	✓
• Drilling a right-hand thread without any compensating chuck cycle (G84)		–	✓	–	✓
• Boring cycle (G85)		–	✓	–	✓
• Boring cycle, retraction with G00 (G86)		–	✓	–	✓
• Boring cycle, reverse countersinking (G87)		–	✓	–	✓
• Boring cycle, retraction with machining feedrate (G89)		–	✓	–	✓

2

Canned cycles/Program and workpiece management/Programming support/Simulations

✓ Basic version O Option – Not available	Article No.	SINUMERIK 808D ADVANCED			
		PPU 15x.3		PPU 16x.3	
	Note	Turning	Milling	Turning	Milling
Canned cycles (continued)					
Canned cycles for ISO code turning (G code system A):					
• Thread cutting with constant lead (G32)		✓	–	✓	–
• Thread cutting with variable lead (G34)		✓	–	✓	–
• Finishing cycle (G70)		✓	–	✓	–
• Stock removal cycle longitudinal axis (G71)		✓	–	✓	–
• Stock removal cycle transverse axis (G72)		✓	–	✓	–
• Closed cutting cycle (G73)		✓	–	✓	–
• Multiple repetitive grooving cycles in the longitudinal axis (G74)		✓	–	✓	–
• Deep hole drilling and recessing in facing axis (G75)		✓	–	✓	–
• Multiple thread cutting (G76)		✓	–	✓	–
• Axial cutting (G90)		✓	–	✓	–
• Thread cutting (G92)		✓	–	✓	–
• Radial cutting (G94)		✓	–	✓	–
Program and workpiece management					
Part programs on PPU, max. number		255	255	255	255
Readable part program names		✓	✓	✓	✓
Sub-folders for part programs with readable names		✓	✓	✓	✓
Programming support					
Background editing		✓	✓	✓	✓
Program editor:					
• Full screen CNC editor with cut, copy and paste functionality		✓	✓	✓	✓
• Programming support programGUIDE BASIC for SINUMERIK technology cycles		✓	✓	✓	✓
• Contour computer with programming graphics/free contour input (contour calculator)		✓	✓	✓	✓
Simulations					
2D simulation		✓	✓	✓	✓
Real-time simulation of current machining operation		✓	✓	✓	✓

2

Overview of functions
SINUMERIK 808D ADVANCED CNC controls

Operating modes/Tools

| ✓ Basic version
O Option
– Not available | Article No. | SINUMERIK 808D ADVANCED | | | |
| | | PPU 15x.3 | | PPU 16x.3 | |
	Note	Turning	Milling	Turning	Milling
Operating modes					
Manual Machine plus for manual controlled semi-CNC lathes	**6FC5800-0AP07-0YB0**	O	–	O	–
JOG:					
• T, S, M screen for quick activation of machine functions		✓	✓	✓	✓
• Face milling cycle for workpiece preparation		–	✓	–	✓
• Handwheel selection		✓	✓	✓	✓
• Switchover: inch/metric		✓	✓	✓	✓
• Manual measurement of work offset		✓	✓	✓	✓
• Manual measurement of tool offset		✓	✓	✓	✓
• Semi-automatic tool measurement with tool probe		–	✓	–	✓
MDI:					
• Input in text editor		✓	✓	✓	✓
Automatic:					
• Execution from memory stick connected to USB interface on operator panel front		✓	✓	✓	✓
• Program control (dry-run feed, block skip etc.)		✓	✓	✓	✓
• Program editing		✓	✓	✓	✓
• Block search with/without calculation		✓	✓	✓	✓
Repos (repositioning on the contour):					
• With operator command/semi-automatically		✓	✓	✓	✓
• Program-controlled		✓	✓	✓	✓
Preset:					
• Set actual value		✓	✓	✓	✓
Tools					
Tools/cutting edges, max.		64/128	64/128	64/128	64/128
Tool types:					
• Turning		✓	–	✓	–
• Drilling		✓	✓	✓	✓
• Milling		✓	✓	✓	✓
Tool radius compensations in plane:					
• With approach and retract strategies		✓	✓	✓	✓
• With transition circle/ellipse on outer edges		✓	✓	✓	✓
Tool offset selection via T and D numbers		✓	✓	✓	✓
Look-ahead detection of contour violations		✓	✓	✓	✓

2

✓ Basic version O Option – Not available	Article No.	SINUMERIK 808D ADVANCED			
		PPU 15x.3		**PPU 16x.3**	
	Note	**Turning**	**Milling**	**Turning**	**Milling**
Communication and data management					
USB interface on panel front for memory stick and USB PC keyboard:					
• Transfer of:		✓	✓	✓	✓
- Machine and setting data		✓	✓	✓	✓
- PLC data		✓	✓	✓	✓
- Compensation data		✓	✓	✓	✓
- Tool and work offset data		✓	✓	✓	✓
- R parameter		✓	✓	✓	✓
- HMI data		✓	✓	✓	✓
- User cycles		✓	✓	✓	✓
- Part programs		✓	✓	✓	✓
- PLC program (*.pte)		✓	✓	✓	✓
• Execute part program		✓	✓	✓	✓
Ethernet interface:					
• Transfer of:		✓	✓	✓	✓
- Machine and setting data		✓	✓	✓	✓
- PLC data		✓	✓	✓	✓
- Compensation data		✓	✓	✓	✓
- Tool and work offset data		✓	✓	✓	✓
- R parameter		✓	✓	✓	✓
- HMI data		✓	✓	✓	✓
- User cycles		✓	✓	✓	✓
- Part programs		✓	✓	✓	✓
• Execute part program		✓	✓	✓	✓
• Part program send/receive		✓	✓	✓	✓
• PLC program upload/download		✓	✓	✓	✓
• PLC status monitoring		✓	✓	✓	✓

2

Overview of functions
SINUMERIK 808D ADVANCED CNC controls

HMI functions/Monitoring functions/Compensations

✓ Basic version O Option – Not available	Article No.	SINUMERIK 808D ADVANCED			
		PPU 15x.3		PPU 16x.3	
	Note	Turning	Milling	Turning	Milling
HMI functions					
CNC lock function	**6FC5800-0AS71-0YB0**	O	O	O	O
Lock MyCycles	**6FC5800-0AP54-0YB0**	O	O	O	O
SINUMERIK 808D startGUIDE: • Startup assistant Built-in graphical interactive assistant for 1st commissioning of machines with SINUMERIK 808D		✓	✓	✓	✓
• Series startup assistant Built-in graphical interactive assistant for the series production of machines with SINUMERIK 808D		✓	✓	✓	✓
• Sales assistant Built-in viewer for bitmaps with sales arguments for SINUMERIK 808D, extendable by customer-specific sales arguments for the machine		✓	✓	✓	✓
Online help for programming, alarms and machine data		✓	✓	✓	✓
CNC program messages		✓	✓	✓	✓
Screen saver		✓	✓	✓	✓
Access protection level support		✓	✓	✓	✓
Chinese input method editor for part program names, sub-directory names and CNC comments		✓	✓	✓	✓
Operating software languages: • Chinese Simplified, Czech, English, French, German, Italian, Korean, Polish, Portuguese, Russian, Spanish, Turkish, Hungarian		✓	✓	✓	✓
• Language switchover online		✓	✓	✓	✓
Monitoring functions					
Working area limitation		✓	✓	✓	✓
Limit switch monitoring		✓	✓	✓	✓
Software and hardware limit switches		✓	✓	✓	✓
Position monitoring		✓	✓	✓	✓
Standstill (zero-speed) monitoring		✓	✓	✓	✓
Clamping monitoring		✓	✓	✓	✓
Contour monitoring		✓	✓	✓	✓
Axis limitation from the PLC		✓	✓	✓	✓
Spindle speed limitation		✓	✓	✓	✓
Compensations					
Backlash compensation		✓	✓	✓	✓
Leadscrew error compensation		✓	✓	✓	✓
Bidirectional leadscrew error compensation	**6FC5800-0AM54-0YB0**	O	O	O	O

2

| ✓ Basic version
O Option
– Not available | Article No. | SINUMERIK 808D ADVANCED | | | |
| | | PPU 15x.3 | | PPU 16x.3 | |
	Note	**Turning**	**Milling**	**Turning**	**Milling**
PLC area					
Integrated PLC		✓	✓	✓	✓
Style of PLC program:					
• Prepared and ready to run PLC program on board		✓	✓	✓	✓
• Fully customized PLC programs by offline PLC programming tool		✓	✓	✓	✓
Fixed cycle time for PLC		12 ms	12 ms	12 ms	12 ms
Maximum number of ladder steps		6000	6000	6000	6000
PLC programming language:					
• LAD ladder diagram		✓	✓	✓	✓
Offline PLC programming tool	**6FC5811-0CY00-0YA8**	O	O	O	O
	On toolbox DVD-ROM				
PLC Ladder Viewer on PPU		✓	✓	✓	✓
PLC I/O:					
• On-board digital PLC:	Connection via screw-clamp connector on PPU.				
- Inputs 24 V		24	24	24	24
- Outputs 24 V, 0.2 A		16	16	16	16
• On-board digital PLC:	Connection via 50-pole ribbon cable connector.				
- Inputs 24 V		48	48	48	48
- Outputs 24 V, 0.2 A		32	32	32	32
Connection via 50-pole ribbon cable connector to PPU:					
• Terminal strip converter	**6EP5406-5AA00**	O	O	O	O
• Cable set	**6EP5306-5BG00**	O	O	O	O
PLC alarms/messages, max. number		128	128	128	128
Bit memories, number		256 bytes	256 bytes	256 bytes	256 bytes
Timers, number		64	64	64	64
Counters, number		64	64	64	64
Subroutines		64	64	64	64
User machine data for configuring the PLC user program		✓	✓	✓	✓

Overview of functions
SINUMERIK 808D ADVANCED CNC controls

Commissioning and serial production/Diagnostic functions/Service and maintenance/Training and offline programming

✓ Basic version O Option – Not available	Article No. Note	SINUMERIK 808D ADVANCED			
		PPU 15x.3		PPU 16x.3	
		Turning	**Milling**	**Turning**	**Milling**
Commissioning and serial production					
SINUMERIK 808D startGUIDE • Startup assistant Built-in graphical interactive assistant for 1st commissioning of machines with SINUMERIK 808D controls		✓	✓	✓	✓
• Series startup assistant Built-in graphical interactive assistant for the series production of machines with SINUMERIK 808D controls		✓	✓	✓	✓
Backup/restore of system software via USB memory stick		✓	✓	✓	✓
Cloning of serial startup files for serial production via USB memory stick		✓	✓	✓	✓
SINUMERIK 808D family toolbox with:	**6FC5811-0CY00-0YA8** On toolbox DVD-ROM.	O	O	O	O
• Offline PLC programming tool		O	O	O	O
• Sample PLC program		O	O	O	O
• MCP strip template		O	O	O	O
• MCP icon library		O	O	O	O
• User manuals		O	O	O	O
• Access My Machine AMM		✓	✓	✓	✓
Diagnostic functions					
Alarms and messages		✓	✓	✓	✓
Action log can be activated for diagnostic purposes		✓	✓	✓	✓
PLC status		✓	✓	✓	✓
LAD display		✓	✓	✓	✓
Service and maintenance					
Integrated service planner for monitoring of service intervals		✓	✓	✓	✓
One touch system backup (Ctrl + S)		✓	✓	✓	✓
CNC memory buffering via battery		✓	✓	✓	✓
Training and offline programming					
SINUMERIK 808D on PC	**6FC5870-0YC40-0YT0** Free download of trial version from: www.cnc4you.com	O	O	O	O

SINUMERIK 808D ADVANCED system
CNC control

SINUMERIK 808D ADVANCED PPU 15x.3/PPU 16x.3

■ Overview

SINUMERIK 808D ADVANCED PPU 151.3/PPU 161.3 horizontal

SINUMERIK 808D ADVANCED PPU 150.3/PPU 160.3 vertical

The SINUMERIK 808D ADVANCED PPU 15x.3/PPU 16x.3 is an operator-panel-based CNC, preconfigured for use in modern basic standard turning and milling machines.

There are two variants of SINUMERIK 808D ADVANCED PPU's – PPU 15x.3 and PPU 16x.3 – with same appearance and different functionalities. The differences are described between PPU 15x.3 and PPU 16x.3 in chapter 2 - Overview of functions.

■ Benefits

- Compact, rugged, and maintenance-friendly operator-panel CNC
- Actual position feedback to CNC
- Intelligent clamp mounting without drilling holes into the cabinet
- Minimum commissioning efforts due to plug and play machine control panel connected via USB interface
- Direct commissioning on HMI for feed drives and automatic servo tuning (AST)
- Maximum performance and accuracy due to most modern CNC features
- SINUMERIK 808D startGUIDE: assists all process steps of the machine – from engineering to production, from sales to operation and programming at the push of a button

- SINUMERIK Operate BASIC: maximum operator convenience similar to SINUMERIK 828D and SINUMERIK 840D sl
- SINUMERIK programGUIDE BASIC: wide range of technology cycles for turning, milling and drilling with graphical input screens
- Manual Machine plus: easy semi-automatic machining with handwheel controlled flat-bed lathes[1]
- Fast data transmission via USB stick and high-speed Ethernet interface
- More software options can cover more applications and enhance the machine performance
- Maximum performance and accuracy due to the Advanced Surface function[2]

■ Function

- 2 operator panel variants for horizontal and vertical operator panel housings
- IP65 protection for CNC front panel and machine control panel
- Integrated CNC keyboard with mechanical keys
- Simplified Chinese or English panel layout
- 8.4" color LCD display
- USB user interface on the operator panel front
- Drive bus interface for feed drives and spindle
- Analog ±10 V interface for spindle drive
- Data buffering without battery
- Pre-configured system software for turning and milling technologies
- Up to 6 axes/spindles[3]
- Automatic servo tuning AST
- Ethernet interface for commissioning and data transfer
- Graphically guided SINUMERIK CNC programming and standard ISO-code programming with canned cycles
- Graphical CNC simulation
- Integrated contour computer
- Integrated PLC based on the SIMATIC S7-200 command set with ladder logic programming
- Integrated/distributed PLC I/O concept with 72 digital PLC inputs and 48 digital PLC outputs
- CNC options subject to license
- Customized user screens
- Machine maintenance tasks are accomplished by integrated service planner

■ Integration

The following components can be connected to the SINUMERIK 808D ADVANCED PPU 15x.3/PPU 16x.3:

- Up to 2 electronic handwheels
- Up to 72 digital PLC inputs and 48 digital PLC outputs
- 1 TTL direct spindle encoder
- SINUMERIK 808D MCP via USB interface
- SINAMICS V70 drive system for feed axes and spindle
- Spindle drives via ±10 V analog output
- PC via Ethernet interface
- 1 digital tool probe[4]

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[1] Only for turning
[2] Only for PPU 16x.3 milling
[3] Up to 4 axes/spindle for PPU 15x.3
[4] Only for milling

3

Technical specifications

Article No.	6FC5370-.B.03-0.A0	6FC5370-.A.03-0.A0
Product name	SINUMERIK 808D ADVANCED PPU 150.3/PPU 160.3 vertical	SINUMERIK 808D ADVANCED PPU 151.3/PPU 161.3 horizontal
Supply voltage at DC	24 V + 20 %/- 15 %	
Active power consumption maximum	50 W	
Buffering time in the event of power failure	3 ms (20 ms with SITOP smart power supply)	
Degree of protection • Front, with the front flap closed • Rear	IP65 IP20	
Relative humidity at 25 °C, during • storage and transport • operation	5 … 95 % 5 … 90 %	

Ambient temperature, during
• storage and transport
• operation
  - front
  - rear
	-20 ... +60 °C
	
	0 ... 45 °C
	0 ... 50 °C	

Width	265 mm	420 mm
Height	330 mm	200 mm
Depth	104 mm	104 mm
Mounting surface • Section width • Section height • Tolerance	244.1 mm 307.1 mm + 1 mm	406 mm 186 mm + 1 mm
Net weight	2.9 kg	3.0 kg
Certificate of suitability	CE, EAC, KC	

Selection and ordering data

Description	Article No.
Hardware components	
SINUMERIK 808D ADVANCED T PPU 160.3 vertical • English layout • Simplified Chinese layout	 6FC5370-2BT03-0AA0 6FC5370-2BT03-0CA0
SINUMERIK 808D ADVANCED T PPU 161.3 horizontal • English layout • Simplified Chinese layout	 6FC5370-2AT03-0AA0 6FC5370-2AT03-0CA0
SINUMERIK 808D ADVANCED M PPU 160.3 vertical • English layout • Simplified Chinese layout	 6FC5370-2BM03-0AA0 6FC5370-2BM03-0CA0
SINUMERIK 808D ADVANCED M PPU 161.3 horizontal • English layout • Simplified Chinese layout	 6FC5370-2AM03-0AA0 6FC5370-2AM03-0CA0
SINUMERIK 808D ADVANCED T PPU 150.3 vertical • English layout • Simplified Chinese layout	 6FC5370-3BT03-0AA0 6FC5370-3BT03-0CA0
SINUMERIK 808D ADVANCED T PPU 151.3 horizontal • English layout • Simplified Chinese layout	 6FC5370-3AT03-0AA0 6FC5370-3AT03-0CA0

Description	Article No.
Hardware components (continued)	
SINUMERIK 808D ADVANCED M PPU 150.3 vertical • English layout • Simplified Chinese layout	 6FC5370-3BM03-0AA0 6FC5370-3BM03-0CA0
SINUMERIK 808D ADVANCED M PPU 151.3 horizontal • English layout • Simplified Chinese layout	 6FC5370-3AM03-0AA0 6FC5370-3AM03-0CA0
Software components	
SINUMERIK 808D T/M toolbox On DVD-ROM	6FC5811-0CY00-0YA8

Options

Description	Article No.
Additional NC axis[1]	6FC5800-0AK70-0YB0
Additional 1 positioning axis/ auxiliary spindle[1]	6FC5800-0AK80-0YB0
Manual Machine plus (MM+)[2]	6FC5800-0AP07-0YB0
TRANSMIT/TRACYL Transformation without Y axis[3]	6FC5800-0AS50-0YB0
Pair of synchronized axes (gantry axes), basic[3]	6FC5800-0AS51-0YB0
Generic coupling CP-Basic[4]	6FC5800-0AM72-0YB0
Bidirectional leadscrew error compensation	6FC5800-0AM54-0YB0
Contour handwheel	6FC5800-0AM08-0YB0
Lock MyCycles	6FC5800-0AP54-0YB0
CNC lock function	6FC5800-0AS71-0YB0

[1] Only for PPU 15x.3 turning and PPU 16x.3
[2] Only for turning
[3] Only for PPU 16x.3
[4] Only for PPU16x.3 turning

SINUMERIK 808D ADVANCED system
CNC control

SINUMERIK 808D ADVANCED PPU 15x.3/PPU 16x.3

■ **Dimensional drawings**

Dimensions in mm
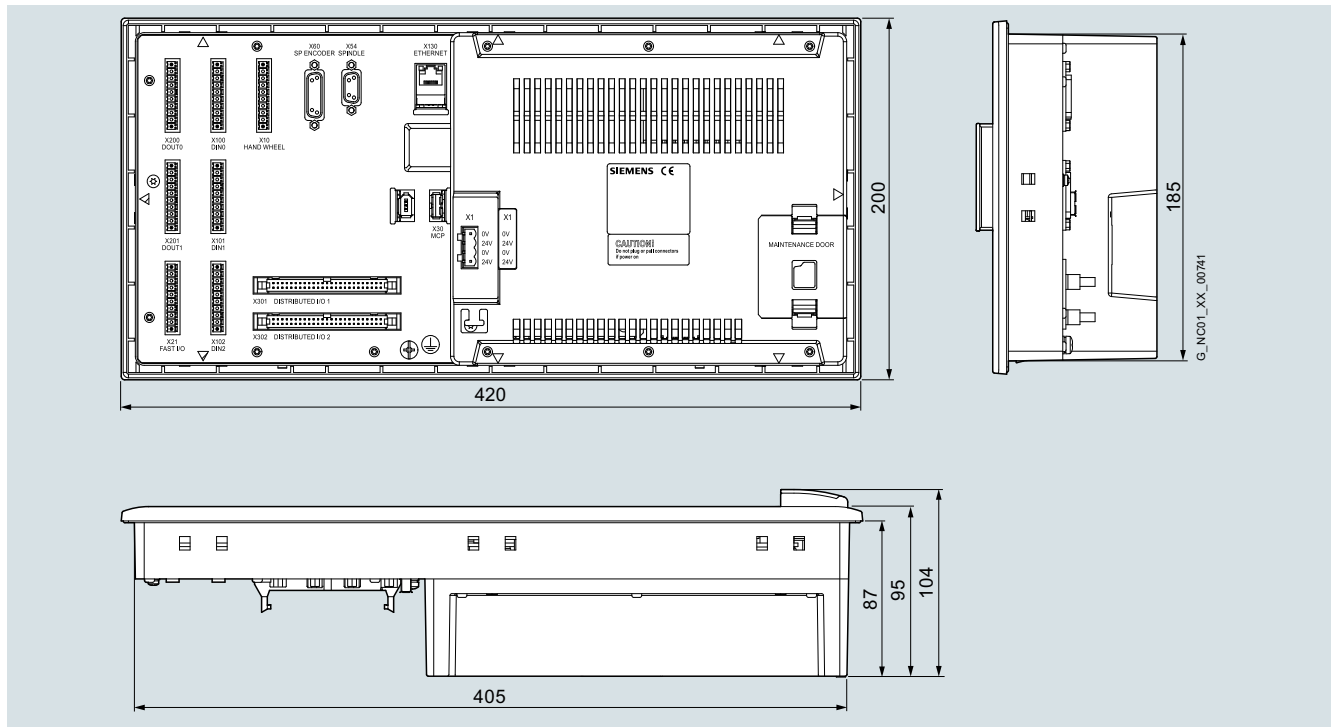
SINUMERIK 808D ADVANCED T/M horizontal
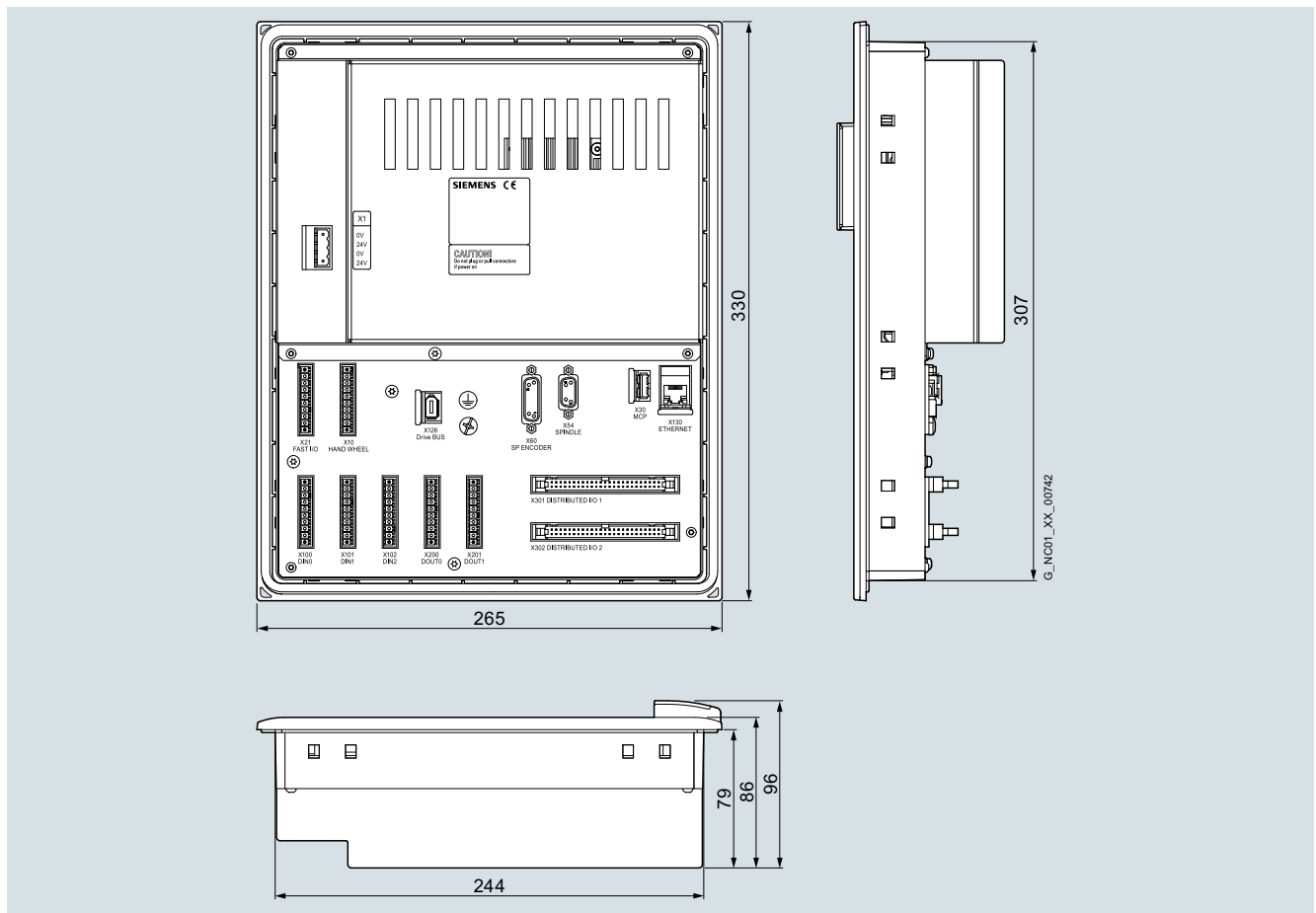
SINUMERIK 808D ADVANCED T/M vertical

Overview

SINUMERIK 808D MCP horizontal

SINUMERIK 808D MCP vertical

SINUMERIK 808D MCP vertical, with handwheel slot

The SINUMERIK 808D MCP machine control panels with mechanical keys are designed to permit user-friendly, well-structured operation of the machine functions. They are suitable for machine-level operation of turning and milling machines. Customized keys can be individually labeled using slide-in strips.

The machine control panel is available as vertical and horizontal version for different machine designs. Depending on the design of the machine, the SINUMERIK 808D MCP can also be ordered with a handwheel slot.

The machine control panel can be mounted from the rear using special clamps without drilling holes into the cabinet.

Design

Operator controls:
- Mode selectors and function keys
  - 39 keys (horizontal version: of which 30 keys with LEDs, vertical version: 39 keys with LEDs)
  - Direction keys for machines with rapid traverse override (The machine control panel is equipped with slide-in labels for turning at the factory – slide-in labels for milling are enclosed.)
  - Preassigned keys for common functions, such as handwheel selection, tool change, coolant control or program testing
- Horizontal version and vertical version without handwheel slot: Spindle control with spindle override (rotary switch with 15 positions)
- Feedrate control with feedrate/rapid traverse override (rotary switch with 18 positions)
- 7-segment display for tool number

Layout:
- English or Chinese Simplified

Key type:
- Mechanical keys with protection film

Interface to CNC:
- USB

Expansion options:
- 1 slot for emergency stop button (d = 22 mm)
- Horizontal version: 3 slots for control devices (d = 16 mm)
- Vertical version: 4 slots for control devices (d = 16 mm)
- 1 slot for handwheel (d = 44 mm), only for the vertical version with handwheel slot. The handwheel with a diameter of 44 mm must be ordered separately

Selection and ordering data

Description	Article No.
SINUMERIK 808D MCP machine control panel, horizontal	
With USB cable	
• English layout	**6FC5303-0AF35-0AA0**
• Simplified Chinese layout	**6FC5303-0AF35-0CA0**
SINUMERIK 808D MCP machine control panel, vertical with rotary switch for spindle override	
With USB cable	
• English layout	**6FC5303-0AF35-2AA0**
• Simplified Chinese layout	**6FC5303-0AF35-2CA0**
SINUMERIK 808D MCP machine control panel, vertical with handwheel slot	
With USB cable	
• English layout	**6FC5303-0AF35-3AA0**
• Simplified Chinese layout	**6FC5303-0AF35-3CA0**

The following are included in the scope of delivery of the SINUMERIK 808D MCP horizontal/vertical machine control panel:
- USB cable 0.5 m
- Mounting clamps
- Slide-in labels for turning application (already inserted)
- Slide-in labels for milling applications
- Blank labeling strips for individual inscription

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SINUMERIK 808D ADVANCED system
Operator components

SINUMERIK 808D MCP horizontal/vertical

■ Integration

The SINUMERIK 808D MCP machine control panel can be used for:
• SINUMERIK 808D ADVANCED T
• SINUMERIK 808D ADVANCED M

■ Technical specifications

Article No.	6FC5303-0AF35-0.A0	6FC5303-0AF35-..A0
Product name	SINUMERIK 808D MCP machine control panel horizontal version	SINUMERIK 808D MCP machine control panel vertical version
Supply voltage at DC	5 V via USB interface of PPU	
Active power consumption maximum	5 W	
Degree of protection • Front • Rear	IP65 IP00	
Environmental category acc. to IEC 60721-3-3	Condensation and icing excluded. Low air temperature 0 °C.	
Relative humidity at 25 °C, during • storage • transport • operation	5 … 95 % 5 … 95 % 5 … 90 %	

Ambient temperature, during
• storage
• transport
• operation
  - front
  - rear
	-20 ... +60 °C
	-20 ... +60 °C
	
	0 ... 45 °C
	0 ... 50 °C	

Transmission link to PCU maximum	0.5 m	
Width	420 mm	265 mm
Height	120 mm	230 mm
Depth	58 mm	58 mm
Mounting surface • Section width • Section height • Tolerance	406 mm 106 mm + 1 mm	245 mm 211 mm + 1 mm
Net weight • With handwheel slot • With rotary switch	0.86 kg – –	 0.79 kg 0.93 kg
Certificate of suitability	CE, EAC	

◼ Dimensional drawings

Dimensions in mm
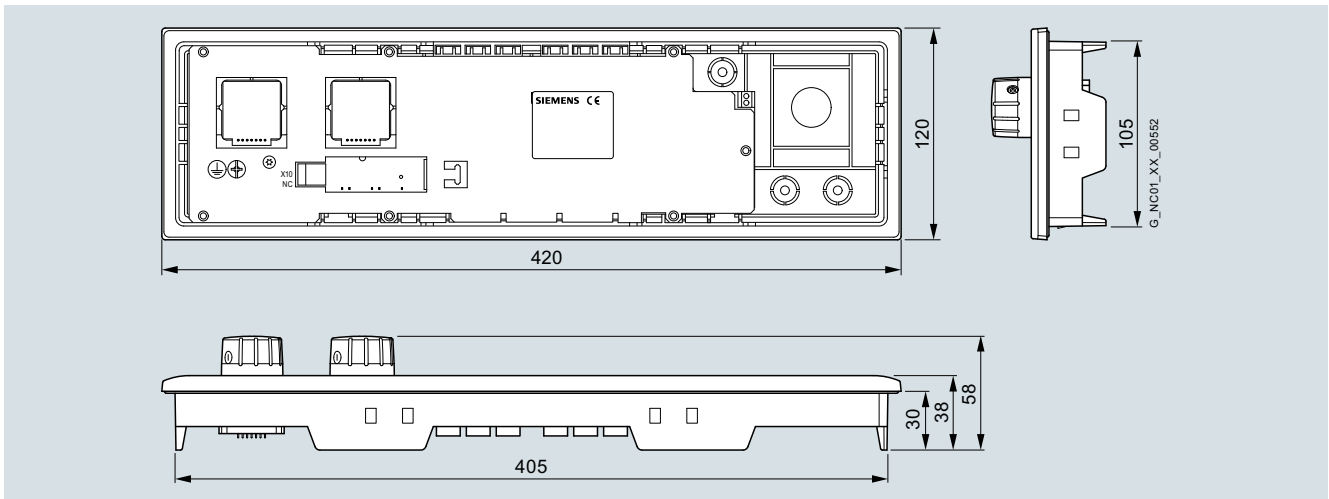
SINUMERIK 808D MCP horizontal
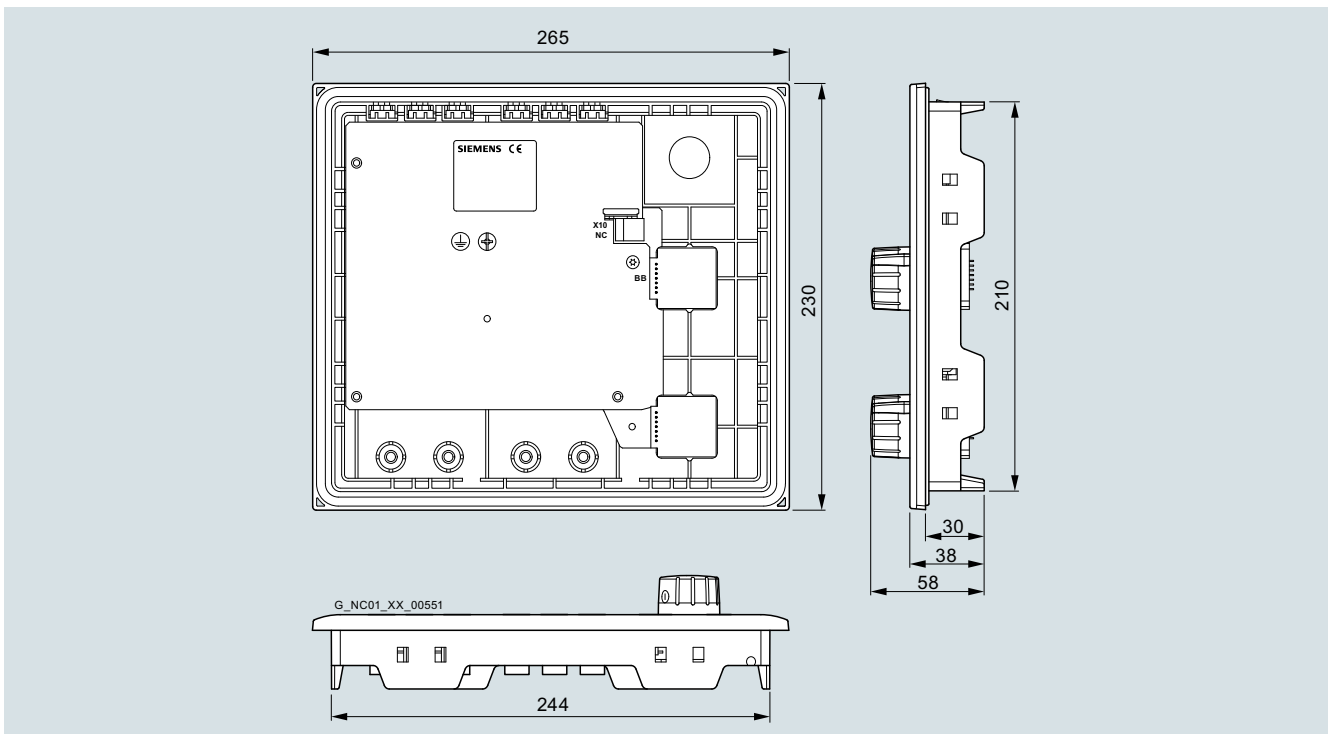
SINUMERIK 808D MCP vertical with handwheel slot/without handwheel slot

SINUMERIK 808D ADVANCED system
Feed axis solutions

SINAMICS V70 servo drive

Overview

SINAMICS V70, frame sizes FSC/FSB/FSA

The SINAMICS V70 servo drive is specially designed to control the feed axes in standard machine tool applications. The system is designed essentially for applications where cost effectiveness is the primary consideration. The key performance data of the drive are aligned to perfectly fit to the solution provided by the SINUMERIK 808D ADVANCED.

Benefits

- Compact module with integrated infeed, inverter and closed-loop position control for one feed axis
- Coated electronic modules
- Commissioning on CNC directly
- Faster commissioning thanks to pre-configured motor data stored in the drive.
- CE certified

Function

- 7 versions cover power range from 0.4 kW to 7 kW
- Supply voltage 380 V to 480 V 3 AC
- 300 % overload capability
- Drive bus communication to the SINUMERIK 808D ADVANCED
- Integrated motor brake switch
- Safe Torque Off (STO)

Integration

The following components can be connected to the SINAMICS V70:
- SINUMERIK 808D ADVANCED PPU 15x.3/PPU 16x.3
- SIMOTICS S-1FL6 feed motor
- Encoder in SIMOTICS S-1FL6 feed motor
- Brake in SIMOTICS S-1FL6 feed motor

Selection and ordering data

Rated output current	Frame size	SINAMICS V70 servo drive
A		Article No.
1.2	FSA	**6SL3210-5DE12-4UA0**
3.0	FSA	**6SL3210-5DE13-5UA0**
4.6	FSB	**6SL3210-5DE16-0UA0**
5.3	FSB	**6SL3210-5DE17-8UA0**
7.8	FSB	**6SL3210-5DE21-0UA0**
11	FSC	**6SL3210-5DE21-4UA0**
13.2	FSC	**6SL3210-5DE21-8UA0**

Description	Article No.
Spare parts	
SINAMICS V70/V90 fan kits	
• Frame size FSB	**6SL3200-0WF00-0AA0**
• Frame size FSC	**6SL3200-0WF01-0AA0**
SINAMICS V70 drive bus terminator	**6FC5548-0BA21-0AA0**

3

Technical specifications

Article No.	6SL3210-5DE12-4UA0	6SL3210-5DE13-5UA0	6SL3210-5DE16-0UA0	6SL3210-5DE17-8UA0	6SL3210-5DE21-0UA0	6SL3210-5DE21-4UA0	6SL3210-5DE21-8UA0
Product name	SINAMICS V70 servo drive						
Frame size	FSA		FSB			FSC	
Input voltage	380 ... 480 V 3 AC -15 %/+10 %						
Input frequency	50 ... 60 Hz ± 10 %						
Infeed	Non-stabilized						
Electronics power supply	24 V DC ± 10 %						
24 V DC supply	2.0 A (4.0 A) combined with motors without brake (with brake)						
Cooling	Natural cooling		Forced ventilation				
Ambient temperature • Storage/transport • Operation	-40 ... +70 °C 0 ... 45 °C without derating, > 45 ... 55 °C with derating (derating by 0 % at 45 °C up to 20 % at 55 °C)						
Air humidity • Storage/transport • Operation	90 % (non-condensing) < 90 % (non-condensing)						
Ambient conditions	Indoor (without sunshine), without corrosive gas, combustible gas, oil gas, nor dust						
Installation altitude	Up to 1000 m without derating						
Connectable motors	SIMOTICS S-1FL6						
Degree of protection	IP20						
Encoder evaluation	Absolute encoder 20 bit/incremental encoder with 2500 S/R (13 bit resolution through electronic multiplication)						
Output current • Rated current I_{rated} • Peak current I_{max}	1.2 A 3.6 A	3.0 A 9.0 A	4.6 A 13.8 A	5.3 A 15.9 A	7.8 A 23.4 A	11.0 A 33.0 A	13.2 A 39.6 A
Rated output power P_{rated}	0.4 kW	1 kW	1.5 kW	1.75 kW	2.5 kW	3.5 kW	7 kW
Power loss	36 W	47 W	54 W	70 W	47 W	54 W	70 W
Cooling air required	0.005 m³/s	0.005 m³/s	0.005 m³/s	0.005 m³/s	0.005 m³/s	0.005 m³/s	0.005 m³/s
Conductor cross-section, max.	1.5 mm²		2.5 mm²				
Dimensions[1)] • Width • Height • Depth	80 mm 180 mm 200 mm		100 mm 180 mm 200 mm			140 mm 260 mm 240 mm	
Weight, approx.	1.85 kg		2.45 kg			5.65 kg	
Certificate of suitability	CE, EAC						

S/R = Signals/Revolution

3

[1)] Minimum distance between drive modules: 10 mm.

SINUMERIK 808D ADVANCED system
Feed axis solutions

■ **Dimensional drawings**
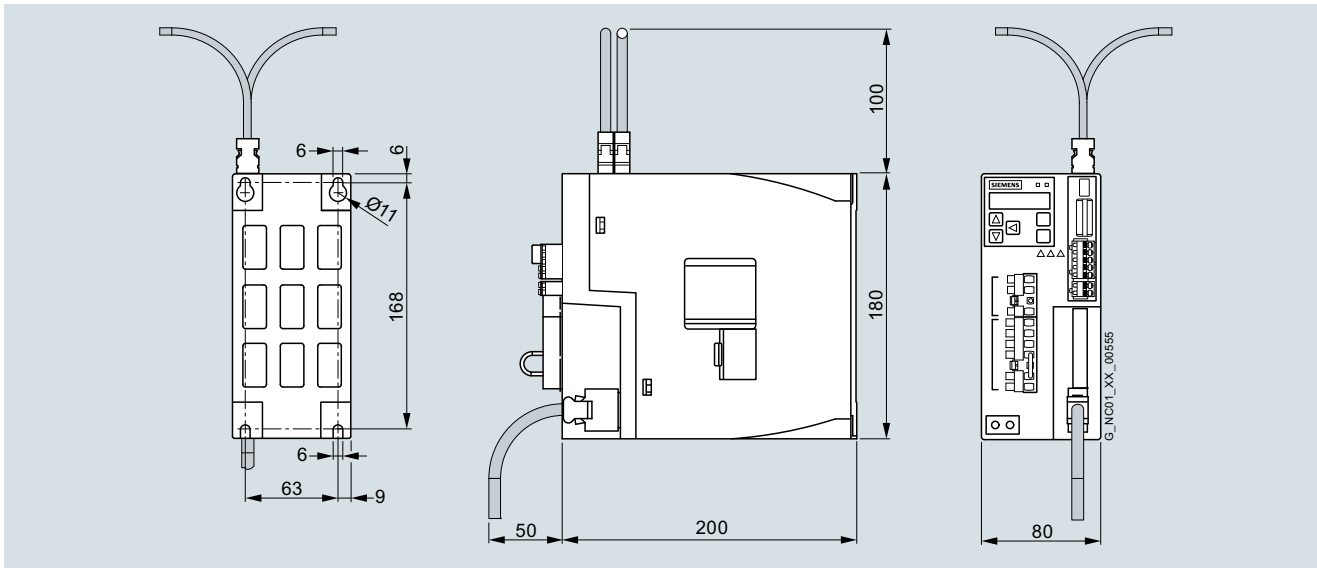
Dimensions in mm

SINAMICS V70, frame size FSA
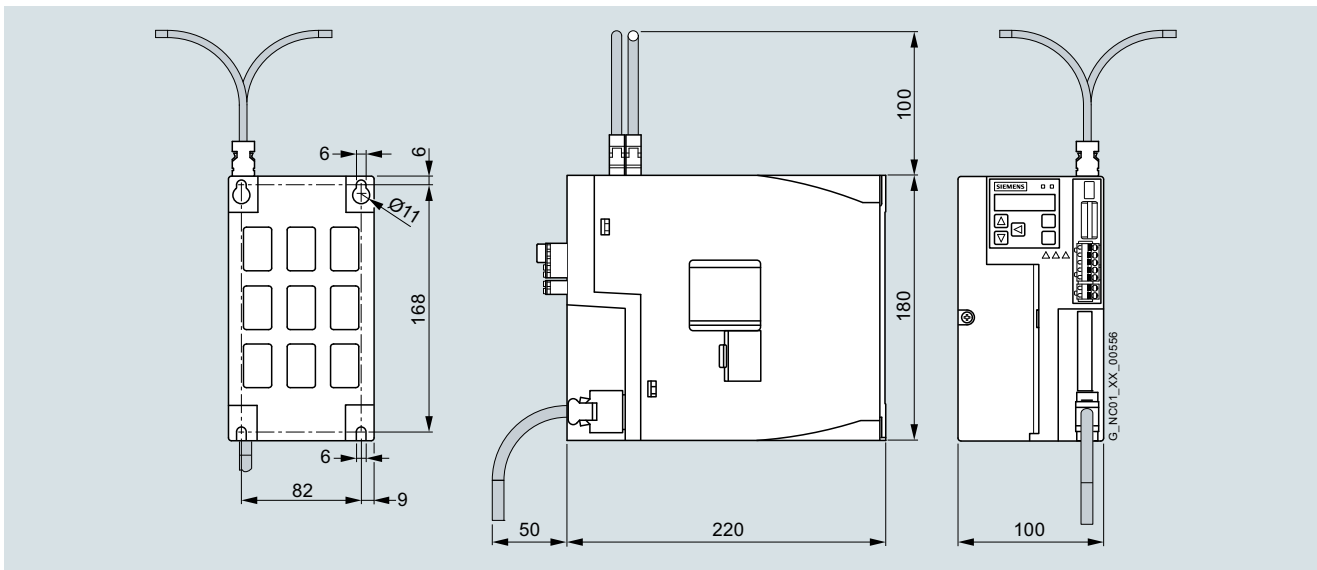
SINAMICS V70, frame size FSB

■ **Dimensional drawings** (continued)

Dimensions in mm
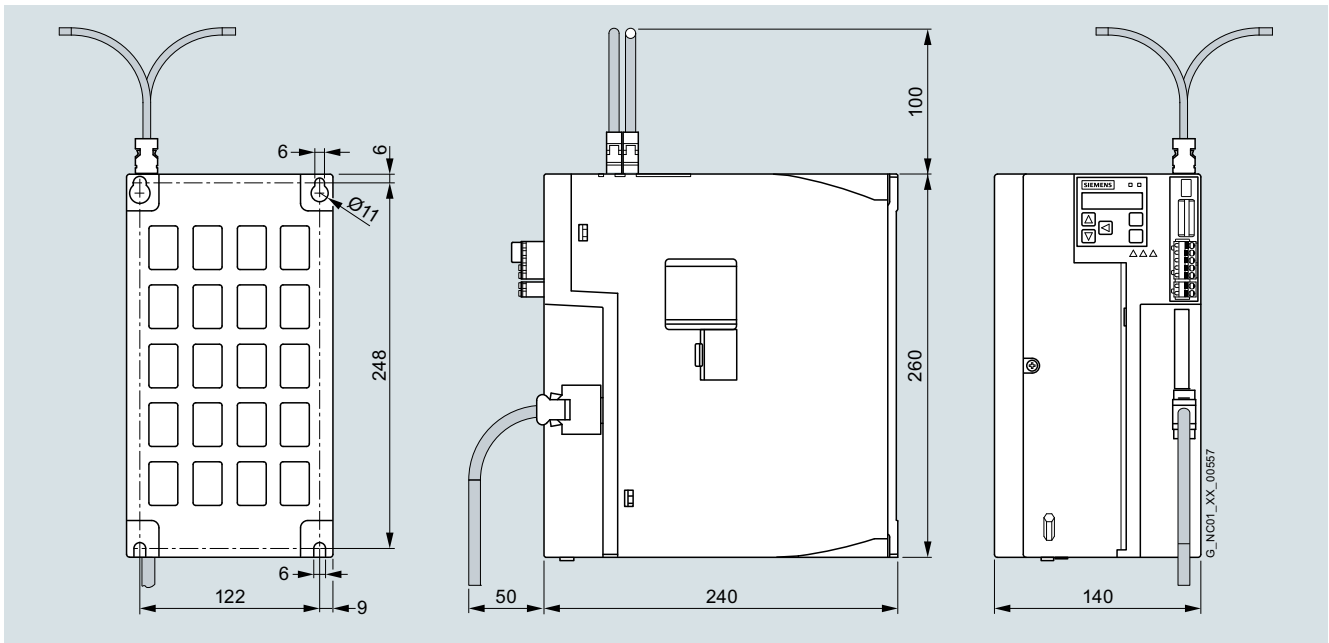
SINAMICS V70, frame size FSC
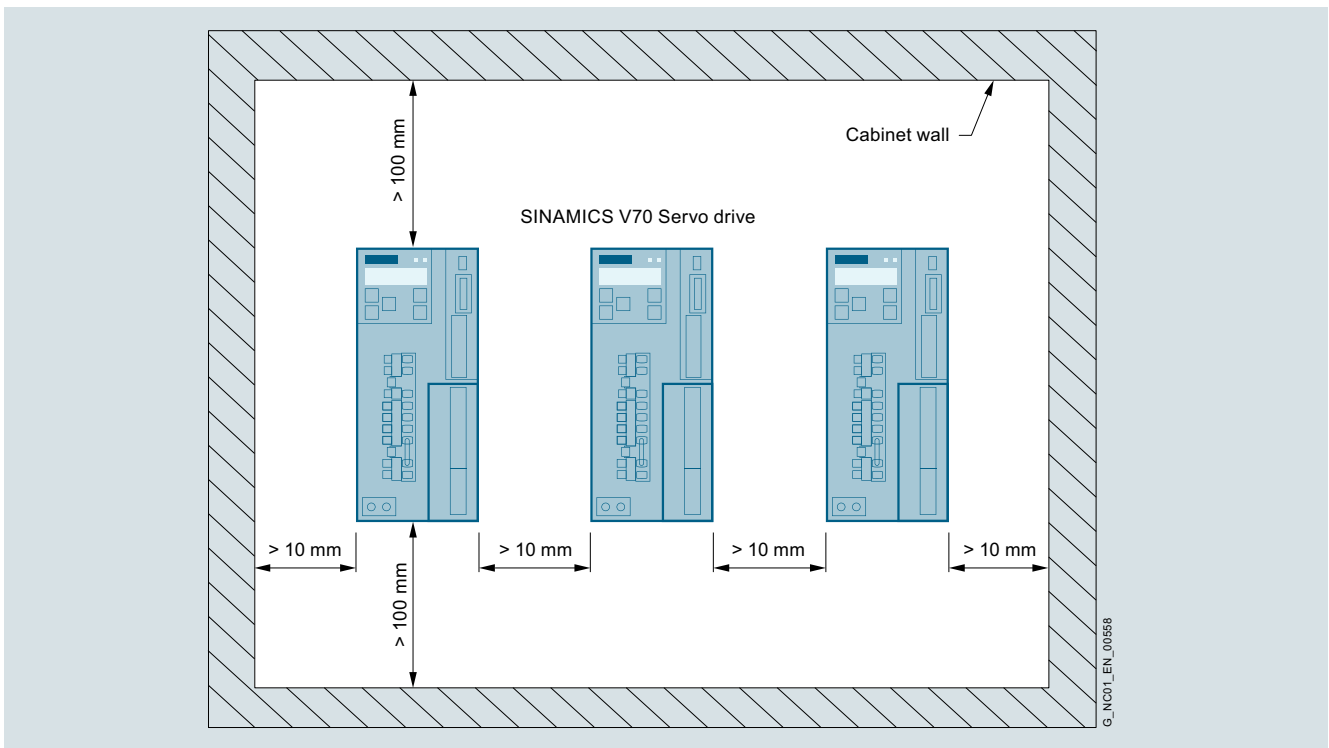
Mounting clearance

SINUMERIK 808D ADVANCED system
Feed axis solutions

SIMOTICS S-1FL6 feed motor

■ Overview
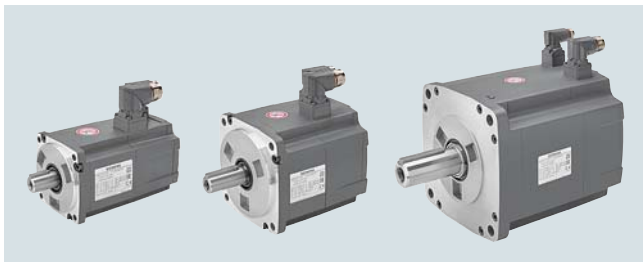
SIMOTICS S-1FL6 motors

SIMOTICS S-1FL6 motors are permanent-magnet synchronous motors and designed for operation without external cooling. The heat is dissipated through the motor surface. Quick and easy mounting of the motors is possible. Together with the SINAMICS V70, the SIMOTICS S-1FL6 feed motors provide a highly dynamic solution for the machine tool application.

■ Benefits

■ High-performance magnet material

■ Rugged design with IP65 degree of protection for complete motor including connectors

■ Smooth running quality thanks to low torque ripple

■ High rated speed for some variants

■ High acceleration due to the 300 % overload capacity

■ Rotatable connectors

■ Maximum flexibility due to variants with incremental encoder/20 bit absolute encoder, with/without brake and plain shaft/feather key, half-key balancing

■ Function

• 3 motor shaft heights: SH 45, SH 65 and SH 90

• Rated speed of 2000 rpm/3000 rpm

• Max. speed up to 4000 rpm

• 300 % overload capacity

• Integrated 20 bit absolute encoder or incremental encoder with 2500 S/R (13 bit resolution through electronic multiplication of the V70 drive)

• Degree of protection IP65, natural cooling

• Optional holding brake[1]

• With plain shaft or feather key, half-key balancing

■ Technical specifications

Article No.	1FL6...
Product brand name	SIMOTICS
Product type designation	S-1FL6
Product designation	Feed motor
Type of motor	Synchronous motor
Type of motor	Permanent-magnet synchronous motor
Magnet material	High-performance magnet material
Cooling	Natural cooling
Insulation of the stator winding in accordance with EN 600034-1 (IEC 60034-1)	Temperature class 130 (B)
Thermal class	B (130 °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, with oil seal
Shaft extension in accordance with IEC 60072-1	Plain shaft/feather key (C type, motors with a keyway are balanced with a half-fitted key by the manufacturer)
Shaft and flange accuracy in accordance with IEC 60072-1[2]	Tolerance N
Vibration severity in accordance with IEC 60034-14	Grade A
Sound pressure level, max. • 1FL604 • 1FL606 • 1FL609	65 dB 70 dB 70 dB
Ambient temperature • Storage/transport • Operation	-20 ... +65 °C 0 ... 40 °C without derating
Humidity • Storage/transport • Operation	90 % at 30 °C 90 % at 30 °C
Installation altitude	Up to 1000 m above sea level without power derating > 1000 m ... 5000 m with power derating
Paint finish	Black
Certificate of suitability	CE, EAC

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[1] It is not permissible to use the holding brake for an emergency stop.

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

Selection and ordering data

Rated speed	Max. speed	Shaft height	Rated power[1]	Static torque	SIMOTICS S-1FL6 Feed motors Synchronous motors Natural cooling	Moment of inertia of rotor		Weight[2]		SINAMICS V70	
n_{rated}	$n_{max.}$	SH	P_{rated} at $\Delta T = 100$ K	M_0 at $\Delta T = 100$ K		without brake	with brake	without brake	with brake		Frame size
						J	J	m	m		
rpm	rpm		kW	Nm	Article No.	10^{-4} kgm^2	10^{-4} kgm^2	kg	kg	Article No. 6SL3210-...	
3000	4000	45	0.4	1.9	**1FL6042-1AF61-2 ■ ■1**	2.7	3.2	3.4	4.8	5DE12-4UA0	FSA
	4000		0.75	3.5	**1FL6044-1AF61-2 ■ ■1**	5.2	5.7	5.2	6.6	5DE13-5UA0	FSA
2000	3000	65	0.75	4	**1FL6061-1AC61-2 ■ ■1**	8.0	9.1	5.7	8.8	5DE13-5UA0	FSA
	3000		1	6	**1FL6062-1AC61-2 ■ ■1**	11.7	13.5	7	10.1	5DE13-5UA0	FSA
	3000		1.5	8	**1FL6064-1AC61-2 ■ ■1**	15.3	16.4	8.4	11.5	5DE16-0UA0	FSB
	3000		1.75	11	**1FL6066-1AC61-2 ■ ■1**	22.6	23.7	11.1	14.2	5DE17-8UA0	FSB
	3000		2	15	**1FL6067-1AC61-2 ■ ■1**	29.9	31.0	13.7	16.8	5DE21-0UA0	FSB
2000	3000	90	2.5	15	**1FL6090-1AC61-2 ■ ■1**	47.4	56.3	15.4	21.5	5DE21-0UA0	FSB
	3000		3.5	22	**1FL6092-1AC61-2 ■ ■1**	69.1	77.9	19.8	25.9	5DE21-4UA0	FSC
	2500		5	30	**1FL6094-1AC61-2 ■ ■1**	90.8	99.7	24.4	30.5	5DE21-8UA0	FSC
	2000		7[3]	40	**1FL6096-1AC61-2 ■ ■1**	134.3	143.2	33.3	39.3	5DE21-8UA0	FSC

Encoder type	
Incremental encoder 2500 S/R	A
Absolute encoder 20 bit	L

Shaft extension	Holding brake	
Feather key, half-key balancing	Without	A
Feather key, half-key balancing	With	B
Plain shaft	Without	G
Plain shaft	With	H

[1] Rated power allows for a production tolerance of 10 %.

[2] Motor weight with incremental encoder.

[3] For SIMOTICS S-1FL6096-... motors with brake, when the ambient temperature exceeds 30 °C, the power should be derated by 10 %. Power derating is not required for other motors.

SINUMERIK 808D ADVANCED system
Feed axis solutions

SIMOTICS S-1FL6 feed motor

Dimensional drawings
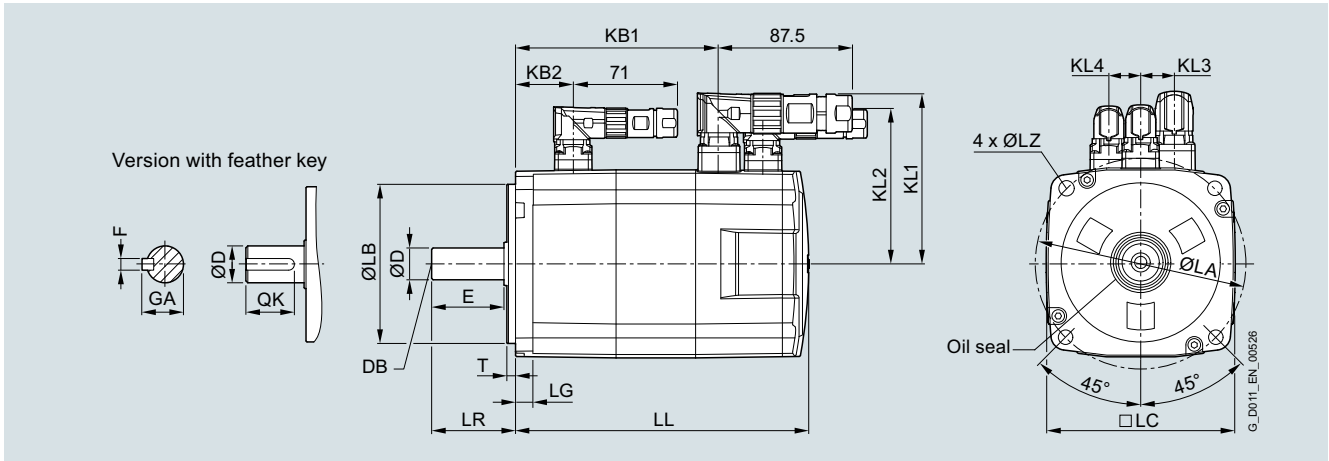
SIMOTICS S-1FL6 feed motor with incremental encoder

For motor		Dimensions in mm																		Encoder system: Incremental encoder 2500 S/R									
										DE shaft extension										without brake			with brake						
Shaft height	Type	LC	LA	LZ	LB	LR	T	LG	D	DB	E	QK	GA	F	LL	KB1	KB2	LL	KB1	KB2	KL1	KL2	KL3	KL4
1FL6 natural cooling without/with brake																									
45	1FL6042	90	100	7	80	35	4	10	19	M6×16	30	25	21.5	6	154.5	93.5	–	201	140	31.5	96.2	84.6	13	14
	1FL6044														201.5	140.5	–	248	187					
65	1FL6061	130	145	9	110	58	6	12	22	M8×16	50	44	25	8	148	85.5	–	202.5	140	39.5	118	108	23	22
	1FL6062														164.5	102	–	219	156.5					
	1FL6064														181	118.5	–	235.5	173					
	1FL6066														214	151.5	–	268.5	206					
	1FL6067														247	184.5	–	301.5	239					
90	1FL6090	180	200	13.5	114.3	80	3	18	35	M12×25	75	60	38	10	189.5	140	–	255	206	44.5	143	133	34	34
	1FL6092														211.5	162	–	281	232					
	1FL6094														237.5	188	–	307	258					
	1FL6096														289.5	240	–	359	310					

Dimensional drawings (continued)
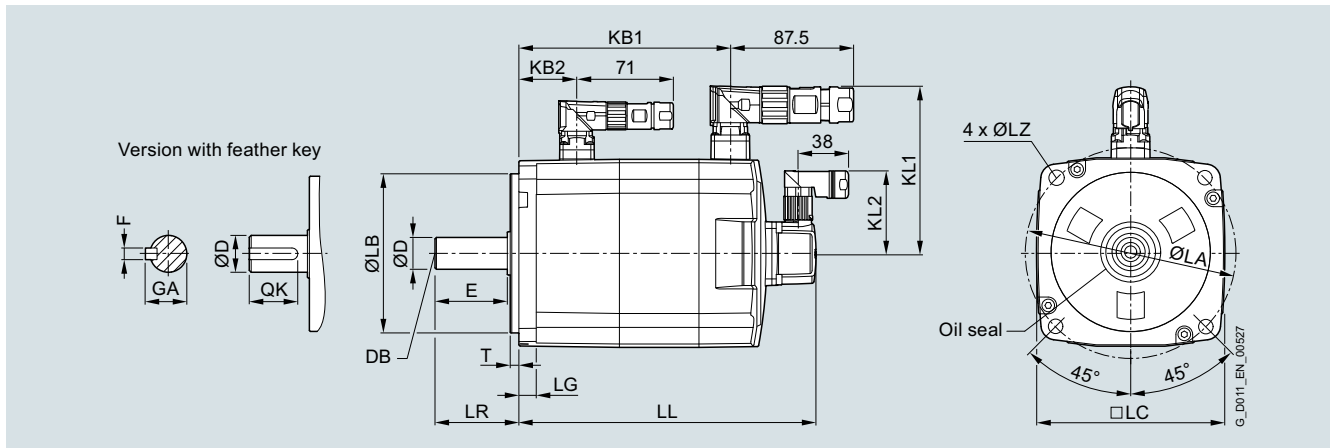
SIMOTICS S-1FL6 feed motor with absolute encoder

For motor		Dimensions in mm							DE shaft extension					Encoder system: Absolute encoder 20 bit							
														without brake			with brake				
Shaft height	Type	LC	LA	LZ	LB	LR	T	LG	D	DB	E	QK	GA	F	LL	KB1	KB2	LL	KB1	KB2	KL1	KL2
1FL6 natural cooling without/with brake																						
45	1FL6042	90	100	7	80	35	4	10	19	M6×16	30	25	21.5	6	157	100	–	203.5	147	31.5	96.2	60
	1FL6044														204	147	–	250.5	194			
65	1FL6061	130	145	9	110	58	6	12	22	M8×16	50	44	25	8	151	92	–	205.5	147	39.5	117.5	60
	1FL6062														167.5	108.5	–	222	163.5			
	1FL6064														184	125	–	238.5	180			
	1FL6066														217	158	–	271.5	213			
	1FL6067														250	191	–	304.5	246			
90	1FL6090	180	200	13.5	114.3	80	3	18	35	M12×25	75	60	38	10	197	135	–	263	201	44.5	143	60
	1FL6092														223	161	–	289	227			
	1FL6094														249	187	–	315	253			
	1FL6096														301	239	–	367	305			

3

SINUMERIK 808D ADVANCED system
Spindle solutions

SINAMICS V70 spindle drive

■ Overview

SINAMICS V70 spindle drive, frame sizes FSD/FSC/FSB

The SINAMICS V70 spindle drive controls the spindle in standard machine tool applications. The system is designed essentially for applications where cost effectiveness is the primary consideration. The key performance data of the drive are aligned to perfectly fit to the solution provided by the SINUMERIK 808D ADVANCED.

■ Benefits

- Compact module with integrated infeed, inverter and closed-loop for spindle
- Coated electronic modules
- Commissioning on CNC directly
- Faster commissioning thanks to pre-configured motor data stored in the drive
- CE certified

■ Function

- Power range from 3.7 kW to 15 kW
- Supply voltage 380 V to 480 V 3 AC
- Drive bus communication to the SINUMERIK 808D ADVANCED
- Safe Torque Off (STO)

■ Integration

The following components can be connected to the SINAMICS V70 spindle drive:
- SINUMERIK 808D ADVANCED PPU 15x.3/PPU 16x.3
- SIMOTICS M-1PH1 main spindle motor
- Encoder in SIMOTICS M-1PH1 main spindle motor

■ Technical specifications

Article No.	6SL3210-5DE21-1UA0	6SL3210-5DE21-3UA0	6SL3210-5DE22-0UA0	6SL3210-5DE23-0UA0	6SL3210-5DE24-0UA0
Product brand name Product type designation Product designation	SINAMICS V70 Spindle drive				
Frame size	FSB	FSC		FSD	
Rated output current	10.5 A	12.9 A	19.6 A	29.8 A	37.6 A
Max. output current	21 A	24.6 A	39.2 A	59.6 A	75.2 A
Max. supported motor power	3.7 kW	3.7 kW	7.5 kW	11 kW	15 kW
Output frequency	0 Hz to 400 Hz				
Power supply • Voltage/frequency • Permissible voltage fluctuation • Permissible frequency fluctuation • Rated input current • Power supply capacity • Inrush current	380 V ... 480 V 3 AC, 50/60 Hz -15 % ... +10 % -10 % ... +10 % 13.2 A 8.7 kVA 4 A	16.2 A 10.7 kVA 2.5 A	24.5 A 16.1 kVA 2.5 A	37.3 A 24.5 kVA 2.5 A	47 A 30.9 kVA 2.5 A
24 V DC power supply • Voltage • Maximum current	24 V (-15 % ... +20 %) 3 A				
Overload capability	The overload capability is 150 % by default. It can be set up to 200 % via p0640, but the corresponding overload duration might be reduced under the circumstances.				
Control system	Servo control				
Braking resistor • Resistance • Max. power • Rated power • Max. energy	Braking resistor is not included in the standard system package. Choose an external braking resistor according to the technical specifications as listed below from Siemens product portfolio or from 3rd party. 70 Ω 9.1 kW 229 W 18.3 kJ	27 Ω 23.7 kW 1185 W 189.6 kJ		18 Ω 37.4 kW 1870 W 299.2 kJ	
Protective functions	• Earthing fault protection • Output short-cut protection • Overvoltage/undervoltage protection • I^2t detection • IGBT overtemperature protection				

■ **Technical specifications** (continued)

Article No.	6SL3210-5DE21-1UA0	6SL3210-5DE21-3UA0	6SL3210-5DE22-0UA0	6SL3210-5DE23-0UA0	6SL3210-5DE24-0UA0
Product brand name	SINAMICS				
Product type designation	V70				
Product designation	Spindle drive				
Cooling method	Fan-cooled				
Degree of protection	IP20				
Degree of pollution	Class 2				
Operating environment	Indoor (without direct sunlight), free from corrosive gas, combustible gas, oil gas, or dust				
Relative humidity, during • storage • operation	90 % (non-condensing) < 90 % (non-condensing)				
Ambient temperature, during • storage • operation	-40 °C ... +70 °C 0 °C ... 45 °C without power derating 45 °C ... 55 °C with power derating				
Installation altitude	< 1000 m above sea level (without derating)				
Vibration • transport and storage • operation	5 Hz ... 9 Hz: 3.5 mm deflection 9 Hz ... 200 Hz: 1 g vibration Ambient Classification: 1M2 Operational area II/3M2 10 Hz ... 58 Hz: 0.075 mm deflection 58 Hz ... 200 Hz: 1 g vibration				
Shock • transport and storage • operation	Covered by vibration test Operational area: II Ambient classification: 3M2 Peak acceleration: 5 g + 15 g Duration: 30 ms + 11 ms Quantity of shocks: 3 Summed shocks: 18 Cycle time: 1 s				
Width	100 mm	140 mm	140 mm	190 mm	190 mm
Height	180 mm	260 mm	260 mm	350 mm	350 mm
Depth	220 mm	240 mm	240 mm	185 mm	185 mm
Net weight	2.35 kg	5.05 kg	5.05 kg	8.05 kg	8.3 kg
Certificate of suitability	CE, EAC, RCM				

■ **Selection and ordering data**

Motor output power	Frame size	SINAMICS V70 spindle drive
kW		Article No.
Line voltage 380 V ... 480 V 3 AC		
3.7	FSB	**6SL3210-5DE21-1UA0**
3.7	FSC	**6SL3210-5DE21-3UA0**
7.5	FSC	**6SL3210-5DE22-0UA0**
11	FSD	**6SL3210-5DE23-0UA0**
15	FSD	**6SL3210-5DE24-0UA0**

■ **Accessories**

A shield plate can be ordered as an option for FSD devices.

Description	Article No.
Shield plate for V70 spindle drive Frame size FSD	**6SL3266-1ED00-0VA0**

3

SINUMERIK 808D ADVANCED system

Spindle solutions

■ Dimensional drawings
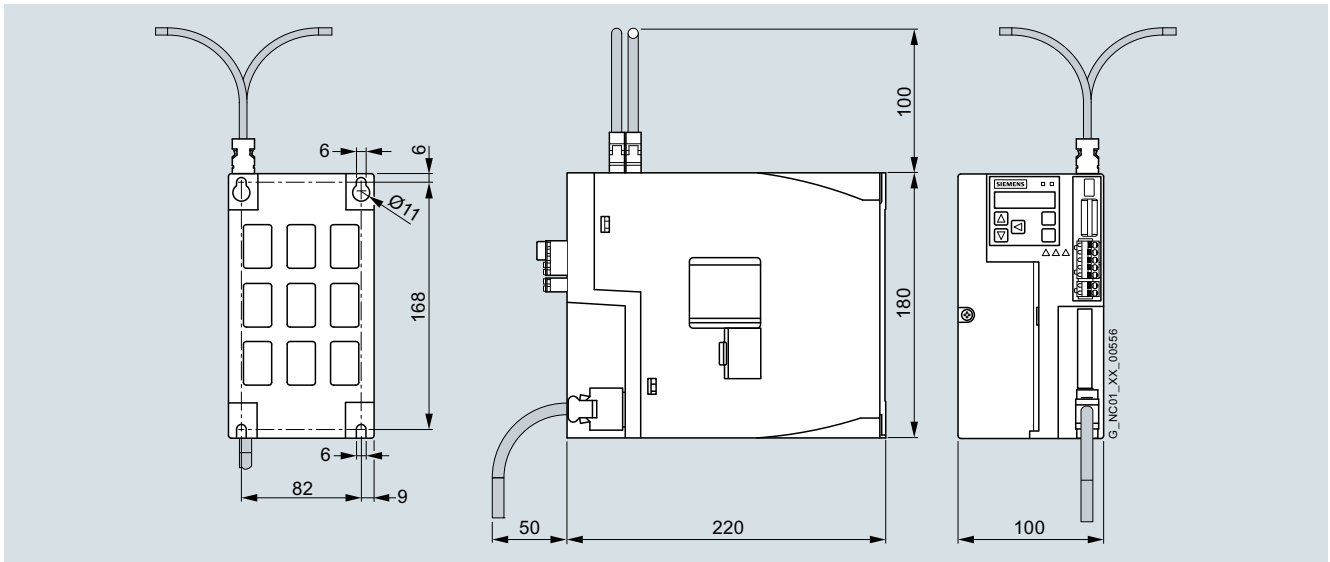
Dimensions in mm

SINAMICS V70 spindle drive, frame size FSB
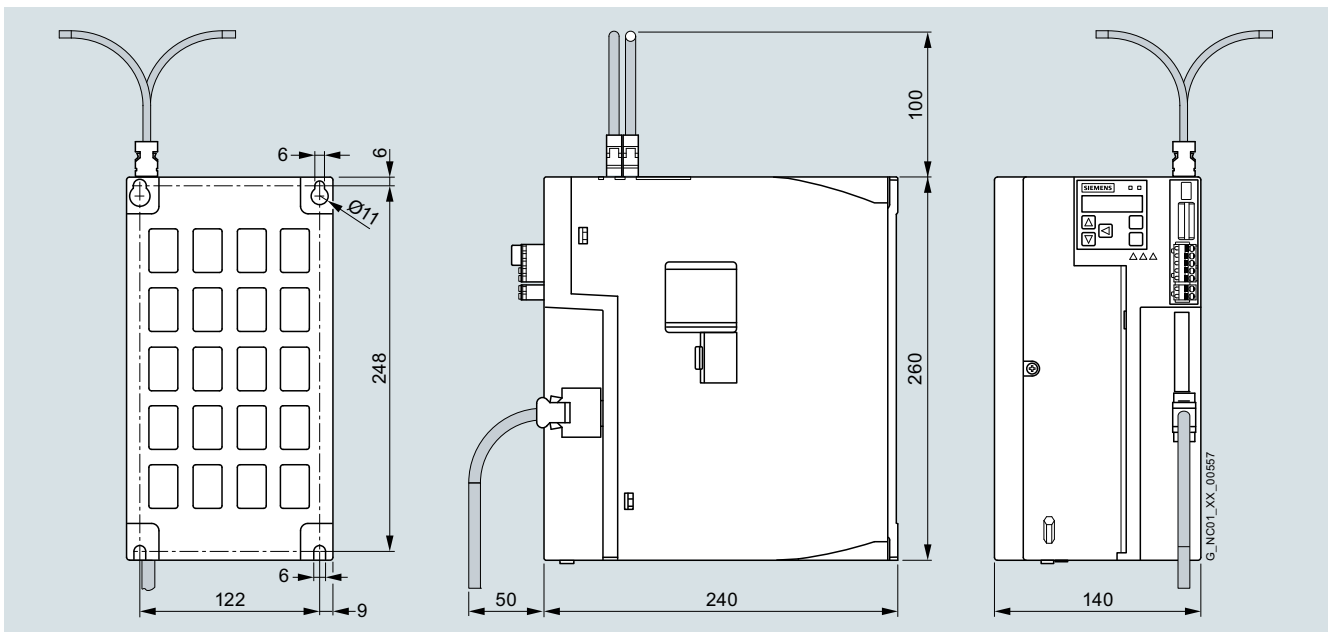
SINAMICS V70 spindle drive, frame size FSC

■ Dimensional drawings (continued)

Dimensions in mm
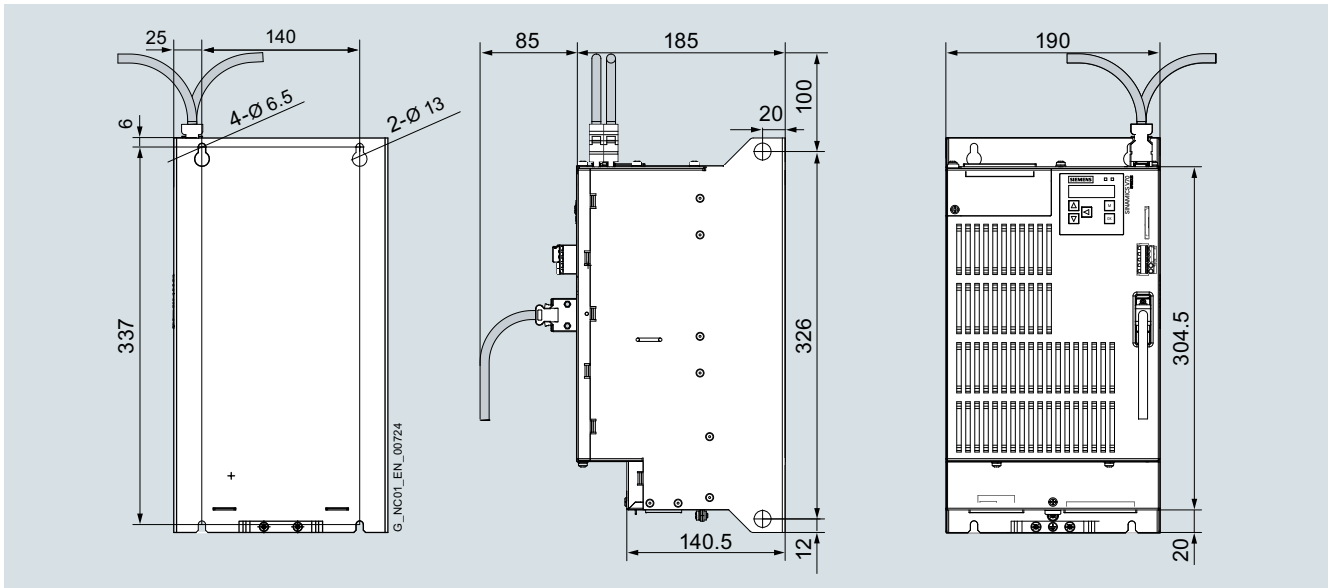
SINAMICS V70 spindle drive, frame size FSD

SINUMERIK 808D ADVANCED system
Spindle solutions

SIMOTICS M-1PH1 main spindle motor

Overview
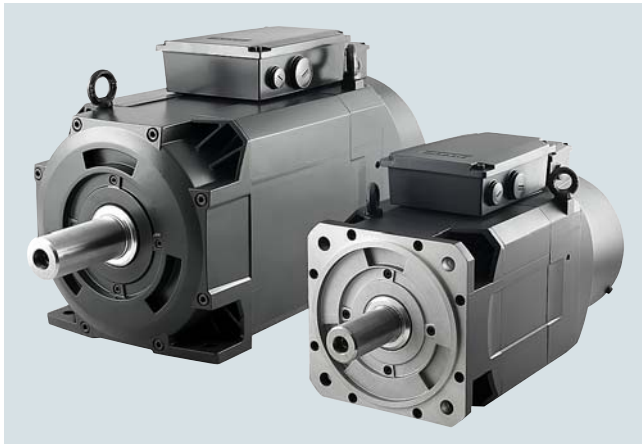
SIMOTICS M-1PH1 main spindle motors SH 132/SH 100

1PH1 main spindle motors have been especially designed for use as main drives in machine tools. These motors are available as asynchronous version with forced fan cooling. Together with the SINAMICS V70 spindle drive, a dynamic and powerful main drive system with high performance is created.

Benefits

■ High productivity
  - Short ramp up and ramp down time
  - High overload capability
  - Low moment of motor inertia
■ Better cutting performance
  - High vibration resistance (R/S)
  - Low torque ripple
■ Compact design
■ Easy commissioning together with drive
  - Easy wiring via drive bus communication
  - Easy parameter setting and monitor servo status in HMI
■ Easy service
  - Fan design optimized for easy replacement
■ High robustness
  - Optimized bearing concept for high transverse force

Function

- Robust, cost optimized design
- Shaft height: SH 100/SH 132
- Rated speed: 1000 rpm/1500 rpm
- Max. speed: up to 10000 rpm
- Rated output: 3.7 kW to 15 kW
- Rated torque 24 Nm to 105 Nm
- 2 times overload capability for high dynamic response
- Foot mounting and flange mounting available
- Degree of protection IP54
- Incremental encoder TTL 2500 S/R / Absolute encoder single-turn 20-bit
- Plain shaft or with key

S/R = Signals/Revolution

Technical specifications

Article No.	1PH1...
Product brand name	SIMOTICS
Product type designation	M-1PH1
Product designation	Main spindle motor
Type of motor	Squirrel-cage asynchronous motor
Cooling	Forced ventilation
Ambient temperature, admissible	
• Storage	-20 ... +65 °C
• Operation	-15 ... +40 °C without power derating
Relative humidity, during	
• Storage	≤ 95 %
• Operation	≤ 90 %
Installation altitude	Up to 1000 m above sea level without power derating
Maximum noise level	72 dB
Thermal class	F
Vibration severity grade	
• 1PH11..-1.F	Grade B is maintained up to 1800 rpm Grade S is maintained from 1800 rpm to 10000 rpm
• 1PH11..-1.D	Grade B is maintained up to 1800 rpm Grade R is maintained from 1800 rpm to 6000 rpm
Shock resistance	2.25 m/s² (continuous in axial direction); 10 m/s² (continuous in radial direction)
Static bearing lifetime	> 20000 h[1]
Oil seal lifetime	> 20000 h
Encoder lifetime	> 20000 h
Motor lifetime	20000 h
Degree of protection	IP54 (dust-tight and splash-proof during motor operation)
Type of construction	IM B5, IM B3, IM V1, and IM V5
Paint finish	Anthracite
Certificate of suitability	CE, EAC

[1] This lifetime is only for reference. When a motor keeps running at rated speed under rated load, replace its bearing after 20000 hours to 30000 hours of service time. Even if the time is not reached, the bearing must be replaced when unusual noise, vibration, or faults are found.

■ **Selection and ordering data**

Rated speed	Maxi-mum speed[1]	Shaft height	Rated power S1 duty	Rated torque S1 duty	SIMOTICS M-1PH1 Main spindle motors Asynchronous motors Forced ventilation NDE → DE	Rated current for S1 duty	SINAMICS V70 spindle drive		
n_{rated}	$n_{max.}$	SH	P_{rated}	M_{rated}			Rated output current for S1 duty		Frame size
						I_{rated}	I_{rated}		
rpm	rpm		kW	Nm	Article No.	A	A	Article No. 6SL3210-...	
1000	6000	100	3.7	35	**1PH1103-1 ■ D 1 ■ - ■ GA0**	12.9	12.9	5DE21-3UA0	FSC
	6000		5.5	53	**1PH1105-1 ■ D 1 ■ - ■ GA0**	18.8	19.6	5DE22-0UA0	FSC
1500	10000	100	3.7	24	**1PH1101-1 ■ F 1 ■ - ■ GA0**	10.3	10.5	5DE21-1UA0	FSB
	10000		5.5	35	**1PH1103-1 ■ F 1 ■ - ■ GA0**	16.9	19.6	5DE22-0UA0	FSC
	10000		7.5	48	**1PH1105-1 ■ F 1 ■ - ■ GA0**	19.6	19.6	5DE22-0UA0	FSC
1000	6000	132	7.5	72	**1PH1131-1 ■ D 1 ■ - ■ GA0**	26.6	29.8	5DE23-0UA0	FSD
	6000		11	105	**1PH1133-1 ■ D 1 ■ - ■ GA0**	28.3	29.8	5DE23-0UA0	FSD
1500	8000	132	11	70	**1PH1131-1 ■ F 1 ■ - ■ GA0**	28.8	29.8	5DE23-0UA0	FSD
	8000		15	96	**1PH1133-1 ■ F 1 ■ - ■ GA0**	36.7	37.6	5DE24-0UA0	FSD

Encoder type	
Incremental encoder TTL 2500 S/R	**L**
Absolute encoder, single-turn, 20 bit	**H**

Type of construction	
IM B3/IM V5, foot mounting	**0**
IM B5/IM V1, flange mounting	**2**

Shaft extension DE	**Balancing**	
Plain shaft	-	**0**
Feather key	Full-key	**1**
Feather key	Half-key	**2**

S/R = Signals/Revolution

[1] Maximum speed that must not be exceeded.

3

SINUMERIK 808D ADVANCED system
Spindle solutions

SIMOTICS M-1PH1 main spindle motor

■ **Dimensional drawings**

Mounting position

The SIMOTICS M-1PH1 main spindle motor supports flange mounting and foot mounting as shown below:

Mounting method	Standard type of construction	Rotated type of construction
Foot mounting	IM B3	IM V5
Flange mounting	IM B5	IM V1

Minimum clearance between a fan and parts/components mounted by the customer

The minimum clearance between a fan and parts/components mounted by the customer or the air discharge opening, and the minimum clearance S between the air intake/air discharge opening and adjacent components must be maintained.

Shaft height	Fan mounting	Minimum clearance between a fan and parts/ components	Minimum clearance S
SH 100	Non-drive end axial, can be rotated through 180°	30 mm	30 mm
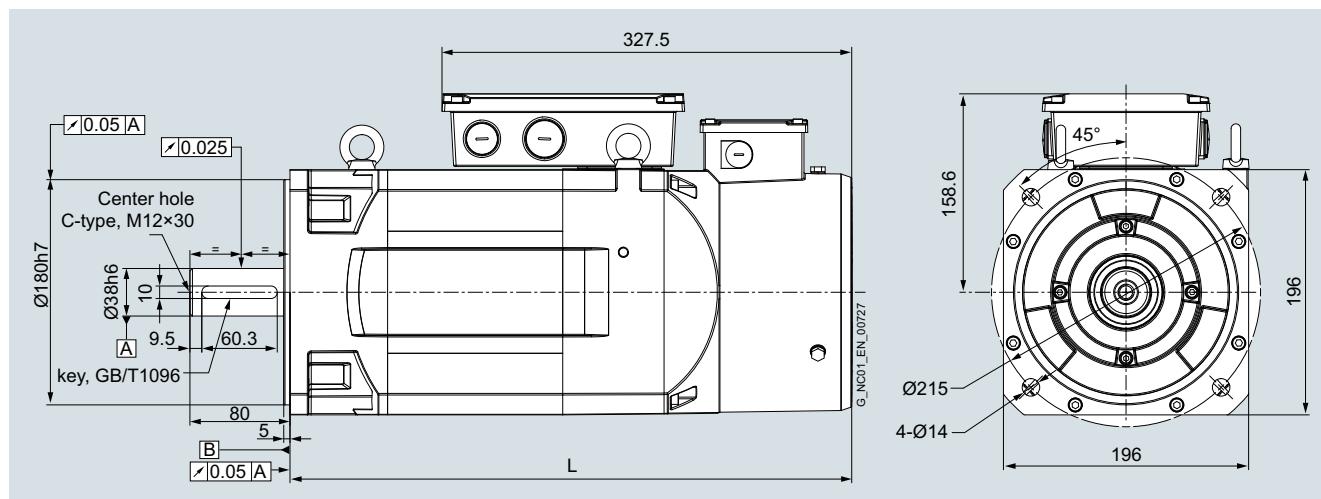
For motor		Dimensions in mm
Shaft height	Type	
		L
1PH1, type of construction IM B5/IM V1		
100	1PH1101-1.F12-.GA0	419
	1PH1103-1.F12-.GA0	449
	1PH1103-1.D12-.GA0	449
	1PH1105-1.F12-.GA0	499
	1PH1105-1.D12-.GA0	499

Dimensional drawings (continued)
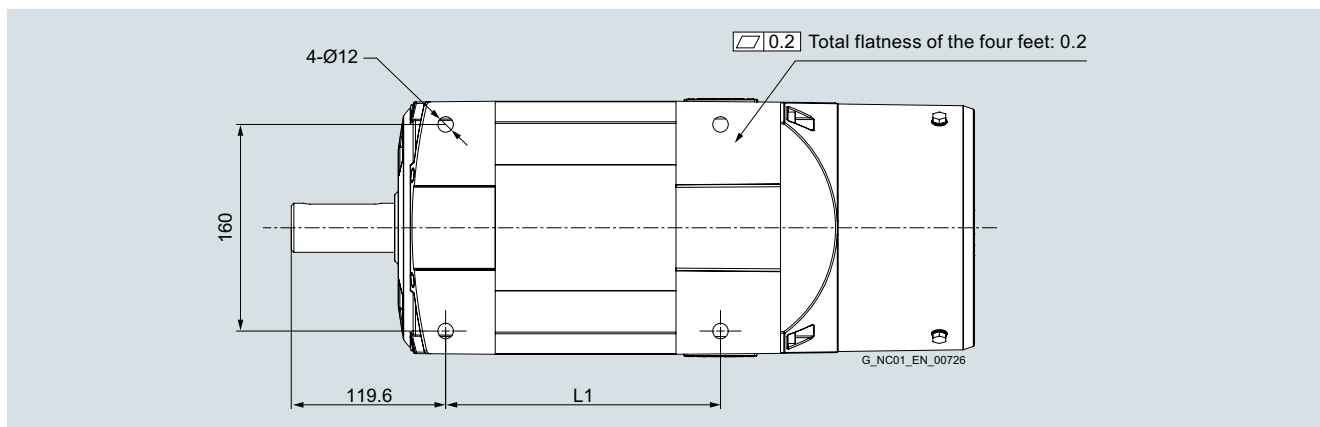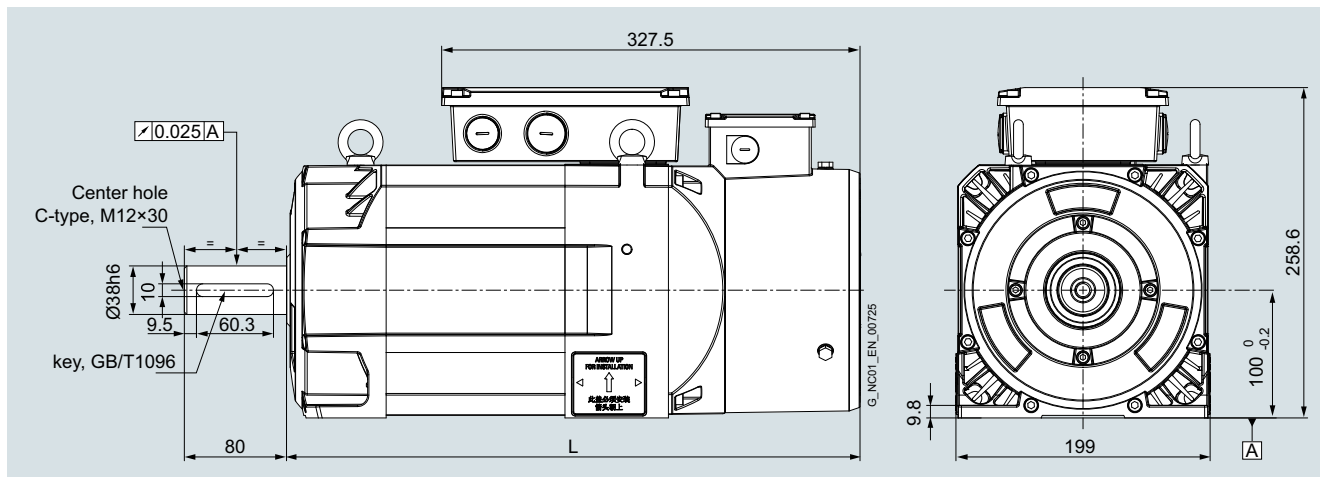
For motor		Dimensions in mm	
Shaft height	Type	L	L1
1PH1, type of construction IM B3/IM V5			
100	1PH1101-1.F10-.GA0	419	183
	1PH1103-1.F10-.GA0	449	213
	1PH1103-1.D10-.GA0	449	213
	1PH1105-1.F10-.GA0	499	263
	1PH1105-1.D10-.GA0	499	263

SINUMERIK 808D ADVANCED system
Spindle solutions

SIMOTICS M-1PH1 main spindle motor

■ **Dimensional drawings** (continued)
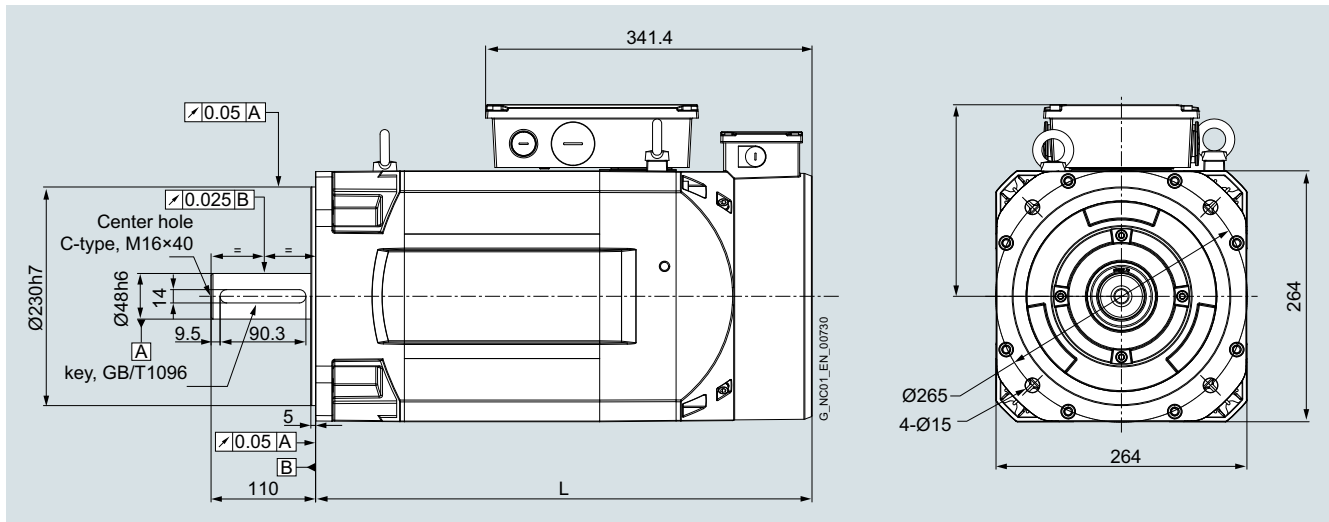
For motor		Dimensions in mm
Shaft height	Type	L
1PH1, type of construction IM B5/IM V1		
132	1PH1131-1.F12-.GA0	475
	1PH1131-1.D12-.GA0	465
	1PH1133-1.F12-.GA0	525
	1PH1133-1.D12-.GA0	525

Dimensional drawings (continued)
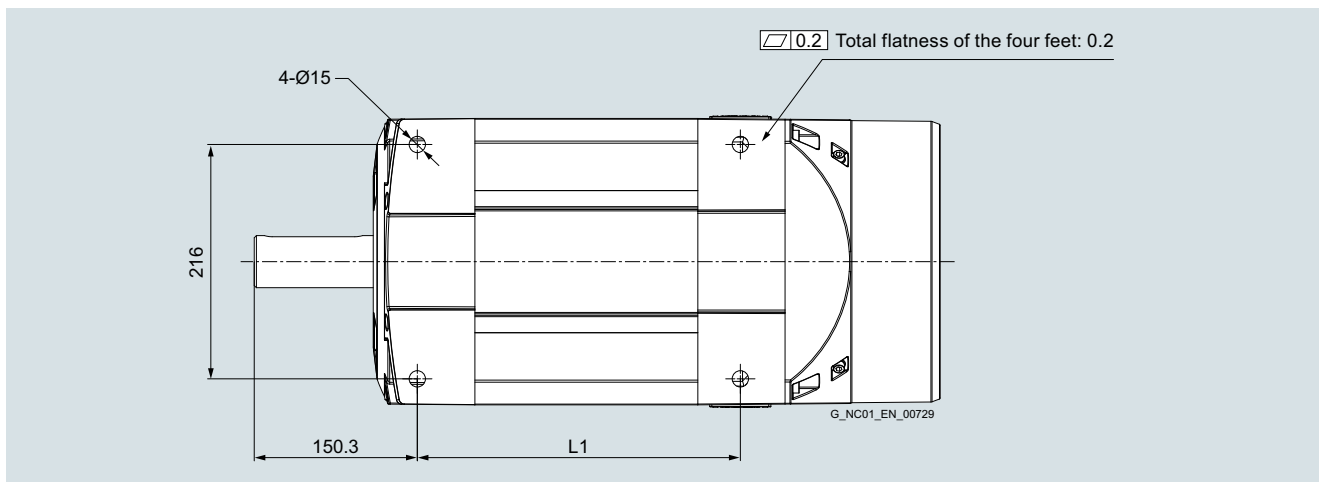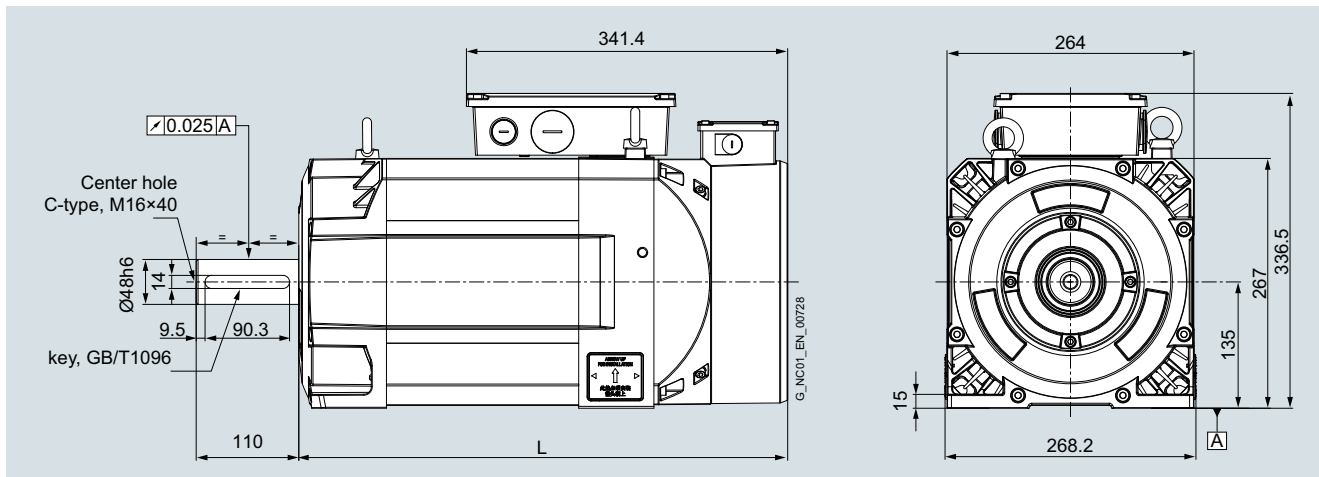
For motor		Dimensions in mm	
Shaft height	Type	L	L1
1PH1, type of construction IM B3/IM V5			
132	1PH1131-1.F10-.GA0	475	251.8
	1PH1131-1.D10-.GA0	465	241.8
	1PH1133-1.F10-.GA0	525	301.8
	1PH1133-1.D10-.GA0	525	301.8

SINUMERIK 808D ADVANCED system
MOTION-CONNECT connection systems

■ **Integration**

SINUMERIK 808D ADVANCED T/M	Article No. Pre-assembled cable	
X1		Power supply 24 V DC
X126	**6FC5548-0BA20-….** 0.25 m/0.35 m/1 m/3 m/5 m/7 m/10 m/15 m/20 m (0.82 ft/1.1 ft/3.3 ft/9.8 ft/16 ft/23 ft/32 ft/49 ft/64 ft)	SINAMICS V70
X54	**6FC5548-0BA05-….** 3 m/5 m/7 m/10 m/15 m/20 m (9.8 ft/16 ft/23 ft/32 ft/49 ft/64 ft)	Spindle drive
X60	**6FX8002-2CD01-….** 5 m/7 m/10 m (16 ft/23 ft/32 ft)	Incremental encoder for spindle (TTL) RS422 6FX2001-2...
X10	**6FX8002-2BB01-….** ≤ 25 m (82 ft) for handwheel signals	Handwheels (max. 2)
X30	USB cable 0.5 m (1.6 ft) (included in scope of delivery of MCP)	SINUMERIK 808D MCP
X100/X101/X102		24 digital inputs 24 V DC
X200/X201		16 digital outputs 24 V DC
X301	**6EP5306-5BG00** ≤ 6 m (20 ft)	24 DI / 16 DO, 24 V DC Terminal strip converter
X302	**6EP5306-5BG00** ≤ 6 m (20 ft)	24 DI / 16 DO, 24 V DC Terminal strip converter
X21	Wire (0.14 ... 1.5 mm^2)	NC Ready, CW, CCW, 3 fast inputs (e.g. BERO signals), 1 fast output 24 V DC

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Connection overview of SINUMERIK 808D ADVANCED T/M

■—	Connector with pin contacts
⟩—	Connector with socket contacts
○—	Exposed core ends
– – – –	Cable is not included in the scope of delivery. It must be provided by the customer.

SINUMERIK 808D ADVANCED system
MOTION-CONNECT connection systems

MOTION-CONNECT cables for SINUMERIK 808D ADVANCED

■ Technical specifications

Article No.	6FC5548-0BA20-....	6FC5548-0BA05-....
Product name	Drive bus cable PPU 15x.3/PPU 16x.3 – SINAMICS V70 SINAMICS V70 – SINAMICS V70	Setpoint cable PPU 15x.3/PPU 16x.3 – spindle drive
No. of cores	2	4
Certificate of suitability • cURus or UR/CSA[1] • RoHS conformity	UL1581 Yes	UL2576 Yes
Operating voltage	100 V	30 V
Test voltage, rms	3600 V	500 V
Operating temperature on the surface • Fixed installation • Flexible installation	-40 … +80 °C -40 … +60 °C	-20 … +80 °C 0 … 60 °C
Smallest bending radius • Fixed installation • Flexible installation	75 mm 150 mm	60 mm 120 mm
Insulation material, incl. jacket	PVC	PVC
Oil resistance	Limited mineral oil and fats resistance	70 °C × 4 h
Outer jacket	PVC Gray	PVC Gray
Flame-retardant	IEC 60332–3–24	VW-1

Article No.	6FX8002-2CD01-....	6FX8002-2BB01-....
Product name	Signal cable PPU 15x.3/PPU 16x.3 – Incremental encoder for spindle (TTL)	Signal cable PPU 15x.3/PPU 16x.3 – handwheel
Certificate of suitability • cURus or UR/CSA[1] • RoHS conformity	UL758-CSA-C22.2-N.210.2-M90 Yes	UL758-CSA-C22.2-N.210.2-M90 Yes
Rated voltage	30 V	30 V
Test voltage, rms	500 V	500 V
Operating temperature on the surface • Fixed installation • Flexible installation	-50 … +80 °C -20 … +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	35 mm 70 mm	35 mm 70 mm
Torsional stress	Absolute 30°/m	Absolute 30°/m
Bending	10 million	10 million
Traversing velocity	300 m/min	300 m/min
Acceleration	5 m/s^2	5 m/s^2
Insulation material, incl. Jacket	CFC/silicone-free IEC 60754-1/DIN VDE 0472-815	CFC/silicone-free IEC 60754-1/DIN VDE 0472-815
Oil resistance	EN 60811-2-1	EN 60811-2-1
Outer jacket	PVC DESINA color green RAL 6018	PVC DESINA color green RAL 6018
Flame-retardant	EN 60332-1-1 to 1-3	EN 60332-1-1 to 1-3

For general information about MOTION-CONNECT please refer to Introduction.

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

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SINUMERIK 808D ADVANCED system
MOTION-CONNECT connection systems

MOTION-CONNECT cables for SINUMERIK 808D ADVANCED

Selection and ordering data

Description	Article No.
Pre-assembled bus cable PPU PPU 15x.3/PPU 16x.3 – SINAMICS V70 and SINAMICS V70 – SINAMICS V70 Length	
• 0.25 m	6FC5548-0BA20-1AA2
• 0.35 m	6FC5548-0BA20-1AA3
• 1 m	6FC5548-0BA20-1AB0
• 3 m	6FC5548-0BA20-1AD0
• 5 m	6FC5548-0BA20-1AF0
• 7 m	6FC5548-0BA20-1AH0
• 10 m	6FC5548-0BA20-1BA0
• 15 m	6FC5548-0BA20-1BF0
• 20 m	6FC5548-0BA20-1CA0
Pre-assembled setpoint cable PPU PPU 15x.3/PPU 16x.3 – spindle drive Length	
• 3 m	6FC5548-0BA05-1AD0
• 5 m	6FC5548-0BA05-1AF0
• 7 m	6FC5548-0BA05-1AH0
• 10 m	6FC5548-0BA05-1BA0
• 15 m	6FC5548-0BA05-1BF0
• 20 m	6FC5548-0BA05-1CA0
Pre-assembled signal cable PPU PPU 15x.3/PPU 16x.3 – incremental encoder for spindle (TTL) Length	
• 5 m	6FX8002-2CD01-1AF0
• 7 m	6FX8002-2CD01-1AH0
• 10 m	6FX8002-2CD01-1BA0
Pre-assembled signal cable PPU PPU 15x.3/PPU 16x.3 – handwheel Length	
• 1 m	6FX8002-2BB01-1AB0
• 5 m	6FX8002-2BB01-1AF0
• 7 m	6FX8002-2BB01-1AH0
• 10 m	6FX8002-2BB01-1BA0

■ Integration

SINAMICS V70 servo drive	Article No. **Pre-assembled cable**	
X10	**6FC5548-0BA20-....** 3/5/7/10/15/20 m (9.8/16/23/32/49/64 ft)	SINUMERIK 808D ADVANCED PPU 15x.3/ PPU 16x.3 (setpoint)
X11	**6FC5548-0BA20-....** 0.25/0.35/1 m (0.82/1.1/3 ft)	SINAMICS V70 X10
X9	**6FX3002-2CT12-....** 3/5/7/10/15/20 m (9.8/16/32/49/64 ft)	TTL encoder in SIMOTICS S-1FL6 feed motor
U / V / W	**6FX3002-5CL02-....** 3/5/7/10/15/20 m (9.8/16/32/49/64 ft)	SIMOTICS S-1FL6 feed motor
X7	**6FX3002-5BL03-....** 3/5/7/10/15/20 m (9.8/16/32/49/64 ft)	Brake in SIMOTICS S-1FL6 feed motor
X6	- - - - - - - - -	24 V DC power supply
L1 / L2 / L3	- - - - - - - - -	380 V 3 AC main supply

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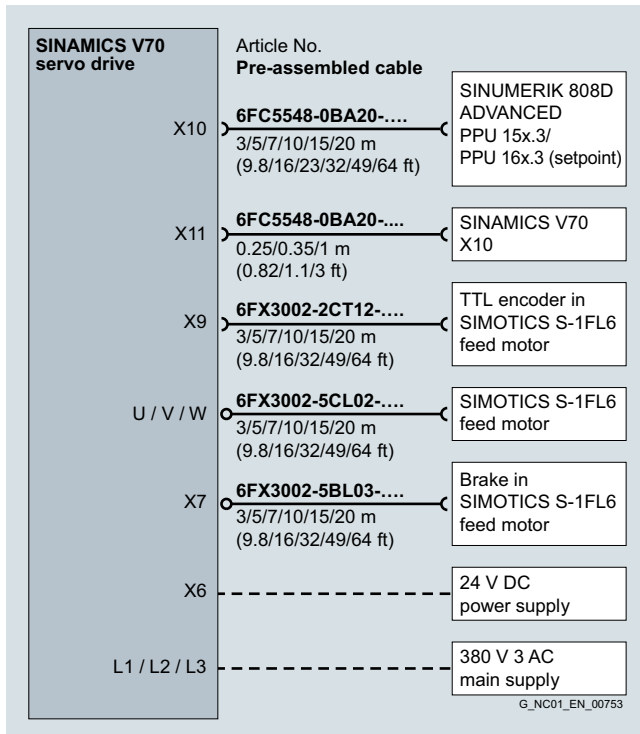
Connection overview of SINAMICS V70 servo drive

■————	Connector with pin contacts
>————	Connector with socket contacts
o————	Exposed core ends
– – – –	Cable is not included in the scope of delivery. It must be provided by the customer.

■ Selection and ordering data

Description	Article No.
Pre-assembled signal cable SINAMICS V70 – SIMOTICS S-1FL6 feed motor with absolute encoder Length	
• 3 m	**6FX3002-2DB10-1AD0**
• 5 m	**6FX3002-2DB10-1AF0**
• 7 m	**6FX3002-2DB10-1AH0**
• 10 m	**6FX3002-2DB10-1BA0**
• 15 m	**6FX3002-2DB10-1BF0**
• 20 m	**6FX3002-2DB10-1CA0**
Pre-assembled signal cable SINAMICS V70 – SIMOTICS S-1FL6 feed motor with incremental encoder Length	
• 3 m	**6FX3002-2CT12-1AD0**
• 5 m	**6FX3002-2CT12-1AF0**
• 7 m	**6FX3002-2CT12-1AH0**
• 10 m	**6FX3002-2CT12-1BA0**
• 15 m	**6FX3002-2CT12-1BF0**
• 20 m	**6FX3002-2CT12-1CA0**
Pre-assembled power cable 4 × 1.5 mm² SINAMICS V70, frame size FSA – SIMOTICS S-1FL6 feed motor Length	
• 3 m	**6FX3002-5CL02-1AD0**
• 5 m	**6FX3002-5CL02-1AF0**
• 7 m	**6FX3002-5CL02-1AH0**
• 10 m	**6FX3002-5CL02-1BA0**
• 15 m	**6FX3002-5CL02-1BF0**
• 20 m	**6FX3002-5CL02-1CA0**
Pre-assembled power cable 4 × 2.5 mm² SINAMICS V70, frame size FSB/FSC – SIMOTICS S-1FL6 feed motor Length	
• 3 m	**6FX3002-5CL12-1AD0**
• 5 m	**6FX3002-5CL12-1AF0**
• 7 m	**6FX3002-5CL12-1AH0**
• 10 m	**6FX3002-5CL12-1BA0**
• 15 m	**6FX3002-5CL12-1BF0**
• 20 m	**6FX3002-5CL12-1CA0**
Pre-assembled brake cable SINAMICS V70 – SIMOTICS S-1FL6 feed motor with brake Length	
• 3 m	**6FX3002-5BL03-1AD0**
• 5 m	**6FX3002-5BL03-1AF0**
• 7 m	**6FX3002-5BL03-1AH0**
• 10 m	**6FX3002-5BL03-1BA0**
• 15 m	**6FX3002-5BL03-1BF0**
• 20 m	**6FX3002-5BL03-1CA0**

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SINUMERIK 808D ADVANCED system
MOTION-CONNECT connection systems

MOTION-CONNECT cables for SINAMICS V70 servo drive

■ **Technical specifications**

Article No.	6FX3002-2DB10-.... 6FX3002-2CT12-….	6FX3002-5CL02-.... 6FX3002-5CL12-….	6FX3002-5BL03-....
Product name	Signal cable SINAMICS V70 – Encoder in SIMOTICS S-1FL6 feed motor	Power cable SINAMICS V70 – SIMOTICS S-1FL6 feed motor	Signal cable SINAMICS V70 – brake in SIMOTICS S-1FL6 feed motor
No. of cores	10	4	2
Degree of protection (when closed and connected)	IP65	IP65	IP65
Certificate of suitability • RoHS • CE	Yes No	Yes Yes	Yes No
Rated voltage U_0/U	30 V/30 V	600 V/1000 V	30 V/30 V
Test voltage, rms	500 V	4 kV	500 V
Operating temperature on the surface • Fixed installation	-15 … +80 °C	-15 … +80 °C	-15 … +80 °C
Tensile stress, max. • Fixed installation • Flexible installation	50 N/mm^2 20 N/mm^2	50 N/mm^2 20 N/mm^2	50 N/mm^2 20 N/mm^2
Smallest bending radius • Fixed installation • Flexible installation	6 × diameter 155 mm	6 × diameter 155 mm	6 × diameter 155 mm
Torsional stress	Absolute 30°/m	Absolute 30°/m	Absolute 30°/m
Bending	1000000	1000000	1000000
Insulation material, incl. jacket	PVC	PVC	PVC
Oil resistance	EN 60811-2-1	EN 60811-2-1	EN 60811-2-1
Outer jacket	PVC	PVC	PVC
Flame-retardant	FT1	FT1	FT1

For general information about MOTION-CONNECT please refer to Introduction.

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■ **Integration**

SINAMICS V70 spindle drive	Article No. **Pre-assembled cables**	
X10	**6FC5548-0BA20-....** 3/5/7/10/15/20 m (9.8/16/23/32/49/64 ft)	SINUMERIK 808D ADVANCED PPU 15x.3/ PPU 16x.3 (setpoint)
X11	**6FC5548-0BA20-....** 0.25/0.35/1 m (0.82/1.1/3 ft)	SINAMICS V70 X10
X9	**6FX3002-2CT30-....** 3/5/7/10/15/20 m (9.8/16/32/49/64 ft)	TTL encoder in SIMOTICS M-1PH1 motor
U / V / W	**6FX5008-1BB21-1DA0** 30 m (98 ft)	SIMOTICS M-1PH1 motor
X6		24 V DC power supply
L1 / L2 / L3		380 V 3 AC main supply

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Connection overview for SINAMICS V70 spindle drive

■—	Connector with pin contacts
>—	Connector with socket contacts
o—	Exposed core ends
– – – –	Cable is not included in the scope of delivery. It must be provided by the customer.

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SINUMERIK 808D ADVANCED system
MOTION-CONNECT connection systems

MOTION-CONNECT cables for SINAMICS V70 spindle drive

■ Technical specifications

Article No.	6FX5008-1BB21-1DA0 6FX5008-1BB31-1DA0 6FX5008-1BB51-1DA0 6FX5008-1BB61-1DA0	6FX3002-2CT30-.... 6FX3002-2DB30-....
Product name	MOTION-CONNECT 500 power cable	MOTION-CONNECT 300 signal cable
No. of cores	4	10
Degree of protection (motor side only)	–	IP20
Certificate of suitability • RoHS • CE	 Yes Yes	 Yes No
Rated voltage	1000 V	30 V
Operating temperature on the surface	-20 … +80 °C	-30 … +90 °C
Smallest bending radius • Fixed installation • Flexible installation	 5 × outer diameter 180 mm, 210 mm	 5 × outer diameter 20 × outer diameter
Bending	100000	100000
Shielding	Yes (coverage ≥ 80 %)	Yes
Oil resistance	DIN VDE 472-803 Part B	EN 60811-2-1
Outer jacket	PVC	PVC
Flame-retardant	IEC 332.1	EN 60332-1-1 to 1-3

For general information about MOTION-CONNECT please refer to Introduction.

■ Selection and ordering data

Description	Article No.
MOTION-CONNECT 500 power cable 4 × 2.5 mm², sold by the meter, for SIMOTICS M-1PH1 motor 3.7 kW Length • 30 m	 **6FX5008-1BB21-1DA0**
MOTION-CONNECT 500 power cable 4 × 4 mm², sold by the meter, for SIMOTICS M-1PH1 motor 5.5 kW to 7.5 kW Length • 30 m	 **6FX5008-1BB31-1DA0**
MOTION-CONNECT 500 power cable 4 × 10 mm², sold by the meter, for SIMOTICS M-1PH1131-1.F... motor Length • 30 m	 **6FX5008-1BB51-1DA0**

Description	Article No.
MOTION-CONNECT 500 power cable 4 × 16 mm², sold by the meter, for SIMOTICS M-1PH1133-1.D... motor and for SIMOTICS M-1PH1133-1.F... motor Length • 30 m	 **6FX5008-1BB61-1DA0**
MOTION-CONNECT 300 pre-assembled signal cable SINAMICS V70 spindle drive – SIMOTICS M-1PH1 motor with incremental encoder Length • 3 m • 5 m • 7 m • 10 m • 15 m • 20 m	 **6FX3002-2CT30-1AD0** **6FX3002-2CT30-1AF0** **6FX3002-2CT30-1AH0** **6FX3002-2CT30-1BA0** **6FX3002-2CT30-1BF0** **6FX3002-2CT30-1CA0**
MOTION-CONNECT 300 pre-assembled signal cable SINAMICS V70 spindle drive – SIMOTICS M-1PH1 motor with absolute encoder Length • 3 m • 5 m • 7 m • 10 m • 15 m • 20 m	 **6FX3002-2DB30-1AD0** **6FX3002-2DB30-1AF0** **6FX3002-2DB30-1AH0** **6FX3002-2DB30-1BA0** **6FX3002-2DB30-1BF0** **6FX3002-2DB30-1CA0**

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SINUMERIK 808D ADVANCED system
Sample packages

■ Overview

The following composition of an equipment package is an example of an inclined-bed lathe with:

- 2 machining axes (X, Z)
- 1 digital spindle with direct spindle encoder
- 24 digital PLC input signals and 16 digital PLC output signals

Designation	Quantity	Article No.
SINUMERIK CNC		
SINUMERIK 808D ADVANCED T PPU 160.3 vertical, English layout	1	6FC5370-2BT03-0AA0
SINUMERIK 808D MCP vertical, with handwheel slot, English layout	1	6FC5303-0AF35-3AA0
Stabilized power supply, SITOP PSU200M 24 V, 5 A	1	6EP1333-3BA10
RS422 (TTL) incremental encoder, 1024 S/R	1	6FX2001-2EB02
Spring disk coupling, shaft diameter 6 mm/6 mm	1	6FX2001-7KF10
Clamp strap for encoders with Synchro flange	3	6FX2001-7KP01
Pre-assembled bus cable PPU 160.3 – SINAMICS V70, length 5 m	1	6FC5548-0BA20-1AF0
Pre-assembled bus cable SINAMICS V70 – SINAMICS V70, length 0.25 m	2	6FC5548-0BA20-1AA2
Pre-assembled signal cable PPU 160.3 – handwheel, length 1 m	1	6FX8002-2BB01-1AB0
Pre-assembled signal cable PPU 160.3 – incremental spindle encoder (TTL), length 5 m	1	6FX8002-2CD01-1AF0
SINAMICS V70		
SINAMICS V70, I_{rated} 3.0 A	1	6SL3210-5DE13-5UA0
SINAMICS V70, I_{rated} 5.3 A	1	6SL3210-5DE17-8UA0
SINAMICS V70 spindle[1], I_{rated} 19.6 A	1	6SL3210-5DE22-0UA0
Pre-assembled signal cable SINAMICS V70 – absolute encoder in SIMOTICS S-1FL6 feed motor, length 5 m	2	6FX3002-2DB10-1AF0
Pre-assembled power cable 4 × 1.5 mm^2 SINAMICS V70 – SIMOTICS S-1FL6 feed motor, length 5 m	1	6FX3002-5CL02-1AF0
Pre-assembled power cable 4 × 2.5 mm^2 SINAMICS V70 – SIMOTICS S-1FL6 feed motor, length 5 m	1	6FX3002-5CL12-1AF0
Pre-assembled brake cable SINAMICS V70 – brake in SIMOTICS S-1FL6 feed motor with holding brake, length 5 m	1	6FX3002-5BL03-1AF0
Pre-assembled signal cable SINAMICS V70 – incremental encoder in M-1PH1, length 5 m	1	6FX3002-2CT30-1AF0
Power cable 4 × 4 mm^2, sold by the meter, (optional)[2] SINAMICS V70 – SIMOTICS M-1PH1 main spindle motor, length 30 m	1	6FX5008-1BB31-1DA0
SIMOTICS motors		
SIMOTICS S-1FL6 feed motor, 4 Nm, 2000 rpm, absolute encoder, plain shaft, without holding brake	1	1FL6061-1AC61-2LG1
SIMOTICS S-1FL6 feed motor, 11 Nm, 2000 rpm, absolute encoder, plain shaft, with holding brake	1	1FL6066-1AC61-2LH1
SIMOTICS M-1PH1 main spindle motor, 53 Nm, 1000 rpm, incremental encoder, plain shaft	1	1PH1105-1LD10-0GA0

[1] For braking resistor selection, please refer to page 3/16.

[2] The 30 m power cables (raw cables) listed above could be selected for use with 1PH1 motors. You must assemble the power cable with connectors by yourself. You could also select the third party power cable by yourselves according to the system configuration.

SINUMERIK 808D ADVANCED system
Sample packages

Sample package for Milling with SINUMERIK 808D ADVANCED M

■ **Overview**

The following composition of an equipment package is an example of a vertical machining center with:

- 3 machining axes (X, Y, Z)
- 1 digital spindle without direct spindle encoder
- 35 digital PLC input signals and 22 digital PLC output signals

Designation	Quantity	Article No.
SINUMERIK CNC		
SINUMERIK 808D ADVANCED M PPU 161.3 horizontal, English layout	1	6FC5370-2AM03-0AA0
SINUMERIK 808D MCP, English layout	1	6FC5303-0AF35-0AA0
Electronic handwheel with front panel 120 mm × 120 mm, with setting wheel 5 V DC, RS422	1	6FC9320-5DB01
Terminal strip converter 50-pole	1	6EP5406-5AA00
Cable set, 50-pole ribbon cable, with insulation displacement connectors, 50-pole	1	6EP5306-5BG00
Stabilized power supply, SITOP PSU200M 24 V, 5 A	1	6EP1333-3BA10
Pre-assembled bus cable PPU 161.3 – SINAMICS V70, length 5 m	1	6FC5548-0BA20-1AF0
Pre-assembled bus cable SINAMICS V70 – SINAMICS V70, length 0.25 m	2	6FC5548-0BA20-1AA2
Pre-assembled bus cable SINAMICS V70 – SINAMICS V70, length 1 m	1	6FC5548-0BA20-1AB0
Pre-assembled signal cable PPU 161.3 – handwheel, length 1 m	1	6FX8002-2BB01-1AB0
Pre-assembled signal cable PPU 161.3 – incremental spindle encoder (TTL), length 7 m	1	6FX8002-2CD01-1AH0
SINAMICS V70		
SINAMICS V70, I_{rated} 4.6 A	2	6SL3210-5DE16-0UA0
SINAMICS V70, I_{rated} 7.8 A	1	6SL3210-5DE21-0UA0
SINAMICS V70 spindle[1], I_{rated} 19.6 A	1	6SL3210-5DE22-0UA0
Pre-assembled signal cable SINAMICS V70 – incremental encoder in SIMOTICS S-1FL6 feed motor, length 10 m	3	6FX3002-2CT12-1BA0
Pre-assembled power cable 4 × 2.5 mm^2 SINAMICS V70 – SIMOTICS S-1FL6 feed motor, length 10 m	3	6FX3002-5CL12-1BA0
Pre-assembled brake cable SINAMICS V70 – brake in SIMOTICS S-1FL6 feed motor, length 10 m	1	6FX3002-5BL03-1BA0
Pre-assembled signal cable SINAMICS V70 – incremental encoder in M-1PH1, length 10 m	1	6FX3002-2CT30-1BA0
Power cable 4 × 4 mm^2, sold by the meter, (optional)[2] SINAMICS V70 – SIMOTICS M-1PH1 main spindle motor, length 30 m	1	6FX5008-1BB31-1DA0
SIMOTICS motors		
SIMOTICS S-1FL6 feed motor, 8 Nm, 2000 rpm, incremental encoder, plain shaft, without holding brake	2	1FL6064-1AC61-2AG1
SIMOTICS S-1FL6 feed motor, 15 Nm, 2000 rpm, incremental encoder, plain shaft, with holding brake	1	1FL6067-1AC61-2AH1
SIMOTICS M-1PH1 main spindle motor, 48 Nm, 1500 rpm, incremental encoder, plain shaft	1	1PH1105-1LF12-0GA0

[1] For braking resistor selection, please refer to page 3/16.

[2] The 30 m power cables (raw cables) listed above could be selected for use with 1PH1 motors. You must assemble the power cable with connectors by yourself. You could also select the third party power cable by yourselves according to the system configuration.

Accessories

4

Accessories
Operator components

Electronic handwheel

■ Overview

Electronic handwheel

This handwheel generates signals which correspond to the movements of the handwheel as it is turned. The axis selected via the control can be positioned. The handwheels are equipped with a magnetic latching mechanism that supports traversing with incremental accuracy. The front panel can be removed.

■ Selection and ordering data

Description	Article No.
Electronic handwheel 5 V DC, RS422	
• With front panel 120 mm × 120 mm, with setting wheel	**6FC9320-5DB01**
• With front panel 76.2 mm × 76.2 mm, with setting wheel	**6FC9320-5DC01**
• Without front panel, with small setting wheel	**6FC9320-5DM00**
• Without front panel, without setting wheel, for installation	**6FC9320-5DF01**
Adapter set For installation in front panel with 3-hole fixing	**6FC9320-5DN00**

■ Technical specifications

Article No.	6FC9320-5DB01	6FC9320-5DC01/ 6FC9320-5DF01/ 6FC9320-5DM00
Product name	Electronic handwheel	
Rated voltage	5 V DC ± 5 %	5 V DC ± 5 %
Rated current, max.	60 mA	60 mA
Interface	RS422 (TTL)	RS422 (TTL)
Phase angle of pulse sequence A to B	90° electrical	90° electrical
Pulses	2 × 100 S/R	2 × 100 S/R
Actuating force	8 Ncm	4 Ncm
Output frequency, max.	2 kHz	2 kHz
Distance to PPU, max.	25 m	25 m
Degree of protection according to EN 60529 (IEC 60529)		
• Front	IP65	IP65
• Rear	IP50	IP50
Relative humidity		
• Storage	10 ... 95 % at 25 °C	10 ... 95 % at 25 °C
• Transport	10 ... 95 % at 25 °C	10 ... 95 % at 25 °C
• Operation	5 ... 80 % at 25 °C	5 ... 80 % at 25 °C
Ambient temperature		
• Storage	-40 ... +85 °C	-40 ... +85 °C
• Transport	-40 ... +85 °C	-40 ... +85 °C
• Operation	0 ... 70 °C	0 ... 70 °C
Weight, approx.	0.6 kg	0.4 kg
Approvals, according to	cULus	cULus

S/R = Signals/Revolution

4

■ Dimensional drawings
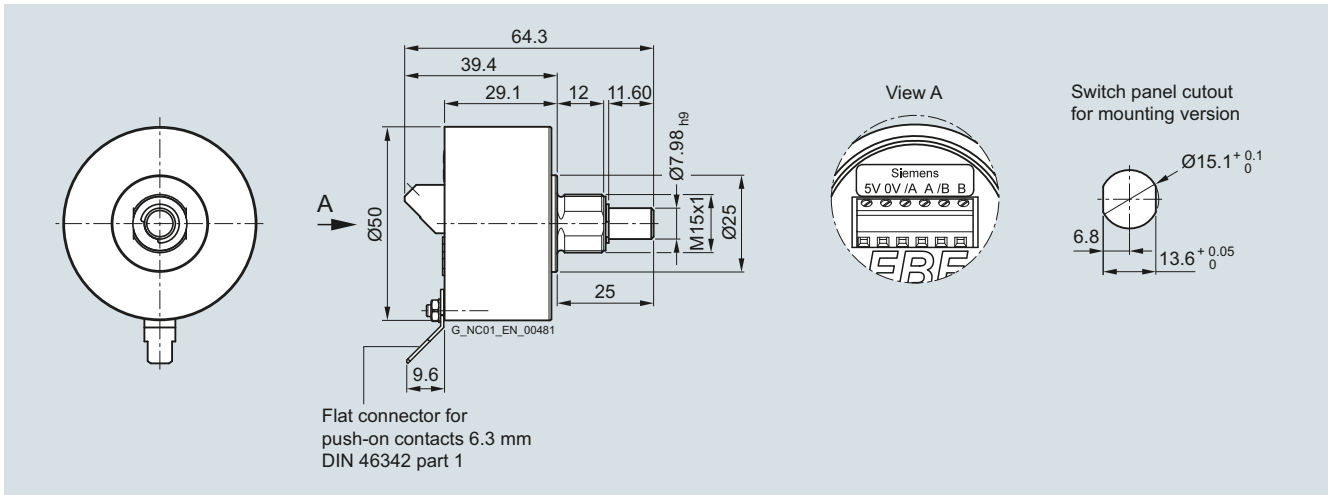
Dimensions in mm

Electronic handwheel without front panel without setting wheel
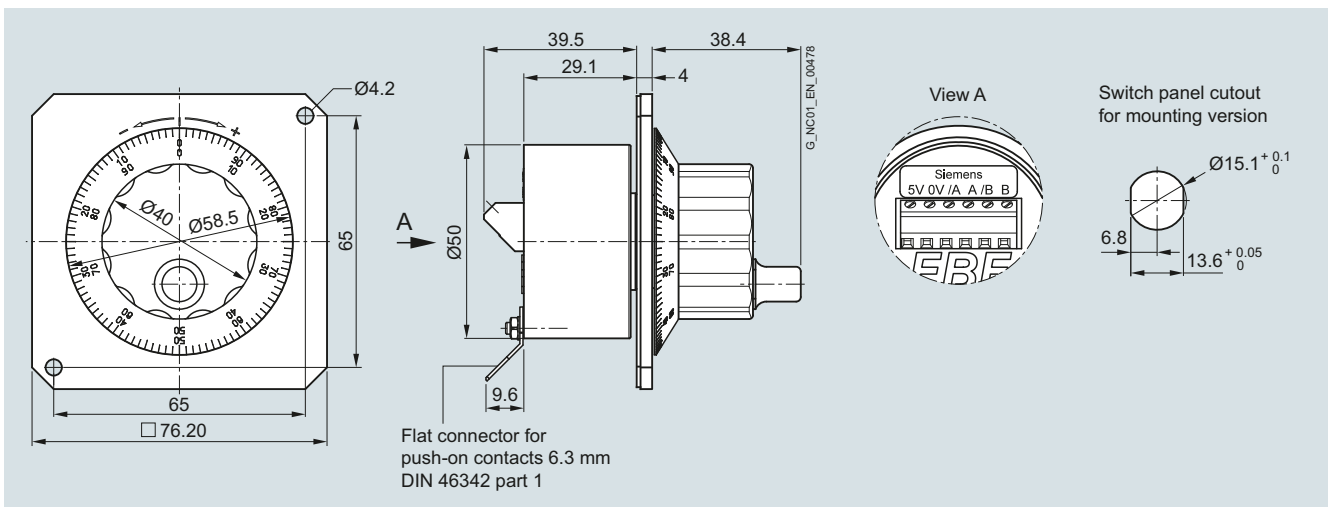
Electronic handwheel with front panel 76.2 mm × 76.2 mm

4

Accessories
Operator components

■ **Dimensional drawings** (continued)

Dimensions in mm
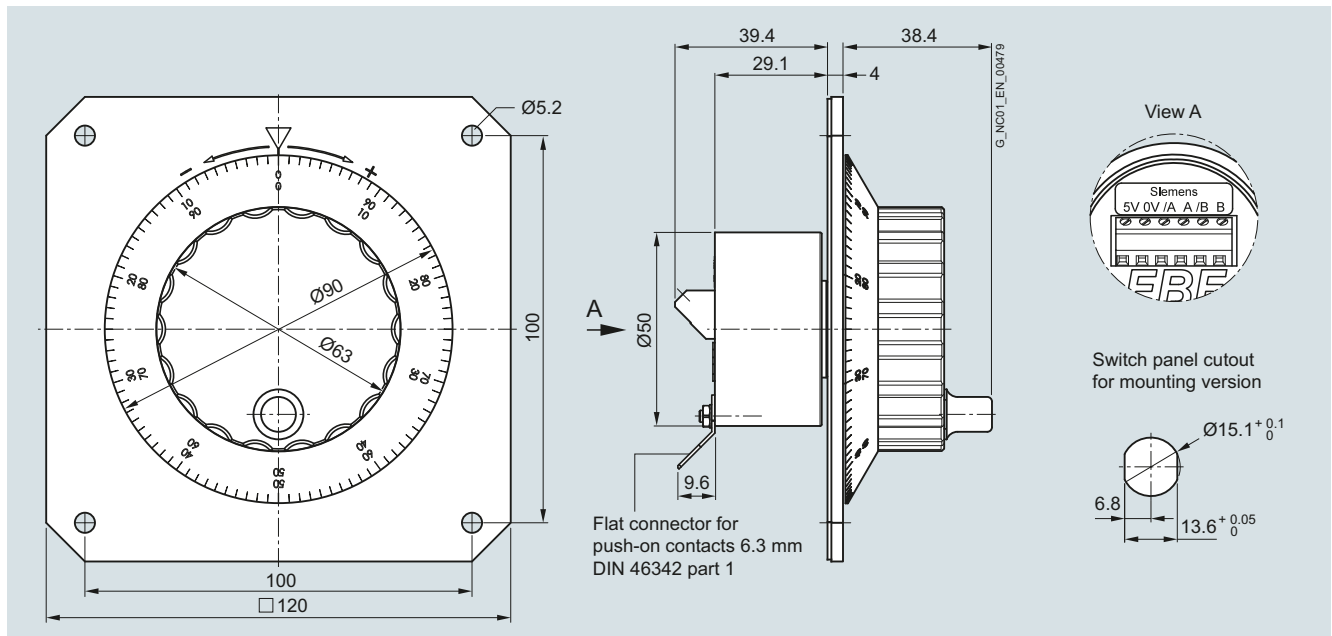
Electronic handwheel with front panel 120 mm × 120 mm
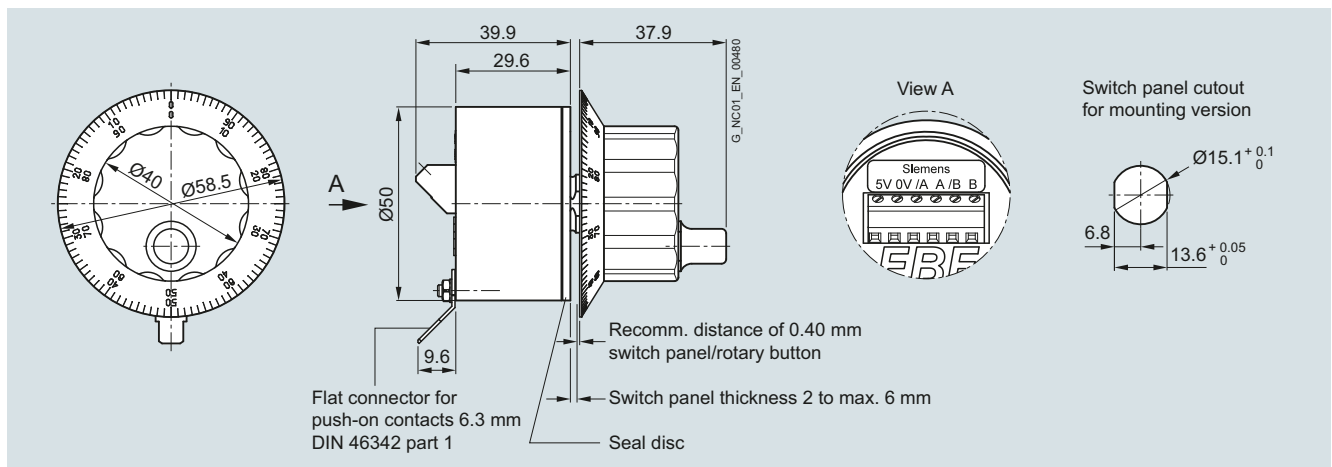
Electronic handwheel without front panel with small setting wheel

Overview
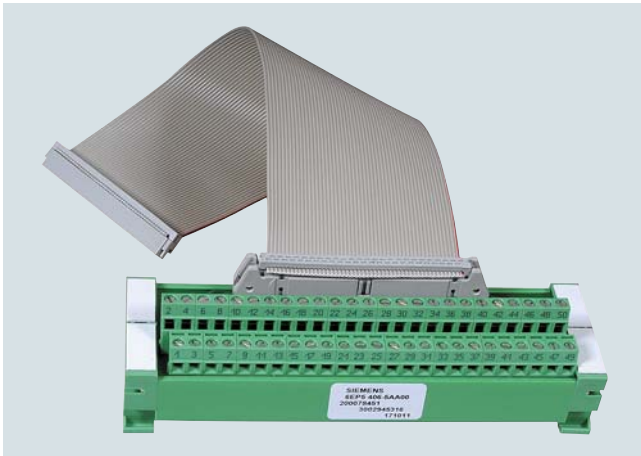
Terminal strip converter

The SINUMERIK 808D ADVANCED PPU 15x.3/PPU 16x.3 feature 24 digital PLC inputs and 16 digital PLC outputs which can be connected directly using screw-clamps on the PPU.

In addition, the PPU 15x.3/PPU 16x.3 feature 48 digital PLC inputs and 32 digital PLC outputs which can be connected via 2 terminal strip converters.

This allows the connection of process signals directly in the cabinet with significantly reduced wiring efforts.

Design

Connection of PLC process signals
- Screw-clamps
  - 24 digital inputs
  - 16 digital outputs

Connection to PPU
- Ribbon cable, 50-pole
- Insulation displacement connectors

Cabinet mounting
- Standard mounting rails

Selection and ordering data

Description	Article No.
Terminal strip converter	**6EP5406-5AA00**
50-pin	
Cable set	**6EP5306-5BG00**
Ribbon cable, 50-pin length: 6 m 8 insulation displacement connectors, 50-pin	

Dimensional drawings

Dimensions in mm

Terminal strip converter

4
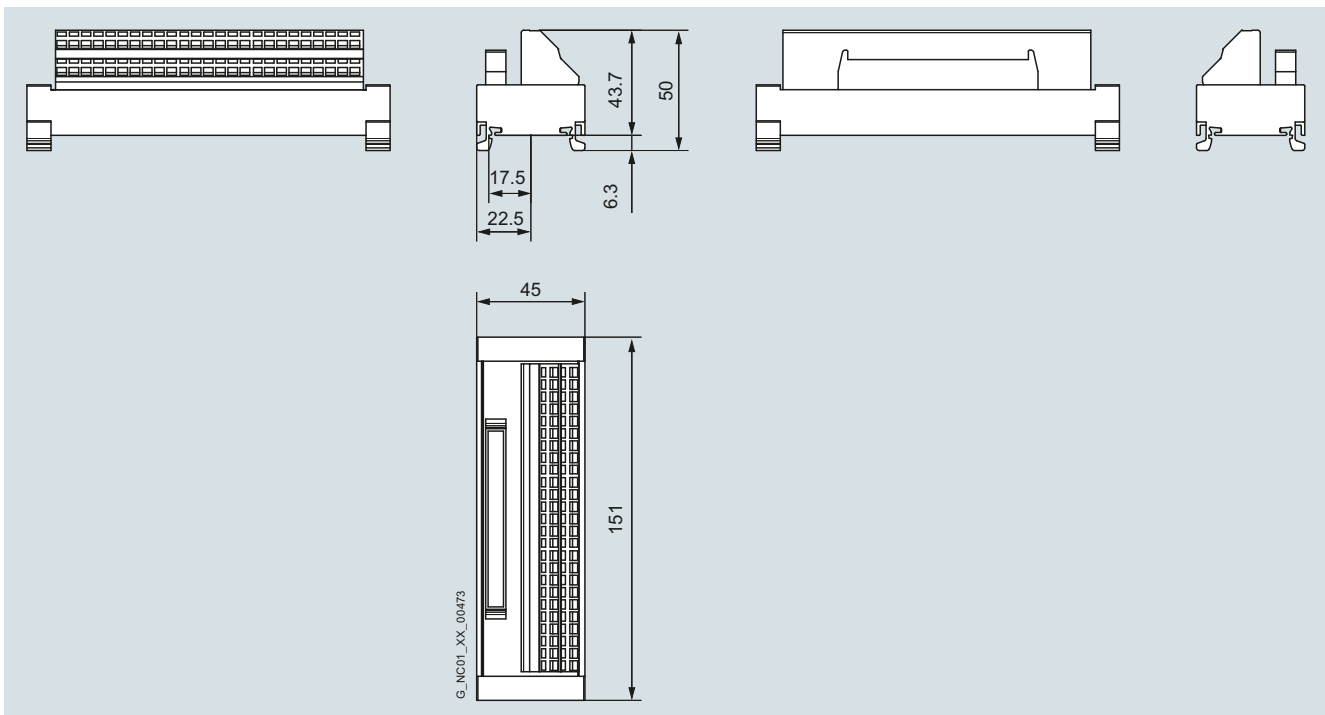
Accessories
Supplementary components

SITOP power supply

■ Overview

Stabilized power supply units

SITOP modular power supply unit

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.

SITOP smart/modular

Slimline dimensions, strong performance. SITOP smart/modular requires little space on the mounting rail and offers high performance at a reasonable price. With its tolerant overload response, even loads with a high inrush current can be smoothly switched on.
If required, 50 % extra power is made available for 5 seconds.

■ Benefits

- High efficiency
- Low space requirements 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.
Stabilized power supply SITOP modular SITOP PSU200M 24 V DC/5 A	**6EP1333-3BA10**
Input voltage: 120 V/230 V AC (85 … 264 V/176 ... 550 V AC)	
Output voltage: 24 V DC ± 3 %	
Approvals: cULus, CSA	
Stabilized power supply SITOP smart PSU100S 24 V DC/10 A	**6EP1334-2BA20**
Input voltage: 120 V/230 V AC (85 … 132 V/170 ... 264 V AC)	
Output voltage: 24 V DC ± 3 %	
Approvals: cULus, CSA	

■ More information

You can find additional information in Catalog KT 10.1 or on the Internet at:

www.siemens.com/sitop

www.siemens.com/industrymall

■ Dimensional drawings

Dimensions in mm
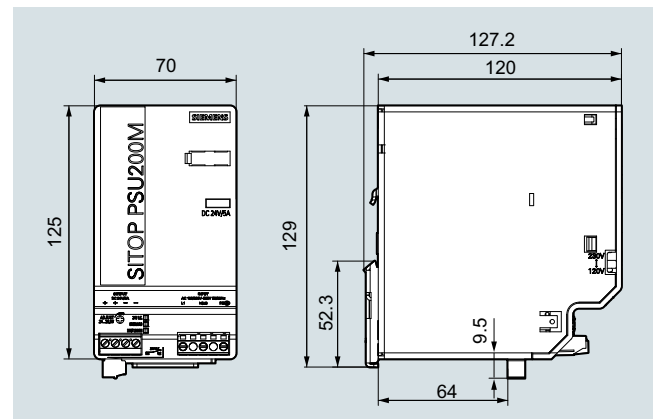
Stabilized power supply SITOP modular 5 A
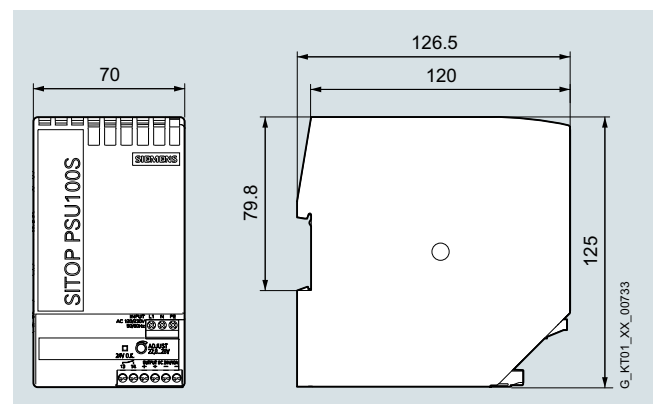
Stabilized power supply SITOP smart 10 A

Application

RS422 (TTL) incremental encoder

The optoelectronic incremental TTL encoders are tailored for the use as direct spindle encoders in conjunction with the SINUMERIK 808D CNCs.

Design

The direct incremental spindle encoder features a Synchro flange and can be attached to the machine with 3 clamp straps and a spring disk coupling.

The encoder supply voltage of 5 V DC is provided by the SINUMERIK 808D CNC.

The direct incremental spindle encoder delivers specific pulses per revolution according to your selection which are multiplied by the factor of 4 internally to reach the precision level suitable for standard lathes and milling machines.

Incremental encoders operate on the principle of optoelectronic scanning of dividing disks with the transmitted light principle. With an appropriate arrangement of the line pattern on the dividing disk connected to the shaft and the fixed aperture, the optoelectronic 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.

4

Accessories
Direct spindle encoder

Direct spindle encoder

■ Technical specifications

Article No.	6FX2001-2E...
Product name	RS422 (TTL) incremental encoder for spindle
Operating voltage U_p on encoder	5 V DC ± 10 %
Scanning frequency, max.	300 kHz
No-load current consumption, max.	150 mA
Resolution, max.	5000 S/R
Signal level	RS422 (TTL)
Outputs protected against short-circuit to 0 V	Yes
Switching time (10 ... 90 %) (for 1 m cable and recommended input circuit)	Rise/fall time $t_+/t_- \leq 50$ ns
Phase angle, signal A to B Edge spacing, min. • At 300 kHz	90° ≥ 0.45 µs
Cable length to downstream electronics, max.[1]	100 m without fault signal 50 m with fault signal
Accuracy (in angular seconds)	± 18 mech. × 3600/ PPR count z
LED failure monitoring	High-resistance driver
Maximum mechanical speed	12000 rpm
Starting torque (at 20 °C)	≤ 0.01 Nm
Shaft loading capacity • n ≤ 6000 rpm - Axial - Radial at shaft extension • n > 6000 rpm - Axial - Radial at shaft extension	40 N 60 N 10 N 20 N
Shaft diameter	6 mm
Shaft length	10 mm
Angular acceleration, max.	10^5 rad/s^2
Moment of inertia of rotor	2.9×10^{-6} kgm^2
Vibration (55 ... 2000 Hz) to EN 60068-2-6	≤ 300 m/s^2
Shock to EN 60068-2-27 • 2 ms	≤ 2000 m/s^2
Degree of protection to EN 60529 (IEC 60529) • At housing • At shaft input	IP67 IP64
Ambient temperature Operation • Flange outlet - At U_p = 5 V ± 10 %	-40 ... +100 °C
Net weight	0.3 kg
EMC	EMC Directive 2014/30/EC and regulations of EMC directives (applicable basic standards)
Certificate of suitability	CE, CSA, UL

S/R = Signals/Revolution

■ Technical specifications (continued)

Article No.	6FX2001-7KF10
Product name	Spring disk coupling
Transferable torque, max.	0.8 Nm
Shaft diameter	6 mm both ends
Center offset of shafts, max.	0.4 mm
Axial displacement	± 0.4 mm
Angular displacement of shafts, max.	3°
Torsional rigidity	150 Nm/rad
Lateral spring stiffness	6 N/mm
Moment of inertia	19 gcm^2
Speed mechanical max.	12000 rpm
Ambient temperature • Operation	-40 ... +150 °C
Net weight	16 g

■ Selection and ordering data

Description	Article No.
RS422 (TTL) incremental encoder Synchro flange 5 V DC supply voltage Radial flange outlet	
• 500 S/R	**6FX2001-2EA50**
• 1000 S/R	**6FX2001-2EB00**
• 1024 S/R	**6FX2001-2EB02**
• 1250 S/R	**6FX2001-2EB25**
• 1500 S/R	**6FX2001-2EB50**
• 2000 S/R	**6FX2001-2EC00**
• 2048 S/R	**6FX2001-2EC04**
• 2500 S/R	**6FX2001-2EC50**
• 3600 S/R	**6FX2001-2ED60**
• 5000 S/R	**6FX2001-2EF00**
Spring disk coupling For shaft diameter 6 mm/6 mm	**6FX2001-7KF10**
Clamp strap (1 unit) For encoders with Synchro flange (3 units are required)	**6FX2001-7KP01**

S/R = Signals/Revolution

4

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

■ Dimensional drawings

Dimensions in mm
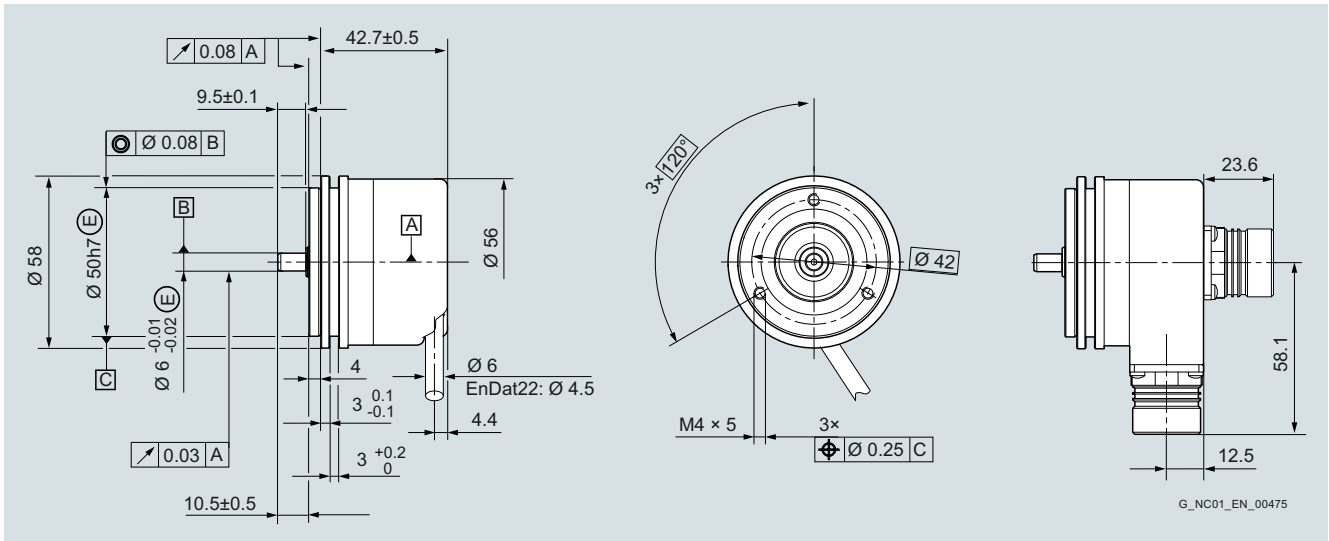
RS422 (TTL) incremental encoder
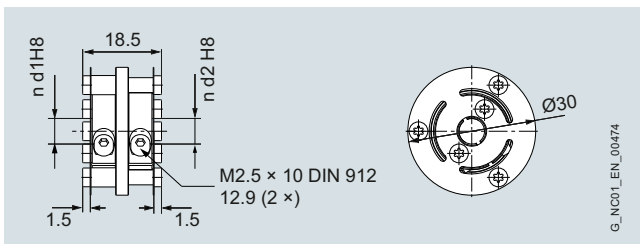
Spring disk coupling, $d1 = d2 = 6$ mm

4

Accessories

Notes

4

Services and training
Services

■ Overview

Equipment package SINUMERIK 808D ADVANCED T, PPU 161.3, horizontal with MCP - SINAMICS V70 FSA ... FSD, 400 V 3 AC – SIMOTICS S-1FL6 servomotors - SIMOTICS M-1PH1 main spindle motor

For the SINUMERIK 808D ADVANCED and the associated components[1] by Siemens DF & PD you will receive a material warranty and free on-site service of up to 36 months[2].

■ More information

For the material warranty and on-site support the same scope as for Repair Service Contracts applies. Further information can be found at:

www.siemens.com/automation/oss

[1] Not applicable to complete motor spindles.

[2] Standard warranty period: 24 months from 1st delivery of equipment package from Siemens factory.
Extended warranty period: 36 months from 1st delivery of equipment package from Siemens factory. When registration completed within standard warranty period.

■ Overview

Siemens offers training directly from the manufacturer and thus first-hand know-how. The training courses comprise Siemens' entire product and system range in the area of automation and drive technology as well as further training regarding branch and system solutions.

■ Benefits

- Training centers in more than 60 countries.
- Standardized or individual training courses.
- Teaching of basic knowledge, advanced and special knowledge.
- Training makes optimum use and adjustment of products and systems possible.

■ More information

You can find additional information on the Internet at:

https://support.automation.siemens.com/WW/view/en/24486113

5

Services and training
Training

■ Overview
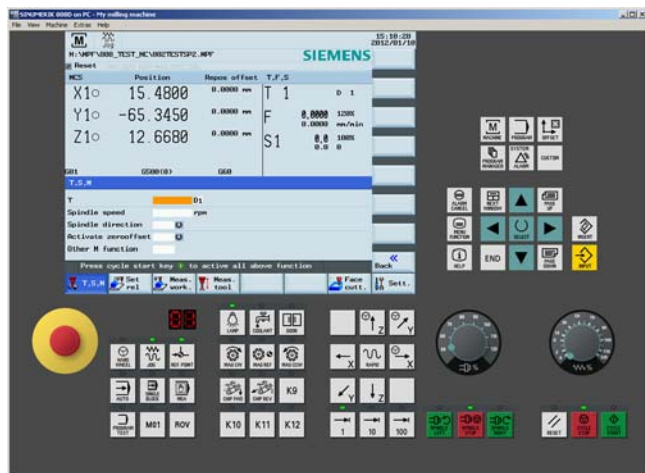
SINUMERIK 808D on PC is a PC-based CNC training/CNC programming software package. SINUMERIK 808D on PC enables completely identical CNC operation and CNC programming as on SINUMERIK 808D ADVANCED. SINUMERIK 808D on PC can be used for the following applications:

- Self-study or professional training of SINUMERIK 808D ADVANCED operation and CNC programming
- Offline CNC program creation and simulation
- Professional presentation of SINUMERIK 808D ADVANCED operation and CNC programming

■ Benefits

- User-friendly, control-identical 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 inexpensive virtual machine control panel
- Optimum training software for the most common CNC programming styles – ISO code and SINUMERIK style CNC programming
- Easy CNC program exchange via PC and CNC of machine via USB memory stick
- The full version of SINUMERIK 808D on PC can be downloaded free of charge

■ Function

Technologies and machine types

SINUMERIK 808D on PC can be used for the following most common machine types:

- Vertical machining centers or milling machines with geometry axes X, Y, Z and a main spindle
- Turning machines with geometry axes X, Z and a main spindle

If the SINUMERIK 808D ADVANCED of the target machine has been configured with the standard parameters, CNC programs created with SINUMERIK 808D on PC can be executed on the machine without any program adaptations.

Accurate simulation of real operator control on the machine

With its fully-fledged virtual machine control panel, SINUMERIK 808D on PC offers functions such as CNC Start, CNC Stop, feedrate and spindle override or direction keys and can therefore be operated just like a real machine.

Online help

Like a SINUMERIK 808D ADVANCED, SINUMERIK 808D on PC also offers a context-based online help.

Languages

The following languages are available:

- English
- Chinese Simplified
- Russian
- Portuguese

Free download

SINUMERIK 808D on PC can be downloaded free of charge at:
www.cnc4you.siemens.com

■ Integration

SINUMERIK 808D on PC can be used for:
- SINUMERIK 808D ADVANCED T
- SINUMERIK 808D ADVANCED M

Preconditions

Hardware

- PC with 1.5 GHz processor (single core)
- RAM: 1 GB
- Hard disk: 2 GB of free memory space
- DVD drive for installation from DVD
- Graphics card: Minimum resolution 640 × 480 pixels
- USB interface
- Mouse, keyboard

Software

- Operating system Windows XP SP3 32 bit Professional/ Home Edition
- Operating system Windows 7 32 bit/64 bit
- Adobe Acrobat Reader

■ Selection and ordering data

Description	Article No.
SINUMERIK 808D on PC on DVD-ROM	**6FC5870-0YC40-0YT0**

5

Teaching made easy – Comprehensive support on the way to Industrie 4.0

■ **Knowledge & technology – the keystones to success in digitalization**

Digitalization is quickly and radically changing our world. What does this mean for education?

In the world of Industrie 4.0, companies can expect a host of new opportunities and challenges. New systems are verified on the spot through simulations. Automated mass production processes can make every product on the conveyor belt a unique product.

New products are now market-ready much faster. Siemens is shaping this transformation as a technology leader in the field of automation and process lifecycle management (PLM).

These new digitalization processes are changing the know-how requirements for employees. Many educational institutions are facing the challenge of conveying Industrie 4.0 know-how as part of their teaching and training. The Siemens Automation Cooperates with Education (SCE) program is supporting educators on the way to Industrie 4.0.

■ **The SCE digitalization concept for educators**

The SCE digitalization concept presented here shows how digitalization can be implemented in educational institutions – from vocational schools to universities.

Digitalization (or Industrie 4.0) know-how is now introduced through CAx and cloud technologies. It is founded on the basics of automation, such as digital technologies, PLC and information technologies, and on advanced automation and industrial communication technologies.

The level of digitalization knowledge can be weighted, depending on the vocational field or branch of study – e.g. mechanical engineering, automation engineering or computer science.

	SIMULATION	AUTOMATION	CLOUD
CAx and cloud technologies	**Computer-assisted technologies (CAx)** Virtual commissioning using simulation models		**Cloud technologies** Connection and data analysis with smart data, manufacturing execution system (MES) and enterprise resource planning (ERP)
Automation and industrial communication technologies	**Industrial automation** e.g. distributed IO, HMI, RFID, IO-Link, drive systems, safety technologies		**Industrial IT technologies** e.g. Industrial Ethernet, interlace with software of third-party providers (OPC UA), security, communication networks
Basics of automation technologies	**Digital technologies** Boolean functions	**PLC technologies** PLC programming according to IEC 61131	**IT technologies** Ethernet and high-level programming languages, e.g. Python, Node-RED, C/C++, Linux

5

Services and training

Siemens Automation Cooperates with Education (SCE)

Teaching made easy – Comprehensive support on the way to Industrie 4.0

The SCE digitalization concept for educators (continued)

As part of their project work, students at Vocational School 2 in Wolfsburg, Germany, have implemented the three levels of the SCE Industrie 4.0 concept. A virtual twin created with the Siemens NX Mechatronics Designer (MCD) CAD software was used for the design and virtual commissioning. This enables fast and efficient assembly of the real automation system, e.g. with SIMATIC S7-1500/ET 200SP/RFID, for use in classes. Production data, such as the number of bottles filled, production date and system parameters, are uploaded to a cloud using SIMATIC IOT2000.

siemens.com/iot2020

siemens.com/nx

The SCE offers

Learning and training documents

More than 100 didactically prepared learning and training documents are available through SCE and incorporate the digitalization concept. They are designed for use in classes, but can also be customized or used for individual study. These documents are available for free download, most of them in 7 languages.

siemens.com/sce/documents

Educator courses

Excellent teaching content is needed to introduce students to digitalization. For this purpose, SCE holds educator courses in certain regions. Based on our learning and training documents and through practical exercises, educators acquire the latest Industrie 4.0 know-how.

siemens.com/sce/courses

Trainer packages

The 90 SCE trainer packages help educators teaching and implementing the SCE digitalization concept. Trainer packages comprise specially compiled, genuine Siemens hardware and software products. The trainer packages are based on the learning and training documents and are offered to schools, colleges and universities at special terms.

siemens.com/sce/tp

Support for your projects / textbooks

We support you on selected projects with advice and assistance from SCE contact partners.

As a special service, we support textbook authors. We maintain a list of textbooks on the SCE website.

siemens.com/sce/contact

siemens.com/sce/books

5

Partnerships for proliferation of Industrie 4.0 in education

Partnership with WorldSkills

As a technology powerhouse, we support vocational training of students around the world. Since 2010, we have partnered with WorldSkills as a Global Industry Partner in order to amplify this cause.

WorldSkills is an international organization whose mission is to raise the profile and recognition of skilled people, and show how important vocational skills are in achieving economic growth and personal success. Every two years, WorldSkills hosts the world championships of skills.

Siemens provides the competitors with automation products, such as SIMATIC S7-1500 and LOGO!, for the disciplines: industrial control, electrical installations, Polymechanics/Automation and manufacturing technology.

The next international skill competitions are scheduled for Kazan/Russia, in 2019 and Shanghai/China, in 2021. Additionally, we support selected continental and regional competitions.

siemens.com/worldskills

Partnerships with educators

We provide support to educators and educational organizations in the form of one-on-one advice through SCE contact partners and Siemens experts as well as long-term cooperation.

siemens.com/sce/contact

Partnerships with producers of learning systems

For practical training in classrooms and labs, numerous producers of learning systems offer a wide range of complete didactic solutions based on SCE trainer packages.

siemens.com/sce/partner

Information portal

To facilitate your teaching assignment and/or for selfstudy, we offer educators and students a comprehensive SCE information portal. At this portal you have quick access to all SCE offers, e.g. learning and training documents including projects, Getting Started information, videos, manuals, trial software and newsletters.

siemens.com/sce

SIEMENS

Global Industry
Partner of
WorldSkills
International

world skills

5

Services and training
Documentation

Specific documentation for SINUMERIK 808D ADVANCED

■ Overview

Comprehensive documentation is available for the SINUMERIK 808D ADVANCED CNC controls, including the SINAMICS V70 drive system. This documentation includes Operator's Guides, Programming Guides or Configuration Guides, as well as Installation Guides.

Information is available in the following formats:

- Paper version, printed copy

https://support.industry.siemens.com/cs/ww/en/view/108464614

- PDF file available for download on the Internet at:

www.siemens.com/automation/support

You will find further information on the Internet at:

www.siemens.com/motioncontrol/docu

■ Selection and ordering data

Description	Article No.
Specific documentation for SINUMERIK 808D ADVANCED for machine tool manufacturers	
SINUMERIK 808D ADVANCED Commissioning Manual	
• English	**6FC5397-4EP10-0BA6**
• Chinese Simplified	**6FC5397-4EP10-0RA6**
SINUMERIK 808D ADVANCED Function Manual	
• English	**6FC5397-7EP40-0BA3**
• Chinese Simplified	**6FC5397-7EP40-0RA3**
SINUMERIK 808D ADVANCED Parameter Manual	
• English	**6FC5397-8EP40-0BA3**
• Chinese Simplified	**6FC5397-8EP40-0RA3**
Specific documentation for SINUMERIK 808D ADVANCED for users	
SINUMERIK 808D ADVANCED Diagnostics Manual	
• English	**6FC5398-6DP10-0BA5**
• Chinese Simplified	**6FC5398-6DP10-0RA5**
SINUMERIK 808D ADVANCED T Programming and Operating Manual	
• English	**6FC5398-5DP10-0BA6**
• Chinese Simplified	**6FC5398-5DP10-0RA6**
SINUMERIK 808D ADVANCED M Programming and Operating Manual	
• English	**6FC5398-4DP10-0BA6**
• Chinese Simplified	**6FC5398-4DP10-0RA6**
SINUMERIK 808D ADVANCED Manual Machine plus (Turning) Programming and Operating Manual	
• English	**6FC5398-3DP10-0BA4**
• Chinese Simplified	**6FC5398-3DP10-0RA4**
SINUMERIK 808D ADVANCED Programming and Operating Manual ISO dialects (Turning and Milling)	
• English	**6FC5398-0DP40-0BA3**
• Chinese Simplified	**6FC5398-0DP40-0RA3**

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Appendix

Appendix
Certificates of suitability

■ Overview

Many of the products in this Catalog fulfill requirements, e.g. for UL, CSA or FM and are labeled with the corresponding approval designation.

All of the certificates of suitability, approvals, certificates, declarations of conformity, test certificates, e.g. CE, UL, Safety Integrated etc. have been performed with the associated system components as they are described in the 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 used for their intended purpose.

In other cases, the vendor of these products is responsible for arranging for the issue of new certificates.

Test code	Tested by	Device series/ Component	Test standard	Product category/ File-No.
UL: Underwriters Laboratories **Independent public testing body in North America**				
	UL according to UL standard	SINUMERIK	Standard UL 508, CSA C22.2 No. 142	NRAQ/7.E164110 NRAQ/7.E217227
		SIMOTION	Standard UL 508, CSA C22.2 No. 142	NRAQ/7.E164110
	UL according to CSA standard	SINAMICS	Standard UL 508, 508C, 61800-5-1 CSA C22.2 No. 142, 274	NRAQ/7.E164110, NMMS/2/7/8.E192450, NMMS/2/7/8.E203250, NMMS/7.E214113, NMMS/7.E253831
	UL according to UL and CSA standards			NMMS/2/7/8.E121068
				NMMS/7.E355661
				NMMS/7.E323473
	UL according to UL standard	SIMODRIVE	Standard UL 508C, CSA C22.2 No. 274	NMMS/2/7/8.E192450 NMMS/7.E214113
	UL according to CSA standard	SIMOTICS	Standard UL 1004-1, 1004-6, 1004-8, CSA C22.2 No. 100	PRGY2/8.E227215
	UL according to UL and CSA standards			PRHZ2/8.E93429
				PRHJ2/8.E342747
				PRGY2/8.E253922
				PRHZ2/8.E342746
		Line/motor reactors	Standard UL 508, 506, 5085-1, 5085-2, 1561, CSA C22.2 No. 14, 47, 66.1-06, 66.2-06	XQNX2/8.E257859
				NMTR2/8.E219022
				NMMS2/8.E333628
				XPTQ2/8.E257852
				XPTQ2/8.E103521
				NMMS2/8.E224872
				XPTQ2/8.E354316
				XPTQ2/8.E198309
				XQNX2/8.E475972
		Line filters, dv/dt filters, sine-wave filters	UL 1283, CSA C22.2 No. 8	FOKY2/8.E70122
		Resistors	UL 508, 508C, CSA C22.2 No. 14, 274	NMTR2/8.E224314
				NMMS2/8.E192450
				NMTR2/8.E221095
				NMTR2/8.E226619
TUV: TUV Rheinland of North America Inc. **Independent public testing body in North America, Nationally Recognized Testing Laboratory (NRTL)** **TÜV: TÜV SÜD Product Service** **Independent public testing body in Germany, Nationally Recognized Testing Laboratory (NRTL) for North America**				
	TUV according to UL and CSA standards	SINAMICS	NRTL listing according to standard UL 508C	U7V 12 06 20078 013
				U7 11 04 20078 009
				U7 11 04 20078 010
				U7 11 04 20078 011
		SIMOTION	NRTL listing according to standard UL 508	U7V 13 03 20078 01
		SIMODRIVE	NRTL listing according to standard UL 508C, CSA C22.2. No. 14	CU 72090702
		Motion Control Encoder	NRTL listing according to UL 61010-1 CSA C22.2 No. 61010-1	U8V 10 06 20196 024

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■ Overview (continued)

Test code	Tested by	Device series/ Component	Test standard	Product category/ File-No.
CSA: Canadian Standards Association **Independent public testing body in Canada**				
	CSA according to CSA standard	SINUMERIK	Standard CSA C22.2 No. 142	2252-01 : LR 102527
FMRC: Factory Mutual Research Corporation **Independent public testing body in North America**				
	FM according to FM standard	SINUMERIK	Standard FMRC 3600, FMRC 3611, FMRC 3810, ANSI/ISA S82.02.1	–
EAC: Ivanovo-Certificate **Independent public testing body in the Russian Federation**				
	EAC in accordance with the EAC Directive	SINAMICS SINUMERIK SIMOTION	Standard IEC 61800-5-1/-2, IEC 61800-3	–
RCM: Australian Communications and Media Authority **Independent public testing body in Australia**				
	RCM according to EMC standard	SINAMICS SINUMERIK SIMOTION	Standard IEC AS 61800-3, EN 61800-3	–
KC: National Radio Research Agency **Independent public testing body in South Korea**				
	KC according to EMC standard	SINAMICS SINUMERIK SIMOTION	Standard KN 11	–
BIA **Federal Institute for Occupational Safety**				
–	Functional safety	SINAMICS SINUMERIK SIMOTION	Standard EN 61800-5-2	–
TÜV SÜD Rail				
–	Functional safety	SINAMICS SINUMERIK SIMOTION	Standard EN 61800-5-2	–

More information about certificates can be found online at:

https://support.industry.siemens.com/cs/ww/en/ps/cert

Appendix
Partners at Siemens

Siemens Partner Program

Overview

Siemens Solution und Approved Partners

Partner Finder

<u>Highest competence in automation and drive technology as well as power distribution</u>

Siemens works closely together with selected partner companies around the world in order to ensure that customer requirements for all aspects of automation and drives, as well as power distribution, are fulfilled as best as possible – wherever you are, and whatever the time.

We place great value on our customers acting in accordance with the same ideals which characterize Siemens as a whole: Competence, professionalism and quality. That is why continuous development through qualification and certification measures in line with global standards is a central aspect of our Partner Program. This means that with our partners, you benefit from the same high quality standards all over the world. The partner emblem is the symbol for tried and tested quality.

<u>Solution Partners and Approved Partners</u>

Our global network of partners includes both Solution Partners and Approved Partners. The latter can be further differentiated into "Value Added Reseller" and "Industry Services".

At present we are working with more than 1,500 Solution Partners worldwide. They are characterized by extensive application, system and sector knowledge, as well as proven project experience, and are able to implement future-proof tailored solutions of the highest quality, based on our product and system portfolio.

With their detailed technical knowledge, Siemens Approved Partners – Value Added Resellers offer a combination of products and services that range from specialist technologies and customized modifications to the provision of high-quality system and product packages. They also provide qualified technical support and assistance.

Approved Partners – Industry Services put their unique expertise entirely at the service of enhancing your productivity and can be instrumental in ensuring the availability of your plants.

In the Siemens global Solution Partner program, customers are certain to find the optimum partner for their specific requirements - with no great effort. The Partner Finder is basically a comprehensive database that showcases the profiles of all our solution partners.

Easy selection:
Set filters in the search screen form according to the criteria that are relevant to you. You can also directly enter the name of an existing partner.

Skills at a glance:
Gain a quick insight into the specific competencies of any particular partner with the reference reports.

Direct contact option:
Use our electronic query form:

www.siemens.com/partnerfinder

Additional information on the Siemens Solution Partner Program is available online at:

www.siemens.com/partner-program

Partner at Siemens
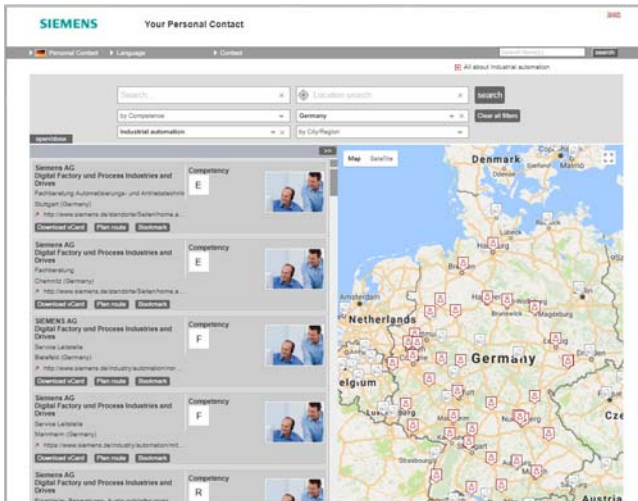
At your service locally, around the globe for consulting, sales, training, service, support, spare parts on the entire portfolio of Digital Factory and Process Industries and Drives.

Your partner can be found in our Personal Contacts Database at:
www.siemens.com/automation-contact

You start by selecting
- the required competence,
- products and branches,
- a country and a city

or by a
- location search or free text search.

Easy product selection and ordering in the Industry Mall and with the Interactive Catalog CA 01
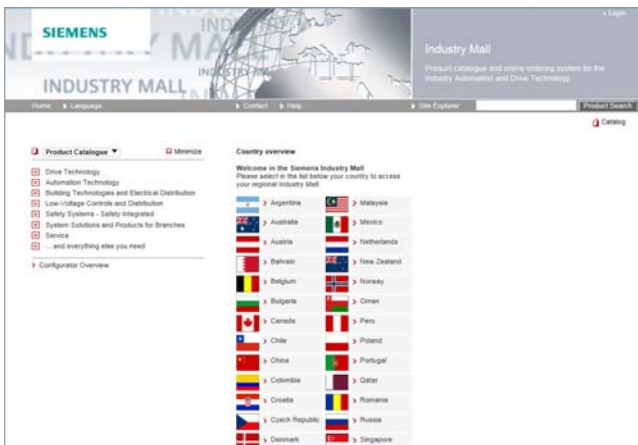
Industry Mall

The Industry Mall is a Siemens Internet ordering platform. Here you have a clear and informative online access to a huge range of products.

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.

Data transfer allows the whole procedure, from selection through ordering to tracking and tracing, to be carried out online. Availability checks, customer-specific discounts and bid creation are also possible.

www.siemens.com/industrymall
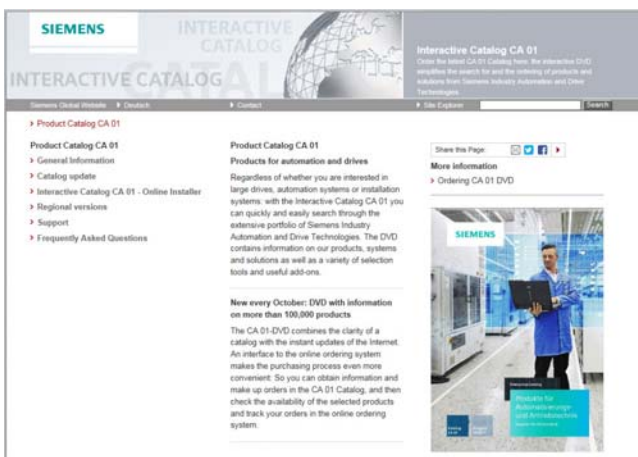
Interactive Catalog CA 01 - Products for Automation and Drives

The Interactive Catalog CA 01 combined with the Siemens Industry Mall unites the benefits of offline and online media in one application – the performance of an offline catalog with the availability of manifold and up-to-date information on the Internet.

Select products and assemble orders with the CA 01, determine the availability of the selected products and track & trace via the Industry Mall.

More information and download:
www.siemens.com/automation/ca01

Downloading catalogs

In the Information and Download Center you can download catalogs and brochures in PDF format without having to register.

The filter dialog makes it possible to carry out targeted searches.

www.siemens.com/industry/infocenter

■ **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

- 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.

Appendix
Notes on software

Software licenses

Overview

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.

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

Software products with and without license keys are supplied.

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

Overview

For supplies and deliveries of software products see also Conditions of sale and delivery.

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 possession 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, systems, machines and networks. In order to protect plants, systems, machines and networks against cyber threats, it is necessary to implement – and continuously maintain – a holistic, state-of-the-art industrial security concept. Siemens' products and solutions constitute one element of such a concept. Customer are responsible for preventing unauthorized access to theire plants, systems, machines and networks. Such systems, machines and components should only be connected to an enterprise network or the internet if and to the extent such a connection is necessary and only when appropriate security measures (e.g. firewalls and/or network segmentation) are in place.

For additional information on industrial security measures that may be implemented, please visit:

https://www.siemens.com/industrialsecurity

Siemens' products and solutions undergo continuous development to make them more secure. Siemens strongly recommends that product updates are applied as soon as they are available and that the latest product versions are used. Use of product versions that are no longer supported, and failure to apply the latest updates may increase customer's exposure to cyber threats.

To stay informed about product updates, subscribe to the Siemens Industrial Security RSS Feed under

https://www.siemens.com/industrialsecurity

Appendix
Conversion tables

■ Rotary inertia (to convert from A to B, multiply by entry in table)

A \ B	lb-in^2	lb-ft^2	lb-in-s^2	lb-ft-s^2 slug-ft^2	kg-cm^2	kg-cm-s^2	gm-cm^2	gm-cm-s^2	oz-in^2	oz-in-s^2
lb-in^2	1	6.94×10^{-3}	2.59×10^{-3}	2.15×10^{-4}	2.926	2.98×10^{-3}	2.92×10^3	2.984	16	4.14×10^{-2}
lb-ft^2	144	1	0.3729	3.10×10^{-2}	421.40	0.4297	4.21×10^5	429.71	2304	5.967
lb-in-s^2	386.08	2.681	1	8.33×10^{-2}	1.129×10^3	1.152	1.129×10^6	1.152×10^3	6.177×10^3	16
lb-ft-s^2 slug-ft^2	4.63×10^3	32.17	12	1	1.35×10^4	13.825	1.355×10^7	1.38×10^4	7.41×10^4	192
kg-cm^2	0.3417	2.37×10^{-3}	8.85×10^{-4}	7.37×10^{-5}	1	1.019×10^{-3}	1000	1.019	5.46	1.41×10^{-2}
kg-cm-s^2	335.1	2.327	0.8679	7.23×10^{-2}	980.66	1	9.8×10^5	1000	5.36×10^3	13.887
gm-cm^2	3.417×10^{-4}	2.37×10^{-6}	8.85×10^{-7}	7.37×10^{-8}	1×10^{-3}	1.01×10^{-6}	1	1.01×10^{-3}	5.46×10^{-3}	1.41×10^{-5}
gm-cm-s^2	0.335	2.32×10^{-3}	8.67×10^{-4}	7.23×10^{-5}	0.9806	1×10^{-3}	980.6	1	5.36	1.38×10^{-2}
oz-in^2	0.0625	4.34×10^{-4}	1.61×10^{-4}	1.34×10^{-5}	0.182	1.86×10^{-4}	182.9	0.186	1	2.59×10^{-3}
oz-in-s^2	24.13	0.1675	6.25×10^{-2}	5.20×10^{-3}	70.615	7.20×10^{-2}	7.09×10^4	72.0	386.08	1

■ Torque (to convert from A to B, multiply by entry in table)

A \ B	lb-in	lb-ft	oz-in	N-m	kg-cm	kg-m	gm-cm	dyne-cm
lb-in	1	8.333×10^{-2}	16	0.113	1.152	1.152×10^{-2}	1.152×10^3	1.129×10^6
lb-ft	12	1	192	1.355	13.825	0.138	1.382×10^4	1.355×10^7
oz-in	6.25×10^{-2}	5.208×10^{-3}	1	7.061×10^{-3}	7.200×10^{-2}	7.200×10^{-4}	72.007	7.061×10^4
N-m	8.850	0.737	141.612	1	10.197	0.102	1.019×10^4	1×10^7
kg-cm	0.8679	7.233×10^{-2}	13.877	9.806×10^{-2}	1	10^{-2}	1000	9.806×10^5
kg-m	86.796	7.233	1.388×10^3	9.806	100	1	1×10^5	9.806×10^7
gm-cm	8.679×10^{-4}	7.233×10^{-5}	1.388×10^{-2}	9.806×10^{-5}	1×10^{-3}	1×10^{-5}	1	980.665
dyne-cm	8.850×10^{-7}	7.375×10^{-8}	1.416×10^{-5}	10^{-7}	1.0197×10^{-6}	1.019×10^{-8}	1.019×10^{-3}	1

■ Length (to convert from A to B, multiply by entry in table)

A \ B	inches	feet	cm	yd	mm	m
inches	1	0.0833	2.54	0.028	25.4	0.0254
feet	12	1	30.48	0.333	304.8	0.3048
cm	0.3937	0.03281	1	1.09×10^{-2}	10	0.01
yd	36	3	91.44	1	914.4	0.914
mm	0.03937	0.00328	0.1	1.09×10^{-3}	1	0.001
m	39.37	3.281	100	1.09	1000	1

■ Power (to convert from A to B, multiply by entry in table)

A \ B	hp	Watts
hp (English)	1	745.7
(lb-in) (deg./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.

Appendix
Metal surcharges

■ **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

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[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: Schutzvereinigung DEL-Notiz e.V. (www.del-notiz.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 2016 - Nov 2016	Q1 in 2017 (Jan - Mar)
Dec 2016 - Feb 2017	Q2 in 2017 (Apr - Jun)
Mar 2017 - May 2017	Q3 in 2017 (Jul - Sep)
Jun 2017 - Aug 2017	Q4 in 2017 (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

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No basis necessary
No surcharge for silver
No surcharge for copper
No surcharge for aluminum
No surcharge for lead
No surcharge for gold
Dysprosium acc. to weight, basic official price 300 €
Neodym acc. to weight, basic official price 50 €

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[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)

Appendix
Metal surcharges

Values of the metal factor

Percentage method	Basic official price in €	Step range in €	% surcharge 1st step Price in € 150.01 - 200.00	% surcharge 2nd step Price in € 200.01 - 250.00	% surcharge 3rd step Price in € 250.01 - 300.00	% surcharge 4th step Price in € 300.01 - 350.00	% sur-charge per addi-tional step
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						
2	100						
3	150						
4	175		Calculation based on raw material weight				
5	200						
6	225						
7	300						
8	400						
9	555						
Miscella-neous							
-	No metal surcharge						

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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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[1] The text of the Terms and Conditions of Siemens AG can be downloaded at
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